Strategic alliance, information and communication technology, and customer related performance: The role of an industry characteristic

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**ABSTRACT**

In today’s globally competitive market, customers have wide range of preferences; they demand fast processing and on time delivery of orders. To successfully meet such customer demands, companies1 need to implement strategies that capitalize on the power of information and communication technology (ICT). The relevant literature suggests one way to successfully implement such strategies is to engage in strategic alliances (SA) which allows the alliance member firms to jointly undertake research and development; share knowledge, costs and risks in developing new products; and share processes and services (Connell & Voola, 2007; Hill, 2010).) The literature however is unclear if managerial use of ICT plays an important role in making SA successful (Andersen & Segars, 2001). Also, the literature is unclear on whether the above role of ICT is effective in different industries. This study answers the above queries, thereby adds to existing knowledge**.**

The results are based on the responses of 78 general managers from large manufacturing firms and the data were analysed using structural equation modelling with PLS. The results reveal that managerial use of ICT is a mediator of the relationship between a firm’s engagement in SA and its performance. In addition the results reveal that the relationship is significantly affected by an industry characteristic.

Key words: SA, ICT, Performance.

**INTRODUCTION**

 In today’s globally competitive and e-commerce market customers have more choices and companies are subject to threats from both local and overseas competitors. To face such threats, a company must keep its customers satisfied. Though companies traditionally spend big money to market their products, it might not work in the global e-commerce environment (O'Connell, 2002). Relevant literature suggests that in today’s market, companies have to improve their customer-related performance to get new customers and retain the existing ones.

 Customer related performance (hereafter, CRP), mainly driven by customer satisfaction, has been regarded as a critical determinant of long-term customer behaviour. The more satisfied customers are, the more loyal they are to the products (Ranaweera & Prabhu, 2003), which in turn leads to increased sales and market share. Satisfied customers show loyalty to a company through repeat as well as increased purchase of its products and services and by recommending the products/services to others (Kim, 2010). Compared to getting new customers, satisfied customers are also less expensive to retain, therefore generate more benefits at relatively less marketing costs (see Ranaweera & Prabhu, 2003). Following the literature, we consider a company’s CRP is important for its success.

 The relevant literature suggests that in competitive market, companies try to maintain or improve their customer satisfaction by using strategies such as increasing product range, improving product quality and services, offering better value for money, and penetrating into new and/or overseas markets (1991; Kaplan & Norton, 1996;Wyle, 2000). One way to successfully achieve these strategies is to engage in SA(s) with other firms. Gulati (1998, p. 293) defines SA as a “voluntary arrangements between firms involving exchange of technologies, sharing of services, and/or co-development of products....”. Engaging in an SA allows the alliance member firms to jointly undertake research and development; share knowledge, costs and risks in developing new products; and share processes and services (Connell & Voola, 2007; Hill, 1994; Hill, 2010).) It is also a way of bringing together complementary skills and resources that a firm could not easily develop alone.

 We view that managerial use of ICT can facilitate the positive effect of a firm’s engagement in SA on its CRP. ICT, in this study comprises Intranet and Internet; including net-meeting, net-phone and videoconference. Andersen & Segars (2001) suggest that managerial use of ICT can help a firm maximise the benefits of its engagement in SA. This is particularly the case when a manufacturing firm operates in a highly competitive market; offers a broad range of products; maintains a number of divisions, and operates in different regions or countries. Figure 1 presents the model of the study. In the next section we present literature review and hypotheses.

Insert Figure 1 here

**2. Literature Review and hypotheses**

 In this section we explain the relationship between engagement in SA and managerial use of ICT followed by the discussion on the relationship between ICT and CRP. Finally the relationship between SA and CRP is discussed.

**2.1. Engagement in SA and managerial use of ICT.**

 Due to globalisation, technological advancements, and deregulations of economy, competition has intensified globally resulting in increasing customer expectations. Today’s customers demand fast processing and on time delivery of orders. To be successful in fulfilling such customer demands and preferences, companies need to implement innovative strategies that capitalize on both the power of ICT and the changes in market demands and preferences. We contend that SA is one such strategy. We also consider that a successful SA requires a communication system built on state of the art ICT. The Internet and intranet are examples of such ICT, which can support the success of SA. Managerial use of the Internet links alliance member firms together, making it easy for the firms to have on time access to each other’s information and resources to jointly develop products and or services, conclude contracts, share promotional plans, negotiate price and identify potential markets. In other words, the Internet as a business-to-business communication tool facilitates on time flow of information between alliance member firms, integrating the business processes across the extended enterprise including customers, suppliers, marketing and services (Papazoglou et al., 2000). The Intranet is critical for on time communication and flow of information among managers within an alliance member firm which, in turn, facilitates communications between alliance member firms.

There are studies on the impact of engagement in SA on a firm’s performance. However, the results of those studies are mixed. For examples, Harrigan (1998) reports that success rate of such alliances is low. About 70 percent of SAs fail to maintain relationships between member organisations and therefore lose the benefits of the alliance. A reason for such failure is the lack of effective communication among the member organisations of an alliance. For instance, Shrader (2001) and Steensma & Corley (2000) suggest the biggest obstacle to the success of an SA is lack of close communication and collaboration between the member firms (see also Galbraith, 1994; Haywood, 1999; Kaplan & Norton, 1996). Other researchers such as Pearce & Robinson (2011) also report that many SAs fail to achieve the objectives because of a lack of commitment and trust among alliance members. Elmuti, et al (2012) report that SA improves organisational performance through interactive learning processes, communication and sharing information among SA partners. These results indicate that communication and collaboration form the basis for inter-firm relationships. Further, given that an SA may take the form of a horizontal and/or vertical inter-firm relationship, it may result in an integrated value chain (Papazoglou et al., 2000). From this point of view, an SA helps workflow distribution providing sequence of business activities, arrangements for deliveries of work to the appropriate organisational sites or facilities, tracking the status of business activities and coordination of the flow of information on activities.

