

*Full Length Research*

## Determinants and Acceptance of Open Innovation in Malaysian SMEs

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The paper analysed determinants of open innovation (OI) responses in Small Medium Enterprises (SMEs) and validated the relationship factors that influence open innovation (OI) adoption. Organisation's goal is to meet the needs and requirements of its customers to ensure the survival of the organisation and it is important that OI is adopted for organisational performance. This study looks into the aspect of behavioural and cost factors to determine the adoption level which includes organizational citizenship behaviour, managerial ties, organizational culture, transactional costs and appropriability regime to determine the open innovation adoption among SMEs particularly in manufacturing sector. Actor Network Theory and Social Exchange Theory utilised in this study. Quantitative analysis used to explore the relationships. Validity, reliability and subsequently the data normality were examined by analysing data with the aid of SPSS software. The study reveals that all the factors are positively correlated and there is a strong relationship between factors of the study with the adoption of OI. Developing new tools and technologies that motivate open innovation adoption brings more beneficial to SMEs. From theoretical aspect, this study contributes the dimensions of behaviours and costs in proposing the guidelines for SMEs to adopt OI.

**Keyword:** Open Innovation, SMEs, manufacturing, behaviour, costs, knowledge and technology

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### INTRODUCTION

Open innovation is defined as the flow of technical knowledge to expand productions (Chesbrough et al. 2006). Successful studies on open innovation adoption are largely found in big and high tech organisations (Chesbrough 2003; van de Vrande et al. 2009; Bianchi et al. 2010). SMEs are still lacking in terms of innovation mainly in developing countries and this has caused them to lose their competitive edge (Abdullah & Manan, 2011, Bhuiyan, et al. 2016 and Damanpour & Aravind 2012). Furthermore SMEs in developing countries totally lack

innovative initiatives (Bhuiyan, et al. 2016). Malaysian government has been providing financial support for SMES to develop but their development, growth and productivity overall has declined over the years (Malaysia Productivity Corporation, 2016). This is partly due to SMEs inefficiencies in enhancing innovative ideas in productions. This study focussed on SMEs that operates in manufacturing sector as they face low productivity, lack in innovative ideas and innovative products to compete in national and international markets (Bhuiyan, et al. 2016).

Challenges and concerns faced by Malaysian SMEs such as lack of skilled labour forces have affected the productivity and quality. As such, SMEs are unable to compete in terms of innovative products with SMEs around the world especially from China and India. SMEs in developed countries are producing products that meet global standards and requirements (Malaysia Productivity Corporation, 2016) and this has resulted in lack of confidence among investors to invest in Malaysia especially foreign direct investment (FDI) which requires SMEs to produce intermediate products. The main issue that SMEs need to tackle is innovative capabilities to ensure superior performances and productivity (Malaysia Productivity Corporation, 2016).

SMEs survival depends on knowledge and technology to produce quality products and that only can be achieved through creativity, technology and innovation in productions (Bhuiyan, et al. 2016). The main reason SMEs unable to meet the requirements and product standard is due to low technology adoption and incompetent towards external technologies adoption. In order to increase technology adoption, it is essential for SMEs to develop its labour force skills and capabilities to adapt changes in adopting innovation in productions. Therefore SMEs must undertake innovation initiatives to improvise production and competencies through engagement with internal and external actors to provide solution for any forms of difficulties in manufacturing. Innovation is vital for SMEs to gain opportunities and create new markets and thus achieving competitive advantages (Birkinshaw, 2011; Clawson, 2009; Grant, 2010). SMEs capability to innovate and manage the innovation processes is difficult due to the limited resources and open innovation provides a platform for SMEs to change the productions concept from internal R & D to external R & D (Hamel, 2002 and Kim & Mauborgne, 2005).

