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Factors Influencing Strategic Technology Alliance Formation of Malaysian Manufacturers

Juhaini Jabar [1], Claudine Soosay[2], Norfaridatul Akmaliah Othman [1] and Md. Nor Hayati Tahir [1]

[1] Faculty of Technology Management and Technopreneurship, Universiti Teknikal Malaysia Melaka, 76100 Durian Tunggal, Melaka, Malaysia.

[2] School of Management, University of South Australia, GPO box 2471, 5001 Adelaide, Australia.

Abstract. This paper examines the relationship between organisations' resource availability and absorptive capacity as well as type of alliances with organisational performance. The results are based on survey data from 335 manufacturing organisations in Malaysia that were then analysed using Structural Equation Modelling (SEM). The result establishes that Malaysian manufacturers need to increase their efforts in increasing internal resources that are the source of competitive advantage in order to achieve superior manufacturing performance.

Keywords: Strategic technology alliance, resources, manufacturing, Malaysia.

1. Introduction

Globalisation and rapid technology change are some of the main challenges faced by organisations today [1]. This challenge is especially felt by manufacturing organisations that are constantly in need of up-to-date technologies. Organisations are then constantly examining their strategies to enhance their innovative capabilities as a means to stay current in their field [1, 2]. Alliances are becoming popular strategies that enable firms to decrease the amount of time, costs and risks involved to acquire external technologies [3, 4]; hence increasing the number of strategic technology alliances (STAs) formed [5-7]. In this study STAs include all types of alliances such as joint ventures, equity alliances and non-equity alliances between organisations seeking resources, knowledge and technologies to enhance their overall business performance while maintaining their competitive advantage [8-10]. There has been a growing stream of literature on STAs in developing nations [11, 12], where organisations form STAs to access resources that they are lacking and to acquire external knowledge through learning. Additionally, organisations from developing countries also form STAs to adopt and access foreign technologies as they lack indigenous capabilities to create their own technologies [14, 15].

Usually, studies on alliances in high-technology organisations have been limited to developed countries—for example, studies on STAs have been conducted mainly in the US (Hagedoorn, Carayannis & Alexander 2001; Norman 2004; Soh & Roberts 2005; Rothaermel & Deeds 2006; Ybarra & Turk 2009). Studies on STAs have also been conducted in Finland (Vilkamo & Keil 2003), Italy (Colombo, Grilli & Piva 2006), Greece (Pateli 2009) and in transition economies such as Russia (Hagedoorn & Sedaitis 1998). Currently, research on STAs is increasing in developing countries such as Taiwan (Ju et al. 2005; Tsai & Wang 2009b) and China (Chen & Wang 2009). Apparently, it is felt that there is still limited research conducted on STAs in developing countries (Abdul Wahab, Abdullah & Che Rose 2009). Therefore this research intends to contribute towards the literature on STAs in developing countries by focusing on organisations' resource availability and absorptive capacity as well as type of alliances as factors affecting the inclination of firms forming STAs and the relationship with organisational performance.

2. Literature Review

2.1. Resource Availability

The resource-based view (RbV) regards firms as collections of resources that include tangible assets and capabilities (or intangible assets—usually semi-permanently attached to the firm) [16-19]. This collection of resources must be simultaneously *valuable, rare, imperfectly imitable, and non-substitutable* (sometimes referred to as VRIN) [17]; and are also the firm's source of sustainable competitive advantage [20]. Firms will engage in STAs when there is a need for additional resources (specifically involving technology) that are expensive and difficult to replicate in a certain time frame [21]; and can enhance the value of their existing resources [20]. From this perspective, firms adopt alliances as a means to extend their collection of value-creating resources, which are otherwise unattainable independently. Hence this study defined resource availability as organisation's tangible assets as well as intangible assets that include technology and knowledge embedded in product material, physical assets, processes and production, and management capabilities. Therefore it is proposed that:

H1: The organisation's resource availability has a negative relationship to the formation of strategic technology alliance

2.2. Absorptive capacity

Absorptive capacity is largely related to the firm's level of prior knowledge [22]. It is further reconceptualised that absorptive capacity is a set of organisational practices and procedures, by which firms acquire, assimilate, transform and exploit external knowledge [23]. For effective learning to take place, partnering firms should have 'medium knowledge overlap' [24, p. 260] because knowledge overlap that is too high or too low may hinder successful learning in collaborations. Hence it is important for organisations to embrace suitable levels of absorptive capacity prior to forming technology alliances to enable successful STAs. Therefore it is hypothesised:

H2: The organisation's absorptive capacity has a positive relationship to formation of strategic technology alliance

2.3. Type of Alliance

Alliances create a unique learning opportunity for firms with different skills, knowledge bases and organisational cultures. Learning outcomes in alliances depend on the type of alliances formed [25]. Various authors acknowledged greater learning opportunities in joint ventures and equity alliances, as compared to non-equity alliances [26-28]. There is however, a challenge for firms to maintain a balance when sharing knowledge with partners, and controlling knowledge flows to avoid unintended divulgence of confidential information [29]. Hence:

H3: The nature of strategic technology alliance has a positive relationship to the formation of strategic technology alliance

2.4. Organisational Performance

There is evidence suggesting organisations forming alliances will experience enhanced organisational performance [30-32]. There are also various measures for alliance success; for example partner satisfaction [33], product, market and financial performance [9], profitability [10], and innovation [34]. Due to the demanding and complex production processes, including distribution, marketing, and R&D efforts in Malaysian manufacturing organisations, there are various initiatives and schemes to encourage alliances with world-class corporations and research establishments in order to amplify the performance of these organisations [35]. Hence it is posited that:

H4: Strategic technology alliance formed by organisations will lead to positive organisational performance

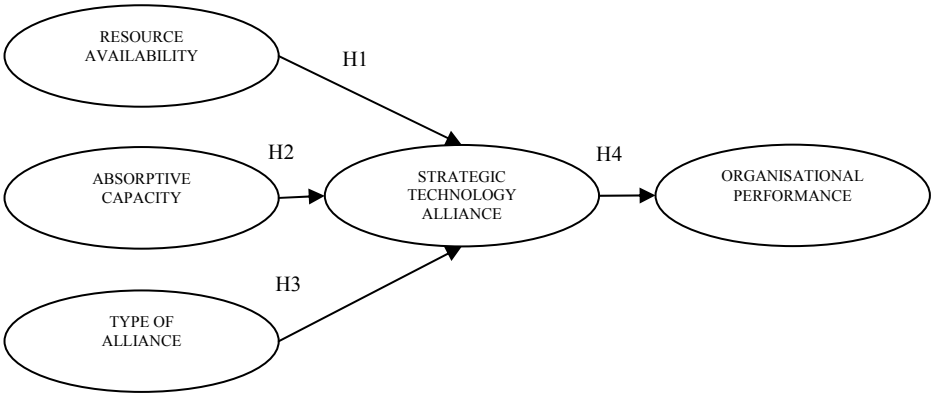


Fig. 1: Theoretical framework.

3. Research Methodology

The data from this research were gathered from manufacturing firms in Malaysia. The procedures employed comprise:

3.1. Pilot Study

This was conducted to generate measurement items, as exploratory research may utilise several techniques, 'including literature searches, experience surveys, and insight stimulating examples' [36, p. 67]. A survey was designed following an extensive literature review to generate items to be tested. Consequently a pilot study was conducted to test the reliability of the instrument and to assess the length as well as the readability of the questionnaire. Two consecutive rounds of pre-testing were conducted in order to ensure that respondents understood the questions. First, the questionnaire was reviewed by three academic researchers experienced in questionnaire design and then piloted with four managers from manufacturing organisations. This was followed up with face to face interviews. The conclusion drawn from the interviews was that the questionnaire was too long, and the terms used were 'too academic'. The final questionnaire was shortened and reworded while retaining its original meaning.

3.2. Large Scale Survey

A random sample of 2,500 organisations was selected from a list of 3,717 in the 2008 Federation of Malaysian Manufacturers (FMM) directory. The Chief Executive Officers/Managing Directors (CEO/MD) or managers were contacted through emails, telephone calls and written letters. The target respondent of the survey was the CEO, MD or managers, whose organisation has had some form of strategic technology alliance.

The process yielded 569 executives agreeing to participate in the study and emails were subsequently sent to complete an online survey with assigned password and restricted access, based on their best performing technology alliance. A major concern in survey research is the degree to which the validity of results may be compromised due to non-response by the subjects when the information is not obtained from some elements of the population that were selected for inclusion in the sample [37]. In the present study, non-response is defined as failure to fill in a complete and usable survey.

There were 343 completed surveys during the four-month data collection period yielding a 13.72% response rate. Out of these, 335 (13.40%) were found usable for this study. This accounted for 137 small organisations (less than 50 employees), 51 medium-sized organisations (between 50 to 149 employees) and 147 large organisations (more than 150 employees). Respondents were from various manufacturing sectors in Malaysia as illustrated in Table 1. This table also indicates that there are relative similarities in the distribution of the respondents with the sample population.