 Following the discussion above, we contend that success of engagement in SA requires strong collaboration through communication. ICT nowadays is the most common technology used to communicate compared with other conventional communication technology, such as telephone and mail. ICT is the most convenient and cheapest communication technology. This advanced communication technology allows people to communicate rapidly and it breaks through the geographical barrier (Forousan, 2001).

 Previous studies investigated the relationship between SA and the use of ICTand report that using ICT, member firms of an alliance can take advantage of each other’s core competencies resulting in the success of all member firms of an SA (Brynjolfsson, 1993; Brynjolfsson and Hitt, 1996; Huber 1990; Weill, 1992). Similarly, Andersen (2001) and Kettinger, et al (1994) suggest that the use of ICT enables the member firms’ business process in tracking transactions across departments, companies and enterprise boundaries. Andersen (2001) also suggests that an online flow of information enhances partnership growth, and serves as a strong foundation for a good relationship. Further, Dewett and Jones (2001) support these studies and suggest that ICT brings efficiency to the relationship among alliance members as well as between a firm's different areas, especially transaction costs as all information can be transmitted through computer.

Other studies show that a successful operation of an SA is dictated by the fact that every member of the alliance is able to share information with trading partners and customers on a real-time basis. A real-time flow of communication allows the alliance members to exchange information freely and promptly, and helps to build up the relationship, collaboration and commitment which, in turn, promote trust and commitment among them (Shrader, 2001). Adobor (2002), for example, reports that an effective communication builds trust, collaboration and mutual cooperation, brings the alliance member firms together and, in turn, leads to members’ commitment and collaboration in an integrated, successful alliance ( see also Ohmae, 1996; Hamel, 1991; Mintzberg et al. ,1996; Villas & Macedos-Soares, 2007).In another study,Luo (2008) suggests that the integration among alliance member firms has a positive effect on alliance integration which, in turn, facilitates alliance success. Similarly, Lee and Ding (2010) report that the use of communication technology, such as internet, is the key to the success of a firm’s engagement in SA. Following the above discussion we posit that

 H1: There is a positive relationship between a firm’s engagement in SA and its managerial use of ICT.

**2.2. Managerial use of ICT and CRP.**

 Due to increasing competition, manufacturers need to have updated and instant information to meet customer demands and preferences. Customised products and services become essential to meet today’s customer expectations, demand an integrated service and quick responses. Therefore, a company has to focus on its customer related performance otherwise competitors may take over its market opportunities (Andel, 2002). CRP in this study incorporates attributes such as on-time delivery of orders, number of customer complaints, market share, order lead time and customer response time.

 The extant literature suggests that the use of ICT is positively associated with a firm’s performance. Andersen (2001) reports that ICT, facilitating rapid sharing of accurate information at little cost, allows an organisation to have instant online information needed for prompt decision-making. For example, in a highly competitive market, customers’ needs and tastes and competitors’ products change rapidly and unexpectedly. With the intranet aspect of ICT, marketing departments are able to timely inform their production departments of the demand trend for product(s~~)~~, enabling the production departments to effectively adjust production processes that meet customers’ changed tastes and needs. In another study, Choe (2008) reports that information sharing throughout a company’s value chain improves organisational performance; while Quader and Quader (2008) report that UK supermarkets through engagement in SA with internet based companies, enable themselves to take customers’ orders on line and deliver the orders quickly, thereby raising their customer-related performance (see also Lee, and Ding, 2010). Similarly, Vanpoucke et al. (2009) report communication among alliance members, such as suppliers, enhances a company’s CRP.Ramanathan (2013) suggests that the use of ICT in hospitals, facilitates service to patients as the use of ICT in the hospital increases service speed, including responsiveness to patients. This is because ICT links not only communication among all the departments within the hospital but also with its suppliers and patients.

 The above discussion leads us to posit that a firm’s managerial use of ICT is positively related to its CRP. This argument is formalized in our second Hypothesis.

 H2: There is a positive relationship between managerial use of ICT and customer-related performance.

**2.3. Engagement in SA and customer-related performance**

 The relevant literature indicates that SA facilitates alliance member firms’ access to broader markets with lower investment, assists them in facing uncertainty in market and improves their brand name, thereby enabling the firms to gain competitive advantage. Further, manufacturing firm’s engagement in a SA has a positive impact on the firm’s product quality because an alliance with suppliers, for instance, helps the firm obtain quality materials and spare parts; this also may result in increased productivity. Further, the alliance supplier(s) helps member firms to respond faster to customer demand as well as maintain and improve customer services (Shrader, 2001; Steensma & Corley, 2000). Jiang and Li (2009),for instance, report that engagement in SA significantly contributes to partner firms’ performance. In other studies, researchers suggest that engagement in SA improves availability of quality service and brand image which ultimately improves market share. For example, the brand image combination of IBM and Intel or Bacardi Rum and Coca Cola has improved the products’ quality image and increased their market share (Akshay, Rueket & Robert, 1994). Similarly, the alliance between Rover and Honda has improved the brand image of the products. Alvarez and Gonzales, (1999) report that the Honda designs of a Rover model increased the alliance partners’ product image, and reputation on reliability and quality. Consider also the case of Arnotts’ (a biscuit maker in Australia) alliance with other local biscuit manufacturers. Through the alliance Arnotts has been able to beat the competitors in gaining additional share in the local market. Also, through forming an alliance with America’s Campbell Soup, Arnotts entered the US market, and by making and selling American Campbell cookies, it increased its Australian market share to 75% (Dettre, 1986).

 The relevant literature also indicates that SA assists member firms manage their inter-organisational dependency, improve brand name and have control over markets by gaining competitive advantages (Shrader, 2001; Steensma & Corley, 2000). Wang & Horsburg (2007), for example, report that a network of interlinked services with alliance member firms improves the service consistency of airlines, which ultimately improves their customer satisfaction.