Management play an important role in engaging with employees whom provide doorways to adopt new ideas, needs and opportunities (Gassmann, et al. 2010). Behaviour is important in addressing the issue of participating in innovation initiatives by exploring the practices to encourage employees to adopt innovative behaviours and implement open innovation (Amo, 2006). Communication, association and cooperation with external parties are crucial in boosting innovation practices (Vrgovic et al., 2012). Manager's capacity and competencies are important in deciding open innovation practices (Wynarczyk, 2013). Manager's ties in communicating with internal external parties overall benefits the organisation as it will enhance the adoption level (Brunswick and Ehrenmann, 2013). Organisational culture that promotes incorporation with internal and external setting for effective collaborations and usage of resources need to be in place to facilitate open innovation adoption (Boschma, 2005 and De Jong et al.,

2007). Adverse organisational culture may cause difficulties in creating harmony relationships (Van de Vrande et al., 2009). The type of organisational culture that is needed to support (Murat & Baki, 2011 and Naranjo-Valencia et al., 2011) and the type of organisational culture that needs to be avoided Saunila (2014) to adopt open innovation. Open innovation is still at infancy stage and therefore there is avenue to conduct an empirical and theoretical research (Lichtenthaler, 2011). Mechanisms are needed to protect innovation (Hurmelinna-Laukkanen and Puumalainen, 2007) and instrument is needed to safeguard the innovations from various threats especially the imitators. Appropriability regime is one of the strategies to protect their intellectual property rights (Gans and Stern, 2003). However, overcoming imitators is not going to be an easy task and therefore exploring the appropriability regimes helps to determine then rate of open innovation adoption (West, 2006).

Many researchers have given limited attention to SMEs innovation competences particularly in Malaysian context (Brunswick and Vanhaverbeke, 2014; Hin et al., 2013 and Malaysia Productivity Corporation, 2016). Studies has focussed on external players issues in the adoption of open innovation but internal issues within the organisation such as employees issues rarely has been discussed (Wendelken et al., 2014). Employee participation is important in making a decision to adopt open innovation; however this concern is highly under-researched (Wendelken et al., 2014). The need to focus on employees 'barriers would assist SMEs in adoption as well as the collaborations with external parties to gain technological knowledge (Colombo et al., 2014 and Parida et al., 2012). Many researchers focussed their studies in SMEs (Gassmann et al., 2010; Henkel, 2006; Lee et al., 2010; Parida et al., 2012; Rahman and Ramos, 2013 and 2014), but focussed on specific industries and issues through qualitative and case studies (Chesbrough, 2003; Laursen and Salter, 2006 & 2014). Open innovation responses among SMEs are very low and need in depth study even though various theories has been utilised. Factors such behaviour and costs that leads to innovation capabilities need to be taken into consideration before implementing OI (Clausen et al. 2013), Therefore, this study will examine the factors that determines the adoption of open innovation in Malaysian SMEs and able to shed some important insights for SMEs to implement innovation strategies (Kayadibi et al., 2013). Many researchers have focussed open innovation in large and high technology companies with specific industries and specific issues through qualitative and case studies Chesbrough, 2003; Henkel, 2006; Kirschbaum, 2005; Lecocq and Demil, 2006 and Laursen and Salter, 2006). All these issues receive less attention towards SMEs especially in manufacturing sector. Therefore, this empirical study was undertaken to

rate the adoption responses by SMEs and how it can be improved further.

## LITERATURE REVIEW

### Open Innovation

Open innovation is a term endorsed by Henry Chesbrough as inflow and outflow of knowledge for organisation to maximise the usage of external innovation (Chesbrough et al., 2006). Most organisations especially SMEs lack strategies in developing technology to produce effectively (Colombo et al., 2014). External technologies are crucial for SMEs to be success in productions whereby innovative ideas and knowledge are absorbed to respond to current demands. Open innovation is valuable for SMEs to respond to current environment (Parida et al., 2012). This study analyses behaviour and costs options in adopting OI and if it is not feasible, SMEs need to switch back to original idea and emphasise on closed innovation (Colombo et al. 2014). In addition to behaviour and costs, selections of external parties are crucial in determining OI success (Theyel, 2013). However, it will not be an easy task to explore external parties for technology as it involves costs (Abouzeedan et al., 2013; Lee et al., 2010 and Spithoven et al., 2013). Associations with external parties are crucial to advance technological knowledge which is not attainable in closed innovation environment (Colombo et al. 2014). Employees 'skill will determine OI adoption and therefore management must value employees' skill in order to be successful in the adoption rate (Comacchio et al. 2012). However, with the absence of such skills, it will decrease the adoption rate (Idrissia et al., 2012). SMEs capacity and competencies is vital in shaping open innovation responses (Wynarczyk, 2013) and therefore open policies need to be formulated and incorporated to support OI (Kim et al., 2014 and McAdam et al., 2014). Open policies is needed during transformation from closed innovation to open innovation by identifying, assimilating and applying the valuable external information in productions (Bocken et al., 2014; Brunswicker and Ehrenmann, 2013; Grimaldi et al., 2013 and Teirlinck & Spithoven 2013).