 Following the discussion above, it is argued that engaging in an SA improves member firms’ customer-related performance. Hypothesis three below formally presents the argument.

 H3: There is a positive relationship between a firm’s engagement in an SA and its CRP.

 However, the benefits of SA discussed above is not universal as some studies report that SA has a negative direct relationship with firm’s performance. Ritala, et al., (2008) and Walter et al, (2008) report that, due to lack of coordination between alliance member firms, engagement in SA(s) harms individual member firm’s performance (see also Rajasekar & Fouts, 2009). We contend that a reason for such undesirable effect on performance is lack of trust and cooperation among alliance member firms. The relevant literature suggests that an effective communication builds trust among alliance member firms, thereby fostering close cooperation among the firms (Abodor, 2002; Fichman & Levinthal, 1991; Gambetta, 1988; Collinson, 2000). We posit that managerial use of ICT plays a mediating role in the relationship of a firm’s engagement in SA and its performance. This is because ICT facilitates on time close communication among the member firms of an SA and thereby acts as a proxy for (or a driver of) trust, commitment and collaboration among the alliance member firms and assists in improving the firms’ performance. In other words, we predict that ICT mediates the relationship between a firm’s engagement in SA and its CRP. Given the relationship between a firm’s engagement in an SA and ICT (H**1**) and the relationship between ICT and CRP (H**2**) are positive and significant, the results then would indicate that the relationship between a firm’s engagement in an SA and its CRP (H**3**) exists, at least partly, via ICT. More specifically, ICT in that case would appear to be playing a mediating role in the relationship. A logical interpretation of such positive results would lead to the conclusion that an adequate managerial use of ICT assists an organisation’s engagement in SA to be effective in improving the organisation’s CRP.

**2.4. The role of industry characteristic**

 We consider that the mediating role of ICT in the firms from electronics industry will be more pronounced than in the firms from the other three industries in the sample. Our argument is based on the theory of product life cycle (PLC) that prevails in industries. The PLC theory describes the evolution of a product as measured by its sales over its lifetime (Cox, 1967; Kotler, 2003). Throughout its life, a product passes sequentially through the stages: introduction, growth, maturity and decline (Grantham, 1997). A product with short PLC passes through the different stages of its life relatively quickly. Consider, for example, the case of plasma TV. Within a few years of its introduction in the market, LCD television also appeared. As a result, the popularity of plasma TV declined rather sharply and may disappear from the market soon. In other words, the plasma TV represents a product with a short PLC. On the other hand, products such as canned tuna or steel rods or rolling chairs have been in the market for decades; these products are still available indicating a long life cycle (see also, Bangchokdee, 2008).

 Given that in today’s market electronic products (e.g., TV, laptop computer, mobile phone) generally have a short PLC, we contend that electronics industry is characterised by a PLC which is shorter than that in a food processing, metal products or furniture industry. The extant literature indicates that the electronics industry is affected by a rapid technological change, unstable demand, volatile competition and market growth (Brown & Eisenhardt, 1997; Dess & Beard, 1984; Geletkanycz & Hambrick, 1997; Henderson, Miller & Hambrick, 2006). The literature contains evidence suggesting that the electronics industry specifically faces a rapid change in product technology (Mendelson & Pillai, 1999; Nadkarni & Narayanan, 2007). For instance, Mendelson & Pillai (1999) report that the capacity of microprocessors has doubled every two years from 64 Kb to 256 Kb, 512 Kb … 1 Mb. In contrast, industries with a relatively long PLC (e.g., the food-processing industry) face a relatively slow change in technology, consistent market growth and stable demand (Geletkanycz & Hambrick, 1997; Henderson et al., 2006). Following the literature, we conclude that the electronics industry is characterised by a relatively short PLC while the food processing, furniture, and fabricated metal products (hereafter, other) industries are characterised by a relatively long PLC. Consequently, the level of uncertainty in the operating environment faced by these other industries is likely to be lower than the level of uncertainty faced by the electronics industry. For instance, Anderson (2004) reports that compared to the food processing industry, the electronics industry faces a significantly high level of uncertainty.

 We argue that the industry-level uncertainty influences managerial use of ICT for decision making. Managers in an industry facing a high level of uncertainty may make greater use of ICT to gather more information than those in an industry facing relatively low level of uncertainty. In an industry facing a high uncertainty, managers require accurate and current information and data to gain a better understanding of the dynamics of the situation (Gordon & Narayanan, 1984) to mount an appropriate response (Gul & Chia, 1994; Mia, 1993) which, in turn, may enhance organisational performance (Chong & Chong, 1997). On the other hand, in an industry facing a relatively low level of uncertainty, managers face a more stable business environment; therefore, they are able to cope with these situations as they can make decisions based on their past experience. Gul and Chia (1994) argue that in a stable environment, managers may suffer from information overload if they access more information than needed, resulting in suboptimal decision-making. This in turn may lead to poor performance (Chong & Chong, 1997).

 Although previous studies have examined the effect of uncertainty on the usefulness/use of information (Chenhall & Morris, 1986; Chong & Chong, 1997; Gordon & Narayanan, 1984; Gul & Chia, 1994; Mia, 1993), these studies focused on the uncertainty at the organisation or individual level, not at the industry level. For example, the early study by Gordon and Narayanan (1984) examined the relationship between managers’ perceived environmental uncertainty (PEU) and the perceived usefulness of accounting information. Chong and Chong’s (1997) study examining the effect of managers’ PEU on the use of information also used Gordon and Narayanan’s (1984) instruments. Chenhall and Morris (1986) investigate the relationship between managers’ PEU and their perceived use of information, which is again at the individual level. Their measurement instrument attempts to capture managers’ perceptions of environmental uncertainty relating to the managers’ operating environment at work. Unlike the previous studies, the current study focuses on uncertainty at the industry level.

 The extant literature suggests that managers’ use of ICT (i) increases volume, speed, and capacity of their data handling; and (ii) improves information exchange and communication across functions, parties, geographical locations and time zones (Badir, et.al, 2009; Andersen, 2001; Forouzan, 2001). Previous studies report that the extent of managers’ information use is positively associated with their ICT use, as ICT helps them to effectively use the information (see, Brynjolfsson and Hitt, 1996; Powell and Dent-Mitcallef, 1997). Recently, Mia and Winata (2008) report managers’ information use and their ICT use are positively related. An effective use of information is particularly relevant for the electronics industry because of its high level of uncertainty. As an integrated computer network and data interface, ICT also provides managers with the capacity to instantaneously share real-time information that enables faster and better decision-making (Andersen, 2001; Brynjolfsson and Hitt, 1996; Powell and Dent-Mitcallef, 1997). Following the above discussion, we posit that managers’ use of ICT plays a more important role in the relationship between a firm’s engagement in SA and its CRP in the electronics industry than in the other industries. Hypothesis four summarises the above discussion.

 H4: The mediating role of ICT in the relationship between a firm’s engagement in SA and its CRP is more pronounced in the electronics industry than in the other industries. Specifically, SA not coupled with the use of ICT will be less effective in the electronics industry than in the other industries.

**3. Research method**

 **3.1. The sample**

 Data were collected from 78 Large (annual sales revenue from 50 to 150 billion Rupiah; 1US$=11000 Rupiah) Indonesian manufacturing firms, using a mailed questionnaire survey. Initially, a list of 600 large private manufacturing companies, operating in Java Island in Indonesia, was obtained from Online Data Centre of Industry and Trading Department of Indonesian Government. From among the 600 large companies, 250 companies were selected at random. Only the large manufacturing companies were selected because such companies are more likely to engage in SA and have more resources to afford the investment in state of the art information facility comprising modern information and communication technology.

Indonesia as the research site for this study was viewed suitable as it is a developing country with a predominantly collectivism culture (Hofstede, 1994). Triandis (1995)explains thatin a collectivism culture trust and social norm drive the initial cooperation. Wong & Tjosvold (2006) also report that collectivism cultures value integrated interaction among partners. However, Because of the predominant collectivism culture, the relationship between SA and ICT in Indonesia may be different from that in other countries with different culture(s). It needs further investigation into whether the engagement in SA in Indonesia also leads to the use of communication technology such as the use of internet and intranet. Table 1 presents the sample distribution.

Figure 1: Path model containing direct and indirect effects



 Initially, a personal letter was written to the managing director (MD) or an equivalent senior executive of each of the selected 250 companies. In the letter we explained the purpose of the study, requested the MD to nominate one general manager in charge of a business unit (henceforth, BU manager) within the company, to take part in the study and solicited the executive’s permission to contact the nominated BU manager. For purposes of the study, a business unit was defined as a profit centre which carried out the usual business activities, including manufacturing and selling products. A sample of the survey questions used for the data collection was attached to the letter addressed to each MD. Within four weeks of posting the letter, we contacted the MDs by telephone, asking if they had received the letter and if they would nominate their BU manager to participate. If the letter was not received, we sent the letter again asking the MDs to nominate a BU manager.

 In total, 160 BU managers were nominated by 160 MDs, who supplied the BU managers’ names and addresses. Subsequently, each of the nominated BU managers was sent a package that contained (i) a personal letter addressed to each BU manager explaining the purpose of the study, the potential benefit of the study, and an assurance of confidentiality of the responses, (ii) a copy of the survey questionnaire and (iii) a self-addressed postage paid envelope for returning the completed questionnaire direct to the researchers. The letter to each BU manager also explained that the questionnaire would not ask for any sensitive information and the information collected would be treated as strictly confidential. Each of the variables (SA, ICT and CRP) was defined for the managers at the beginning of the section for each variable in the questionnaire. Moreover, the letter indicated that a copy of the summary results would be made available to the managers subject to their completion of the request form for results included in the package.

 In total, 78 BU managers fully completed and returned the questionnaire. Thus, the final sample used for data analysis was 78 yielding the response rate of 31.20%. Though the response rate was relatively low, the sample size is acceptable. Page & Meyer (2000) explain that the rule of thumb is at least four sample elements for every variable included in the study. The model of the current study includes three variables: (i) engagement in SA, (ii) managerial use of ICT, and (iii) CRP. To test for non-response-bias we split the sample into three groups based on the dates of the questionnaire return. Statistical comparisons using the Kruskal-Wallis Test did not indicate any significant difference between the groups (p>.10). Hence, non-response-bias was not an issue in the sample.

**3.3. Measurement of the Variables**

 *Engagement in strategic alliance (SA)*. For purposes of this study, SA was defined as a cooperative mutual agreement between autonomous organisations with a view to improving competitive advantage and long-term profitable value for all cooperating parties. The agreement may or may not involve cross-partner equity investments (Jarillo, 1988; Miles & Snow, 1986). The extent of a firm’s engagement in a SA was measured on a 5-point Likert scale, ranging from strongly disagree (low alliance) to strongly agree (high alliance). The instrument consisted of 4 items (see Appendix 1) referring to the extent of agreement between the respondent BU manager’s firm and its alliance member companies in developing, producing and marketing products. The BU managers were asked to respond to each of the four items (questions), indicating how extensive was their company’s mutual agreement or business network with their company’s alliance partners. The instrument was adapted from Li & Atuahene (2001). Table 2 presents the mean and standard deviation for the variable.