### Organizational Citizenship Behaviour (OCB)

OCB is a voluntarily behaviour based on aspiration and willpower Korkmaz and Arpaci, (2009) that boosts organisation's competences (Bolino and Turnley, 2003). The behaviour study is important to support psychological and social component of organisations (Hoffman et al., 2007; Podsakoff et al., 2009). OCB concept is used to enlighten different forms of behaviour in an organisation

that influences the effectiveness of various stages of employees' productivity. Many firms find it difficult to exploit or unsuccessful to adopt technologies due to unwillingness of the workforce to adopt it (Burton-Jones and Hubona, 2006). OCB represents employees' behaviours and attitudes in the workplace Chung et al., (2014) and also an added value to experienced employees (Sabiote et al., 2012) that enable open innovation adoption. Positive behaviours such as teamwork, offering ideas and encouraging a helpful environment which is part of OCB that requires employees support, thorough, communicated and informative employees (Yen et al., 2008). In addition, employees' commitment plays an important role for organisational effectiveness Payne (2013) and that can be considered as most valuable asset in the knowledge-based economy (Jaakkola and Alexander, 2014). OCB is characterized by altruism, conscientiousness, courtesy, harmony and Sportsmanship among the employees. Any innovation initiatives require the changes in behaviour and environment as well as commitment of management by engaging with all the stakeholders (Karkkainen et al. 2013 and Markkula & Kune 2013). Enhancing OCB improves organizational functioning and performances (Omari et al., 2012) and for organisation effectiveness, management should utilise the concept of OCB to empower employees (Mukhtar et al. 2012). The objective of this study is to identify the best working behaviour that suits to the organisational effectiveness and the most important the dimensions of OCB that influences working culture (Ishak, 2005; Naqshbandi and Kaur, 2011 and Naqshbandi, and Kaur, 2013).

### Organisational culture

Culture is normally how the way things are expected to be done traditionally in an organisation (Patel and Conklin, 2012). Therefore, the structure and the control system influence employees' behaviours which impacts the performances (Gregory et al., 2009 and Hartnell et al., 2011). Enhancing internal motivation, cooperation, socialization and emphasizing communication among various communities of the organisation will enhance performances Ghosh et al. (2004). This concept will drive employees' to accept different working culture that is suitable for innovation adoption (McKinlay, 2005). It is important for SMEs to implement and apply knowledge successfully to nurture innovation adoption in their organisation and achieve higher performances (Wonglimpiyarat, 2010). Culture is closely related to human factor and that will influence innovation acceptances (Krassnicka et al., 2014 and Prajogo and Ahmed 2006). Therefore understanding the capacity of employees and nurturing and promoting innovative culture is crucial to respond to the external environment

(Akman & Yilmaz, 2008; Laforet and Tann, 2006; Ledwith, 2000; Neely et al., 2001; Pullen et al., 2012). Studies examining the organisational culture influencing open innovation among SMEs and the contributing factor towards innovativeness are lacking (Kraus et al., 2012; Naranjo-Valencia et al., 2011 and Saunila, 2014). The studies that reflects the relationship between organisational culture and open innovation is scarce and further research complements theoretical and empirical research (Lichtenthaler, 2011). Many studies stated that organisational culture is the main concern on open innovation adoption (Boschma, 2005; Carbone et al., 2010; Lichtenthaler, 2011; van de Vrande et al., 2009). The availability of resources, effective collaborations and support facilitates open innovation adoption (Boschma, 2005 and De Jong et al., 2007). However, adverse organisational culture causes collaboration problems van de Vrande et al., (2009) and Saunila (2014) study exposed the negative relationship between culture and innovation performance. On the contrary, many studies support organisational cultures and indicated that it is positively associated with innovation performances (Murat and Baki, 2011 and Naranjo-Valencia et al., 2011). The nature of organisational culture need to be analysed in order to find out which type of culture that supports innovation adoption and the type of culture that needs to be avoided (Lichtenthaler, 2011). Therefore understanding innovative culture is important for organisational functioning, productivity and performances (Pichlak, 2012; Uzkurt et al., 2013) apart from employee motivation (Krasnicka et al., 2014b).