Tables 2

##### Descriptive Statistics (total sample: n = 78)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | Mean | Median | Std. dev. | Skeweness | Kurtosis |
| SA | 2.49 | 2.50 | 1.08 | 0.19 | 0.48 |
| Info and Comm tech.  | 2.85 | 3.07 | 1.14 | -0.03 | -1.26 |
| Customer-related perf. | 3.42 | 3.50 | 0.60 | -0.59 | 0.47 |

 *Information and communication technology (ICT).* This study focused on managerial use of the ICT~~)~~ comprising Internet, Intranet and visual communication including videoconferencing, and net-meeting (Forouzan, 2001). Measurement of this variable involved assessing the extent of managerial use of Internet and Intranet (Andersen, 2001; Byrd et al., 2000; Reichert et al., 1998). The extent of managers’ use of ICT was assessed on a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always). The instrument was adapted from Andersen (2001) and it consisted of 5 items (see Appendix 1). The respondents were asked to respond to each of the 5 items indicating the extent of their use of the ICT within their business units. Table 2 presents the mean and standard deviation for the variable.

 *Customer related performance (CRP)*. Following the balanced scorecard approach (Kaplan and Norton, 1996) and the importance of CRP discussed in section 2 of the paper, we used CRP as the firm performance. This variable was defined in terms of on-time delivery, the number of customer complaints received, market share, order lead time, customer response time and warranty repair cost (Hoque & James, 2000). The BU managers were asked to indicate on a 5-point Likert scale their business unit’s customer–related performance relative to the average of the related industry. On the scale, 1 represented well below and 5 represented well above the industry average CRP. The 6-item instrument was adapted from Hoque & James (2000). Table 2 presents the mean and standard deviation for the variable.

**4. Data Analysis**

 To test the hypotheses we conducted a partial least squares (PLS) analysis. PLS is a variance-based structural equation modelling approach that has been developed to avoid some of the limitations of the well-known covariance-based techniques like LISREL. Structural equation models in general allow the researcher to represent, estimate and test complex relationships between theoretical constructs (latent variables. While covariance-based techniques like LISREL require certain sample size and distribution assumptions, PLS is able to handle small sample size and non-normal distributions (Chin, 1998). PLS has recently been used in a number of empirical studies (Anderson et al., 2002; Chenhall, 2004; 2005; Ittner et al., 1999; Vandenbosch, 1999).

 The reliability and validity of the measurement model was first assessed to ensure the quality of the measurement instruments used, before conclusions on the theoretical relationships in the structural model are drawn. To assess reliability and validity of each measurement model, we looked at the individual-item reliability, the internal consistency and the convergent and discriminant validity (Barclay et al., 1995; Fornell & Larcker, 1981; Hulland, 1999). Individual-item reliability looks at each loading (or simple correlation) of the indicator with its respective construct (Barclay et al., 1995; Hulland, 1999). A rule of thumb is that loadings should exceed 0.7 (Barclay et al., 1995). To assess internal consistency the composite reliability for each construct was calculated, which looked at all the loadings of the manifest indicators composing a latent variable and is similar to Cronbach’s alpha (Chin, 1998; Fornell & Larcker, 1981). Values of 0.7 or above are recognized as good for the composite reliability measure. Convergent validity was assessed by calculating the average variance extracted (AVE) which represents the average variance shared between a construct and its indicators. Usually it is recommended that the AVE should exceed .0.5 or 50% or more variance of the indicators are accounted for by the construct (Barclay et al., 1995; Chin, 1998; Hulland, 1999; Fornell & Larcker, 1981). To test for discriminant validity, indicating that a given construct is different from other constructs, the AVE of each construct must be greater than the squared correlation between the constructs and all other constructs (Barclay et al., 1995; Chin, 1998; Fornell & Larcker, 1981).

 After having assessed the reliability and validity of the measurement models, the standardized path coefficients derived from PLS estimation were used to measure the relationships between the constructs, and hence the hypothesized relationships. To assess statistical significance of the path coefficients, the nonparametric bootstrapping procedure was used (Chin, 1998). In the present study, 5000 bootstrapping samples were used to estimate standard errors. In addition to the statistical significance of the path coefficients, the predictive power of a model was examined by the squared multiple correlation coefficient, i.e. R2 value, for the endogenous (dependent) constructs. Corresponding values were interpreted in an identical manner to traditional regression (Barclay et al., 1995; Chin, 1998; Hulland, 1999).

 Consistent with our discussion leading to hypothesis H4, the total sample was divided into two subsamples – one comprising the electronics firms and is named as the ‘electronics’ and the other comprising firms in the food processing, furniture, and fabricated metal products and is named as the ‘other industries’. Subsample one includes 36 firms and Subsample two includes 42 firms (see Table 1). Analysis of data for each subsample is carried out separately using the same procedure followed for the total sample.

Table 1

The Sample Distribution

|  |  |  |  |
| --- | --- | --- | --- |
|  | Industry | Number | Percentage |
| 1 | Electronics | 36 | 47.50% |
| 3 | Food processing | 13 | 15.38% |
| 4 | Furniture | 14 | 17.95% |
| 5 | Fabricated metal products | 15 | 19.23% |
|  | Total | 78 | 100% |

**5. Results**

 Table 3 presenting the bivariate correlation between variables in the model for the total sample reveals no multicollinearity. Validation results of the three measurement models in the study are shown in Table 4 for the total sample. The measurement models indicate acceptable results for the three constructs: CRP, ICT, and engagement in SA. The corresponding items of each construct show loadings above 0.7 indicating acceptable individual-item reliabilities. The composite reliabilities of the three constructs were, 0.892 for CRP, 0.965 for ICT, and 0.888 for SA. This means that all constructs reached satisfactory levels of internal consistency. The AVEs of the constructs in the study display values that exceed the recommended 0.5 which reveals that the shared variance between the constructs and its items exceeds 50%. Additionally, Table 4 reports Cronbach (1951) alphas which reaches satisfactory levels at 0.834, 0.954, and 0.835, respectively.

Tables 3

The bi-variate correlation between the variables (total sample: n=78)

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | 1 | 2 | 3 |
| 1. Strat alliance (SA) | 1.00 |  |  |
| 2. Info and com tech (ICT) | 0.33 | 1.00 |  |
| 3. Customer related perf (CRP) | 0.05 | 0.39 | 1.00 |

Table 4. Measurement statistics for validity and reliability of measurement models; total Sample

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Indicators | Cronbachalpha | Standardized Loadings | Composite Reliability | AVE | Mean | Std. Dev. |
| Critical Values | >.7 | >.7 | >.7 | >.5 |  |  |
| SA1 |  | .82 |  |  | 2.27 | 1.31 |
| SA2 | .79 | 2.76 | 1.40 |
| SA3 | .86 | 2.23 | 1.28 |
| SA4 | .80 | 2.51 | 1.39 |
|  |  |  |  |  |  |  |
| ICT1 | .954 | .88 | .965 | .845 | 2.77 | 1.30 |
| ICT2 | .92 | 3.09 | 1.32 |
| ICT3 | .94 | 2.78 | 1.39 |
| ICT4 | .93 | 2.88 | 1.34 |
| ICT5 | .92 | 2.72 | 1.28 |
|  |  |  |  |  |  |  |
| CRP1 | .834 | .86 | .892 | .673 | 3.81 | .81 |
| CRP2 | .78 | 3.46 | .96 |
| CRP3 | .84 | 3.50 | .83 |
| CRP4 | .81 | 3.69 | .92 |
|  |  |  |  |  |  |  |

 Regarding the discriminant validity, Table 5 presents the squared correlations between the constructs for the total sample. The AVE of each construct is shown on the diagonal of the matrix. The results show that the AVE of each construct is greater than the squared correlations with other constructs, indicating that all constructs denote discriminant validity in this study. In summary, all the tests for reliability and discriminant validity show acceptable measurement properties for the three constructs.

 After assuring the reliability and validity of the measurement models, the hypothesised relationships among the constructs were evaluated. The strength of the relationships (path coefficients) and the variance explained are outlined in Table 6 and presented in Figure 1 for the total sample. The squared multiple correlation coefficient for the estimated structural equation model amounts to 15.5% for ICT and 11.3% for CRP which indicates that SA, and ICT together with SA, explain a moderate portion of the variance in ICT, and CRP respectively.

Table 5

Squared Correlations between constructs (total sample: n=78)

(diagonal elements represent AVE)

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | 1 | 2 | 3 |
| 1. SA | **0.665a** |  |  |
| 2. ICT | 0.154 | **0.854** |  |
| 3. Perf. | 0.003 | 0.106 | **0.673** |
| a. The bold elements on the diagonal represent AVE. For discriminant validity, the AVE in each row and column must be greater than the displayed squared correlations in that row or column. |

Table 6. Results from PLS Analysis with path coefficients (standardized) (total sample: n=78)

|  |  |  |
| --- | --- | --- |
| Relationship | ICT | CRP |
| H1: SA (SA) to ICT | .39\* |  |
| H2: ICT to Customer Performance (CRP) |  | .36**†** |
| H3: SA to ICT |  | -.09 |
|  | R2=.155 | R2=.113 |

\* p<0.05, † p<0.025, ⁪ p<0.000 (two-tailed)

Hypothesis H**1** predicts that there is a positive relationship between a manufacturing firm’s engagement in SA and its managers’ use of ICT. The results presented in Table 6 show a significant path coefficient of 0.39 (p<.01) which reveals that SA is positively associated with managers’ use of ICT. Hence, the results support hypothesis one.

 Hypothesis H**2** predicts that there is a positive relationship between managers’ use of ICT and customer-related performance. The corresponding path coefficient is statistically significant (p<.01) and has a value of 0.36 which indicates that managerial use of ICT is positively associated with a company’s customer-related performance, thus supporting hypothesis H**2**.

 In Hypothesis H**3** we predict that there is a positive relationship between an organisation’s SA and customer-related performance. The insignificant path coefficient of -0.09 (p>.10) reveals that SA is not associated with related performance (CRP). Therefore, hypothesis H3 is not supported. In other words, the results indicate that the SA is not directly associated with customer-related performance.

 In hypothesis H**4** we predict that the role of ICT is more pronounced in the SA – CRP relationship in electronics industry than in the other industries. More specifically, SA not coupled with the use of ICT will be less effective in the electronics industry than in the other industries. The discussion below explains the results.

 Similar to the total sample, Table 3A presenting the bivariate correlation between variables for each of the subsamples reveals no multicollinearity issue. As in the total sample, validation of the three measurement models for each of the two subsamples (electronics and other industries) are assessed. The results presented in Table 4A reveal that the measurement models indicate acceptable results for the three constructs. The corresponding items in each construct show a satisfactory loading for both subsamples indicating acceptable individual-item reliabilities. Also, the composite reliabilities of the three constructs for both subsamples are satisfactory, therefore indicating a satisfactory level of internal consistency. The AVEs of the constructs for both of the subsamples display values that exceed the recommended 0.5 which reveals that the shared variance between the constructs and its items exceeds 50%.

 The satisfactory discriminant validity can be observed from Table 5A presenting the squared inter correlations between the constructs for both of the subsamples. The AVE of each construct is shown on the diagonal of the matrix. The results show that the AVE of each construct for both subsamples is greater than the squared correlations with other constructs, indicating that all constructs denote discriminant validity in this study. In summary, all of the tests for reliability and discriminant validity show acceptable measurement properties for the three constructs for both subsamples.