### **Managerial Ties**

Managerial Ties is defined as managers or executives who are well connected with external parties to secure scarce resources needed for productions (Geletkanycz & Hambrick, 1997 and Li, et al. 2008); planned to seize opportunities (Peng and Luo, 2000); managing uncertainty environments (Li and Zhou, 2010) and improve firms performance (Adler and Kwon, 2002). Association with external parties enable firms to provide quality and innovative products by having networks with relevant parties but it will not be an easy task (Curley and Salmelin 2013). Searching for the right partner is not going to be an easy task as it involves decision and complex process that impacts the innovation direction of any organisation (Holzmann et al. 2014). Identifying the right partners and building cordial relationship and ensuring good outcomes (Naqshbandi and Kaur, 2011) cultivates open innovation adoption. Externalities with either formally or informally (Padilla-Meléndez et al., 2013) might lead to effectiveness of open innovation responses among SMEs Lee et al., (2010) and benefits through various opportunities (Heger & Boman 2014 and

Hemert et al., 2013). Open innovation supports the notion of collaboration among various networks McAdam et al. (2014). Ties with external parties are effective Torok and Toth (2013) since SMEs able to select which parties to work with (Theyel 2013). Strong networking strategy via managers is important to pursue open innovation and therefore suitable parties are crucial such as firms, universities, research organisations and government officials (Brunswick and Vanhaverbeke 2014) to increase the response rate of open innovation adoption. As such, ties with external parties enable SMEs to make strategic moves (Colombo et al. 2014) for their productions. However weaker ties with external parties will increase the barriers to accept open innovation notion (Dodourova & Bevis 2014 and Pullen et al. 2012). Funding for technological developments is crucial and therefore ties with government official and financial institutions will help SMEs to gain financial assistance (Wynarczyk, 2013 and Brown and Mason, 2014). Selection of external parties is essential in refining the parties that can be collaborated to gain innovative ideas from the selected parties (Theyel, 2013).

### **Transactional costs**

Transactions costs comprise the ex-ante costs such as searching external parties which also includes negotiations and drafting agreements and safeguarding the agreement such as monitoring and enforcements (Williamson, 1985). In simple term, it involves three stages such contact, contract and control (Coase 1937). Firms need to ensure that transaction partners are reliable and therefore contingencies plan need to be employed in the event if there are any breaches of contractual promises (Rahman and Kumaraswamy 2004). Decisions have to be made by SMEs for effectiveness of innovation in productions either to continue with closed innovation or adopt open innovation or combinations of both (Bogers 2010). Transaction costs generally occur in productions but the potentials will be higher when innovative initiatives undertaken Schwiabacher, (2012) but the ability of firms to manage the innovative activities could reduce the transaction costs. One of the methods that enable SMEs to reduce transaction costs is by responding to open innovation initiatives (Fink et al., 2015).), SMEs that are incapable of adopting open innovation not only increases the transaction costs but also incur adverse effects in their productions and growth (Goedhuys & Srholec, 2015). Many studies conducted also confirmed that lower transaction costs reduce overall production costs (North, 2005; Tebaldi and Elmslie 2013). However poor mechanism placed in organisations will cause hindrance to innovation adoption and increases transactional costs (Chadee and Roxas, 2013). SMEs need to play an

important role in managing costs especially by reducing explicit and implicit cost (Zhu et al., 2012). In order to reduce transaction costs, it is vital for SMEs to expedite innovative activities (Suematsu, 2014). Therefore, SMEs have to evaluate innovation capabilities through determining make or buy decision to reduce their transactional costs (Tidd et al., 2001). This study aims to examine existing internal production capabilities and how it can be enhanced through open innovation with a low degree of transaction costs (Cirera, 2015).

### Appropriability Regimes

Appropriability regime is a form of mechanisms to protect innovation (Hurmelinna-Laukkanen and Puumalainen, 2007) by placing various strategies to protect intellectual property rights (Gans and Stern, 2003). Formal appropriability regime such as patent, industrial design, trademark, and copyright and informal such as secrecy, lead time, and complexity of design can be used as substitutes (Kultti et al., 2007; Somaya, 2012) or complements (Levin et al., 1987; Hall et al., 2014) to secure protections. Strong appropriability regimes may encourage open innovation adoption (Chesbrough, 2003; West and Bogers, 2014) but weak appropriability regime discourages open innovation adoption (Laursen and Salter 2006). Open innovation involves external parties and the tendencies of knowledge being exploited by certain parties involved in retrieving the knowledge in illegitimate means are high without proper protections (Milesi et al., 2013). The knowledge can be retrieved by firms' competitors and free riders especially during introduction of new products in the market. The challenges of how best to protect the innovation are enormous in order to achieve maximum returns from the innovation initiatives (Hollanders and Es-Sadki 2013). The forms of protections that exist are copyrights, confidentiality agreements, patents, trademarks; secrecy, specific assets and lead time are some that enables firms to secure financial returns (Boldrin & Levine, 2013; Hagedoorn & Zober 2015 and Moser, 2013). Appropriability regimes provide framework for the exclusiveness of knowledge sharing, (Audretsch et al. 2012 & Hagedoorn and Zober, 2015) particularly for manufacturing industries (Laursen and Salter, 2014). Resilient appropriability mechanism is required to build confidence to investors and gain profit in the long term (Czarnitzki et al., 2014). In addition, appropriability mechanisms need to be implemented in order to avoid any forms of exploitation Milesi et al., (2013) Innovations are considered to be incremental and radical Hurmelinna-Laukkanen, et al. (2008) appropriability mechanism is critical to moderate the relationship between innovation abilities and open innovation adoption (Lawson et al., 2012). Empirical studies are lacking in addressing the

relationship between SMEs appropriability regimes and open innovation adoption (Leiponen and Byma 2009; Thomä and Bizer 2013). Exploring the appropriability mechanisms helps to determine the advantages and disadvantage in responding to the open innovation adoption (West, 2006). Determining appropriability mechanisms is not going to be an easy task as it lacks theoretical and empirical approach in determining the returns from innovation adoption (Harabi 1995).

### Model Selection

Actor Network Theory (ANT) and Social exchange theory (SET) were deployed to analyse workplace behaviour (Malinowski, 1922 and Mauss, 1925); relationships (Blau, 1964); networks (Brass et al. 2004); psychological contracts (Rousseau, 1995); independence (Westphal and Zajac, 1997) and organisational justice (Konovsky, 2000). In addition, it also offers analytical tools (Czarniawska, 2009) to analyse the effects of devices (Law, 1988); organisations (Law, 1994) and how these relationships can be accomplished. Both theories addresses the complex structure of humans and technology and how both works as networks (Bloomfield & Vurdubakis, 1999 and Spicer et. al., 2009).

## RESEARCH METHODOLOGY

Descriptive research has been utilised that includes surveys and fact-finding enquiries to seek to measure independent, moderating and dependent variables. This study uses quantitative model which adopts a reductionist (positivist) approach (Creswell, 2012). Factor analysis emphasizing on Likert 5 point scale were used in constructing questionnaires for survey. Convenience sampling method is best suited to determine and locate the population sample on manufacturing companies. Hypothesized is tested to explain the nature of relationships (Sekaran 2003 and Sekaran & Bougie, 2010).

### Analysis

The reliability of a measure indicates the extent to which it is without bias (error free) and ensured consistent measurement across time and various items in the instrument (Field, 2005). The reliability is based on the idea that individual items (variables) should produce results consistent with the overall questionnaire. Cronbach's has indicated 0.799 to be an acceptable reliability coefficient. There are two versions of alpha, the normal and standardized versions. The normal alpha is appropriate when items on a scale are summed to

produce a single score for that scale. The standardized alpha is useful though when items on a scale are standardized before being summed (Field 2005).

**Pearson Correlation Analysis**

Correlation analysis was performed for all the variables involved to figure out the relationship between the variables which estimates the strength and direction between variables. The Pearson's r value is positive 0.851, significant at 0.01 levels which mean there is positive correlation between OCB and adoption of open innovation (OI). Therefore it can be concluded that all five items in organisational citizenship behaviour is positively correlated with open innovation adoption. The Pearson correlation coefficient for the relationship between OCB and OI adoption is positively correlated. Therefore, the results of the following hypothesis testing are supported:

H1: There is a significant positive relationship between OCB and Open Innovation adoption.

The table 1-3 shows the correlation and the relationship between organizational culture (OC) and open innovation (OI) adoption. The Pearson correlation coefficient for the relationship between organizational culture (OC) and OI is 0.641 at 0.05 significant levels. Therefore Pearson Correlation analysis suggests that there is a positive relationship between organizational culture and open innovation adoption. Therefore, the result of the following hypothesis testing is supported.