 Having found the reliability and validity of the measurement models satisfactory for both of the subsamples, hypothesis H**4** is tested. The level of significance (strength) of the relationships (path coefficients) and the variance explained are presented for both of the subsamples in Table 6A. The percentage of variance (R**2**) explained in ICT and CRP for each of the subsamples is also presented in the respective Table. A striking difference in the results for the two subsamples is in the relationship between SA and CRP. While the relationship between SA and CRP for other industries is not significant (the path coeff. = 0.08, Table 6A), the same relationship for the electronics industry is highly significant and negative (the path coeff. = -0.73, p<0.000). Table 7 summarises the results for the total sample and the subsamples.

Table 3A. The bi-variate correlation between the variables by sub-samples

|  |  |
| --- | --- |
| Electronics, n=36 | Other industries, n=42 |
|  | 1 | 2 | 3 | 1 | 2 | 3 |
| 1. SA | 1.00 |  |  | 1.00 |  |  |
| 2. ITC | .44 | 1.00 |  | .38 | 1.00 |  |
| 3. CRP | -.45 | .31 | 1.00 | .19 | .33 | 1.00 |

Table 4A. Measurement statistics for validity and reliability of measurement models by subsamples

|  |  |  |
| --- | --- | --- |
|  | Other industries; n=42 | Electronics industry; n=36  |
| Indicators | Stand. Loadings | Comp. Reliability | AVE | Stand. Loadings | Comp. Reliability | AVE |
| Critical Values | >.7 | >.7 | >.5 | >.7 | >.7 | >.5 |
|  | .81.54.86.71 | .826 | .550 | .74.84.88.87 | .903 | .699 |
| SA1 |  |  |  |  |
| SA2 |  |  |  |  |
| SA3 |  |  |  |  |
| SA4 |  |  |  |  |
|  |  |  |  |  |  |  |
| ICT1 | .83.87.89.88.83 | .934 | .740 | .91.96.98.97.98 | .984 | .927 |
| ICT2 |  |  |  |  |
| ICT3 |  |  |  |  |
| ICT4 |  |  |  |  |
| ICT5 |  |  |  |  |
|  |  |  |  |  |  |  |
| CRP1 | .89.64.75.86 | .868 | .626 | .88.80.85.86 | .910 | .716 |
| CRP2 |  |  |  |  |
| CRP3 |  |  |  |  |
| CRP4 |  |  |  |  |
|  |  |  |  |  |  |  |

Table 5A. Squared Correlations between constructs; subsamples

(diagonal elements represent AVE)

|  |  |  |
| --- | --- | --- |
|  | Electronics, n=36 | Other industries,n=42 |
| Variables | 1 | 2 | 3 | 1 | 2 | 3 |
| 1. SA | **.699** |  |  | **.550** |  |  |
| 2. ITC | .194 | **.927** |  | .144 | **.740** |  |
| 3. CRP | .203 | .096 | **.716** | .036 | .109 | **.626** |
| a. Bold-faced elements on the diagonal represent AVE. For discriminant validity, the AVE in each row and column must be greater than the displayed squared correlations in that row or column. |

Table 6A. Results from PLS analysis by subsample with path coefficients (standardized)

|  |  |  |
| --- | --- | --- |
|  | Electronics Industry: n=36 | Other industries: n=42 |
| Relationship | ICT | CRP | ICT | CRP |
| H1 SA to ICT | 0.44**†⁪**  |  | 0.38**†** |  |
| H2 ICT to CRP |  | 0.63⁪†**†**  |  | 0.30\*\* |
| H3 SA to CRP |  | -0.73††⁪ |  | 0.08 |
|  |  |  |  |  |
|  | R**2 = 0.20** | R**2 = 0.53** | R**2 = 0.15** | R**2 = 0.11** |

\* p<0.05, \*\* p<0.025, †† p<0.0001, ⁪ †p<0.01

**6. Discussion, Limitations and Conclusion**

 We argue earlier in the paper that positive and significant relationships (hypotheses H**1** and H**2**) would support the prediction that managerial use of the information and communication technology (ICT) plays a mediating role in the relationship between a firm’s engagement in SA and its customer-related performance (CRP). As the results reveal a significant and positive relationship between SA and ICT (H**1**) and between ICT and CRP (H**2**), the above prediction is supported. Indeed, the lack of support for the direct relationship between SA and CRP (that is H**3**) strengthens the argument for the mediating role played by ICT in the relationship between SA and CRP (Baron and Kenny, 1986). Therefore, this study provides empirical evidence for the argument that a firm’s engagement in SA positively influences the firm’s customer-related performance via managerial use of the ICT.

 We also argue in hypothesis H4 that the mediatingrole of ICT in the relationship between SA and CRP is more pronounced in the electronics industry than in the other industries. Analysing the data separately for the electronics industry and for the other industries reveals a striking difference in the results for SA and CRP relationship for the two subsamples as presented in Table 7. These results support the prediction in H4 that ICT plays a relatively more important role in the electronics industry than in the other industries. Specifically, the negative and highly significant SA and CRP relationship for the electronics industry suggests that an electronics firm’s engagement in SA without an adequate ICT support could be highly detrimental to the firm’s performance. In other words, ICT’s mediating role in the SA - CRP relationship in the electronics industry is more critical than in the other industries.

Table 7. Results from PLS Analysis with path coefficients for the total and subsamples)a

|  |  |  |  |
| --- | --- | --- | --- |
|  | Total sample, n=78 | Other industries, n=42 | Electronics, n=36 |
|  | ICT | CRP | ICT | CRP | ICT | CRP |
| SA → ICT | .39⁪ |  | .38**†** |  | .44**†**  |  |
| ICT → CRP |  | .36**†** |  | .30\* |  | .63**††** |
| SA → CRP. |  | -.09 |  | .08 |  | -.73**††** |
|  | R2**=0.155** | R**2=0.113** | R**2= 0.15** | R**2 = 0.11** | R**2 = 0.20** | R**2 = 0.53** |
|  |  |  |  |  |  |  |

a We used 5000 bootstrapping samples to estimate standard errors

\* p<0.05, ⁪ p<01, **†** p<0.025,  **††** p<0.000 (two-tailed)

 We consider this finding to be a significant contribution towards a better understanding of the benefits that electronics firms could derive from their engagement in SA supported by managerial use of ICT. In addition, the differential strength in the mediating role of ICT in the SA - CRP relationship for the electronics industry, and for other industries highlights that the mediating role of ICT is contextual, rather than universal, and industry characteristics (e.g., extent of product life cycle) are important contingencies. We offer the following explanations for the results discussed above.