Table 1: Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|--|------------|
| .799             | .813   | 65         |

Table2: Correlations between OCB and OI

|     |                     | OI       |
|-----|---------------------|----------|
| OCB | Pearson Correlation | .851(**) |
|     | Sig. (2-tailed)     | .001     |
|     | N                   | 40       |

H2: There is a significant positive relationship between Highly Integrative Organisational Culture and Open Innovation adoption.

The Pearson correlation coefficient for the relationship

**Table 3:** Correlations between Organisational Culture and OI

|    |                     | OI       |
|----|---------------------|----------|
| OC | Pearson Correlation | .641(**) |
|    | Sig. (2-tailed)     | .013     |
|    | N                   | 40       |

**Table 4:** Correlations between Managerial Ties and OI

|       |                     | OI       |
|-------|---------------------|----------|
| Matie | Pearson Correlation | .424(**) |
|       | Sig. (2-tailed)     | .004     |
|       | N                   | 40       |

\* Correlation is significant at the 0.05 level (2-tailed).

between Managerial Ties (MATIE) and OI is 0.424 at 0.05 significant levels. There is a positive relationship between managerial ties and open innovation adoption. Therefore, the results of the following hypothesis testing are supported. (Table 4)

H3: There is a significant positive relationship between Managerial Ties, Universities and/or other Research Centers, customers and adoption of open innovation

The Pearson's r value is significantly positive 0.785, significant at 0.01 levels which mean there is high positive correlation between transactional costs (TC) and adoption of open innovation (OI). Therefore it can be concluded that transactional costs is positively correlated with open innovation adoption. Therefore, the results of the following hypothesis testing are supported:(Table 5)

H4: There is a significant positive relationship between low Transaction Cost and adoption of open innovation.

The Pearson's r value is significantly positive 0.606, significant at 0.01 levels which mean there is high positive correlation between appropriability regimes (AR) and adoption of open innovation (OI). Therefore it can be concluded that the items in appropriability regimes is positively correlated with open innovation adoption. Therefore, the results of the following hypothesis testing are supported: (Table 6)

H5: Appropriability Regime moderates the relationship between OCB, Organisational Culture, Managerial Ties, Transactional Costs and Open Innovation adoption.

**Table 5:** Correlations between Transactional Costs and OI

|    |                     | OI       |
|----|---------------------|----------|
| TC | Pearson Correlation | .785(**) |
|    | Sig. (2-tailed)     | .000     |
|    | N                   | 40       |

**Table 6:** Correlations between Appropriability Regimes and OI

|    |                     | OI       |
|----|---------------------|----------|
| AR | Pearson Correlation | .606(**) |
|    | Sig. (2-tailed)     | .001     |
|    | N                   | 40       |

\*\* Correlation is significant at the 0.01 level (2-tailed).

### Model Summary

Table 7-14, exhibits the adjusted R Squares for organisational citizenship behaviour. The R Squares for OCB is recorded as 89.9 %. The result suggests that OCB contributes to 89.9 % impact on adoption of OI among SMEs. Next is organisational culture that contributes to 84.7% impact on adoption of OI among SMEs. This is followed by managerial ties that contributes to 54.6 % impact on on adoption of OI among SMEs which seems to to be the weakest among all items. The next is transactional costs that contributes to 71.5% impact on on on adoption of OI among SMEs. This indicates that OCB being the most important factor that contributes to adoption of OI among SMEs and followed by organisational culture and transactional costs but managerial ties seems to be the weakest factor which affects adoption of OI among SMEs.

### Anova test

Based on the output in Table 8, 10, 12 &14, all four variables' F statistical significance value is less than 0.05. This explains that all 4 independent variables explaining the variation in the dependent variables quite well. ANOVA result which shows high F value and this suggests that the model selected to test the relationships. The tables exhibit the F test values for organisational citizenship behaviour, organisational culture, managerial ties and transactional costs. The F test value for organisational citizenship behaviour, organisational culture, managerial ties and transactional costs recorded as 62.743; 59.605; 56.089 and 128.87 respectively. The

results suggest that transactional costs contributes to 128.87 impact on adoption of open innovation among SMEs. OCB contributes to 62.743 impact on the adoption of open innovation among SMEs; followed by OC that contributes to 59.605 impact and finally MT contributes to 56.089 impact on adoption of open innovation among SMEs. All the above results for F test value are more than threshold of 4.0 F test value. This indicates that model selected to test the relationship between independent variables and dependent variable is fit and robust.

### DISCUSSION OF THE FINDINGS

This study explored the role of OCBs in responses to open innovation adoption. Hypotheses tested and the outcome is that OCBs is significantly related to open innovation adoptions but the impact of the dimensions of OCBs varies. This finding endorses the previous study of Organ (1988) that OCBs has a major favourable impact on organisational processes and efficiencies. This study validates the concept of OCB and management can utilise this concept to promote open innovation in SMEs. As such, OCB help employees to maintain a positive attitude even when things don't go in a right way or when any minor setbacks occur. Employees' willingness to sacrifice their personal interests for organisations benefits through helping behaviours within or outside the organisations (Organ, 2006). Over the years, such helping behaviours will ultimately be valuable for the effectiveness of the organisations. OCB also involves preventing any problems created for co-workers in an organisation (Podsakoff & MacKenzie, 1994); being considerate to other co-workers and regular communication with co-workers to prevent unwanted issues being created in organisations.

The main hypothesis of organizational culture labelled as innovative culture which fosters creativity that will correspond with a greater scope of employee development and higher levels of productivity. The statistical findings confirmed a positive association between innovative culture and the scope of open innovation. However, elements of innovative culture effectiveness varies from high to low but often used as a benchmark metric for SMEs innovativeness. OC is beneficial to organisations by fostering innovative culture that would be able to increase knowledge on innovative products as well as achieving employee's efficiencies (Sanz-Valle et al. 2011). The results supported the hypothesis and suggested that organizational culture enhances commitment towards open innovation adoption and the relationship strengthens and improves SMEs performances.

Open innovation model acquire external ideas and knowledge from external parties and networking is crucial

**Table 7: Model Summary for OCB**

| Model | R    | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|------|----------|-------------------|----------------------------|
| 1     | .899 | .809     | .645              | .44232                     |

**Table 8: ANOVA or OCB**

| Model |            | Sum of Squares | df | Mean Square | F      | Sig.    |
|-------|------------|----------------|----|-------------|--------|---------|
| 1     | Regression | 54.522         | 18 | 54.522      | 62.743 | .000(a) |
|       | Residual   | 106.884        | 21 | .869        |        |         |
|       | Total      | 161.406        | 39 |             |        |         |

**Table 9: Model Summary for Organisational Culture**

| Model | R    | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|------|----------|-------------------|----------------------------|
| 1     | .847 | .717     | .540              | .55350                     |

**Table 10: ANOVA for Organisational Culture**

| Model |            | Sum of Squares | df | Mean Square | F      | Sig.    |
|-------|------------|----------------|----|-------------|--------|---------|
| 1     | Regression | 52.685         | 15 | 52.685      | 59.605 | .000(a) |
|       | Residual   | 108.720        | 24 | .884        |        |         |
|       | Total      | 161.406        | 39 |             |        |         |

**Table 11: Model Summary for Managerial Ties**

| Model | R       | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|---------|----------|-------------------|----------------------------|
| 1     | .546(a) | .298     | .195              | .73207                     |

**Table 12: ANOVA for Managerial Ties**

| Model |            | Sum of Squares | df | Mean Square | F      | Sig.    |
|-------|------------|----------------|----|-------------|--------|---------|
| 1     | Regression | 49.380         | 1  | 49.380      | 56.089 | .000(a) |
|       | Residual   | 106.370        | 34 | .734        |        |         |
|       | Total      | 155.750        | 35 |             |        |         |

**Table 13: Model Summary for Transactional Costs**

| Model | R       | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|---------|----------|-------------------|----------------------------|
| 1     | .715(a) | .512     | .295              | .62359                     |

**Table 14: ANOVA for Transactional Costs**

| Model |            | Sum of Squares | df | Mean Square | F       | Sig.    |
|-------|------------|----------------|----|-------------|---------|---------|
| 1     | Regression | 109.552        | 13 | 54.776      | 128.877 | .000(a) |
|       | Residual   | 51.853         | 26 | .425        |         |         |
|       | Total      | 161.406        | 39 |             |         |         |



and the forefront in innovative performance. The result indicated that firms that rely heavily on external interaction increases the ability to contact, acquire, use, and associate new and existing knowledge. Business activities are surrounded in networking and interpersonal relationships which influences on firms' to strategize the source of innovation. Managerial ties support companies through acquisition of necessary information and external resources which enables SMEs to be constantly innovative and able to produce innovative products. SME managers need to make efforts to establish and maintain personal ties with the external parties especially in emerging economy like Malaysia in order to conduct business and coordinate exchanges (Li, 2008; North, 2005; Peng and Luo, 2000). Managerial ties comprise of personal networking and the networking benefits SMEs through opportunities. Business ties and political ties provide direct impact towards enhancing opportunities of knowledge creation processes.