 The relevant literature indicates that SA enhances its member firms’ access to new markets, increases resource availability and helps the companies adapt to environmental uncertainty (Li & Atuahene-Gima, 2001; Shrader, 2001; Steensma & Corley, 2000). The literature also suggests that trust and commitment among firms’ alliance members are critical (Fichman & Levinthal, 1991; Gambetta, 1988) as an absence of trust and commitment among the alliance members create barriers to continuing cooperation. Adobor (2002), Collinson (2000), and Whipple & Frankel (2000) suggest that cooperation among alliance members is critical for improving customer-related performance including market share; on time delivery of order, after-sale services and speedy negotiations (see also Jarillo, 1988; Buckley & Casson, 1988; Dwyer, Schurr & Oh, 1987). Managerial use of the ICT facilitates close communication, thereby promotes performance (Andersen, 2001). Since the level of uncertainty in the electronics industry is relatively high due to short product life cycles, the use of ICT plays a more important role in facilitating managerial decision making, maintaining close relationships with suppliers and customers, and fostering close cooperation and commitment among alliance members (Abodor, 2002; Fichman & Levinthal, 1991; Gambetta, 1988; Collinson, 2000)

 Our study extends Shrader (2001) who reports no relationship between the firms’ engagement in SA and their performance. Shrader (2001) argues that there are other factors influencing the SA and performance relationship. Our study reveals that managerial use of ICT is one such other factor influencing the relationship. Our results also support Andersen (2001) and Ramanathan (2013) who argue that managerial use of ICT enhances organisations’ communication and positively influences performance.

 Several limitations of the study merit additional discussion. First, although companies representing four different industries participated in the study, all were in manufacturing industries. Therefore, the results may be manufacturing industry specific; so caution is necessary in generalising the results to other industries. Testing the model in service organisations such as the hospitality and banking and finance industries will be beneficial. Second, this study does not consider the different types of SAs that a firm can engage in. The extant literature suggests that a SA may be vertical or horizontal, internal or external (Li & Atuahene-Gima, 2001; Harrigan, 1985; Andersen & Narus 1984,,1990; Anderson & Weitz, 1992). Future research investigating the role of ICT use in the relationship between a manufacturing firm’s performance and its engagement in different types of SAs will be beneficial to understand whether the role of ICT use differs in different types of SAs (Becket-Camarata et al, 1998; Lorange et al., 1992).

 Despite the limitations highlighted above, the results have implications for both theory and practice. The findings of the study contribute towards a better understanding of the role of ICT in augmenting organisational efforts to improve customer-related performance by engaging in SA. The current study, by introducing ICT as a mediator of the relationship between SA and customer-related performance of organisations, has unlocked an opportunity for further understanding of improving the relationship. Future research in the area will benefit from testing ICT’s role in the relationship in different industry, economy and organisation contexts.

 In terms of practice, we contend that the findings of the study can help managers realise that engagement in SA alone may not be enough to improve their organisations’ desired performance. For this purpose, the SA is required to be effective and managerial use of ICT is a factor that can facilitate the effectiveness. In other words, results of this study indicate that an organisation which engages in SA to improve its desired performance needs to also have in concert an appropriate ICT facility.

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Notes

1. The terms ‘organisation’, ‘company’ or ‘firm’ are used as synonyms in this paper.???

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Appendix 1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Information and communication technology | **Not at all** |  |  |  | **Always** |
| To what extent do the managers in your organisation use electronic mail (by Intranet), to communicate with different people across the organisation? | 1 | 2 | 3 | 4 | 5 |
| To what extent do the managers in your organisation access information and data from other parts of the firm via the computer network (Intranet)? | 1 | 2 | 3 | 4 | 5 |
| To what extent do the managers in your organisation use electronic mail (by Intranet) to exchange information with manufacturing, engineering, and other functional areas? | 1 | 2 | 3 | 4 | 5 |
| To what extent do the managers in your organisation use the Internet or similar external data networks to obtain work related information? | 1 | 2 | 3 | 4 | 5 |
| To what extent do the managers in your organisation use the Internet or other data interface to communicate with customers, suppliers, and other parties? | 1 | 2 | 3 | 4 | 5 |

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| --- | --- | --- | --- | --- | --- |
| **Strategic alliance**  | **Strongly disagree** |  |  |  | **Strongly agree** |
| My company has entered into cooperative agreements with other firms to produce the products | 1 | 2 | 3 | 4 | 5 |
| My company has entered into cooperative agreements with other firms to market the products | 1 | 2 | 3 | 4 | 5 |
| My company’s alliance partners provided my company support services (such as providing maintenance, training, administration and data processing) | 1 | 2 | 3 | 4 | 5 |
| My company has established cooperative agreements with other firms and institutions for R&D. | 1 | 2 | 3 | 4 | 5 |
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| --- | --- | --- | --- | --- | --- |
| Customer related Performance | Stronglydisagree |  |  |  | Stronglydisagree |
| On-time delivery of orders. | 1 | 2 | 3 | 4 | 5  |
| Number of customer complaints. | 1 | 2 | 3 | 4 | 5 |
| Market share | 1 | 2 | 3 | 4 | 5 |
| Customer response time | 1 | 2 | 3 | 4 | 5 |
| Warranty repair cost | 1 | 2 | 3 | 4 | 5 |
|  |  |  |  |  |  |