Transaction Cost has significant impact on open innovation adoption and the most significant factor is technology competencies. Today's productions need specific knowledge which is closely associated with innovation. Since most of the SMEs supply their products to large companies, they often need to develop technological based products to meet standards and in order to attain it, they need to explore and exploit opportunities, to increase their competencies rather than maintaining existing technology. Study furthermore demonstrates that SMEs competitive advantage is primarily based on technology competencies as successful SMEs primarily tend to not only focus on core technologies but also on non-core technologies. Therefore, SMEs need to develop capabilities to test external technologies and to coordinate the integration of new technologies. By doing so, SMEs can synthesize and acquire technological knowledge and transform these ideas knowledge into applications. These solutions may address the rapid changes technological environments and to have controls with the changes in technological perspectives. Furthermore, open innovation paradigm would lead to the interpretation that SMEs must act accordingly with strategies to govern innovation by undertaking various possibilities to change the production directions.

Appropriation strategies need to be in place to resolve free riders problem, and SMEs need to understand the nature and choices and suitability of the appropriation mechanisms. This also depends on SMES choices on the degree of openness. Degree of openness is closely related to the differences in resource commitments, management commitment and mutuality and therefore different attitudes to appropriation may result in the use of different protection mechanism. The findings suggest that stronger appropriation is associated with greater openness. However, greater sensitivity in resolving

protection mechanisms depends on the complexity of the openness and therefore the suitability of mechanisms founded on legal protection or and non-legal protections may go some way to resolve the issues. It was also noted that the relationship between appropriation and open innovation differs according to information source. The extent of innovation collaboration and networking in SMES is strongly correlated with the type of appropriation strategies chosen.

## CONCLUSION

The main objective of the study is to be a catalyst for innovation and to nurture a culture of innovation in SMEs. The acceptance and diffusion of OI are often a time-consuming process and SMEs has to initiate it before it can be answered, especially in view of the way in which success is measured in SMEs. Apart from the fact that the OI generated multiple solutions to problems, many other spill-over benefits have already been realised, including the branding of SMEs as an OI leader. The internal motivation and collaborative way of enabling innovating and huge opportunities associated with OI could ultimately have a very positive effect on a country's economy. Stimulating innovation in SMEs would mean enormous opportunities for local economic development and benefits of these opportunities could be gained through OI adoption. OI could clearly connect SMEs to previously untapped networks, innovators and potentially novel innovations aligned with unsolved problems. The level of innovations adopted by SMEs in developing countries is marginally lower than SMEs in developed nations and therefore implementation of OI could be beneficial to speedup diffusion process in enhancing products. OI should be endorsed by SMEs to stimulate a culture of innovation which will contribute towards optimisation of SME resources. Therefore, internal divisions, policies and procedures such as governance and compliance which could be a challenge considering the policies which the organisation has to comply in order to adopt OI. However, there would be an opportunity for SMEs in particular through local eco-system development that would stimulate SMEs growth and provide opportunities for a better future.

## RESEARCH LIMITATIONS

This research is non-generalizable and therefore other industries should be incorporated to test the open innovation adoption. This research was conducted on cross sectional studies and therefore longitudinal study should be embarked along with any other characteristics that might be of interest of this subject. Convenience sampling was deployed in this study and other forms of sampling criteria could enlighten a different result.

## RECOMMENDATIONS FOR FUTURE RESEARCH

Service sector is one of the most important sectors in SMEs and therefore future research is highly recommended to be conducted on service industries. Through enhancement in technology, SMEs capability in commercialising innovative ideas to other micro sectors would be another means of breakthrough of technology in smaller industries. The study also recommends that future research should investigate appropriability regimes as mediating factor to test the influential factors of open innovation adoption

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