Manufacturing	Respondents		Population	
	Frequency	*%*	*Frequency*	*%*
Basic Metal Product	24	7.2	175	7.0
Electrical and Electronics	109	32.5	850	34.0
Engineering Supporting	176	52.5	1380	55.2
Others	26	7.8	95	3.8
Total	**335**	**100**	**2500**	**100**

Table 1: Frequency of respondents by manufacturing sector

4. Hypotheses Testing and Result

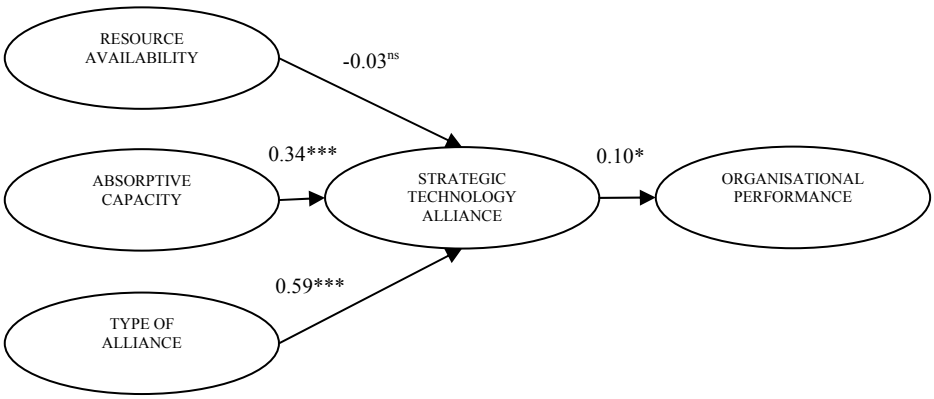
Before testing the model fit, the satisfactory level of reliability and validity of the measures and constructs were analysed. Firstly, the items of each construct were assessed using the Cronbach's α coefficient and the items-to-total correlation. All constructs have values of more than 0.7 of the cut-off level set for basic research [55].

Secondly, exploratory factor analysis using Principal Axis Factoring as the extraction method and Direct Oblimin rotation were used to assess the underlying structure for both exogenous and endogenous variables - namely resource availability, absorptive capacity, type of alliance, strategic technology alliance, and organisational performance. This was performed to examine whether the items for a construct share a single underlying factor and if they are uni-dimensional. The Kaiser-Meyer-Olkin (KMO) and Bartlett test of Sphericity were performed to test the suitability of running factor analysis. Both results suggested that the matrix was factorable with Kaiser-Meyer-Olkin test value of 0.91 and Bartlett test of Sphericity $p < .001$. Principal Axis Factoring identified the presence of six factors with eigenvalues above 1, and the extracted factors account for 54.44 percent of the total variance. All factor loadings are generally high, where the lowest loading is equal to 0.50 [56].

Confirmatory factor analyses were then conducted to test whether items of a construct were uni-dimensional. Several fit statistics were utilised to evaluate the acceptability of each of the factor models. The overall goal in establishing uni-dimensional measurement models is for each set of indicators to have a unique relationship to the latent variable it represents so that unambiguous meaning can be assigned to each of the constructs [57]. A standardised root mean square (SRMR) of 0.05 or less and normed fit index (NFI) of 0.95 and above indicate that the data fit the model well. As recommended by Bentler and Bonnet [58], the goodness-of-fit index (GFI) was utilised and deemed acceptable if above the recommended value of 0.95.

Additionally, the comparative fit index (CFI) and Tucker Lewis Index (TLI) were also used and acceptable model fit are demonstrated with CFI and TLI above 0.95 [59]. Root mean square error of approximation (RMSEA) indicated values of ≤ 0.05 (a close model fit) and ≤ 0.08 (a reasonable model fit) [60].

Finally, given that the purpose of the study is to test the hypothesised causal relationships in the model, a structural equation-modeling package AMOS 17.0 was utilised. The data did not fit the model well where, $\chi^2(3) = 8.89$, $p = 0.03$. Therefore a post-hoc procedure was utilised and the data fit the model well with Bollen-Stine $p = 0.31$. Other fit indices include: SRMR = 0.04, GFI = 0.99, CFI = 0.99, NFI = 0.99, TLI = 0.97, and RMSEA = 0.07 indicating model fit. Having assessed the overall fit of the structural model, the theoretical relationships were then examined. The parameter estimates and their significance are shown in Fig. 2.



Note: ***p<.001, *p<.05, ns=not significant

Fig. 2. Structural Parameters of Proposed Relationships.

The findings of this study generally support the conceptual model where three out of four hypotheses were supported. Absorptive capacity positively affects strategic technology alliance therefore supporting Hypothesis 2. Additionally Hypothesis 3 is also supported indicating that type of alliance positively leads to strategic technology alliance formation. However there is no support on the hypothesised negative relationship between resource availability of organisations with strategic technology alliance therefore, Hypothesis 1 is not supported. Hypothesis 4 is supported signifying that strategic technology alliance positively affects organisational performance.

5. Research Limitations

The findings presented in this study must be understood in the context of the following limitations: firstly, it was difficult to identify organisations that had some form of technology alliances before distributing the questionnaire; otherwise a more effective sampling technique such as stratified random sampling would have been adopted. Additionally, the sample from this study was attained from the FMM directory hence limiting the population to only organisations registered to this database. Therefore, it is suggested that subsequent research in Malaysia should include other databases for a more robust population sampling.

Secondly, since data were collected only from manufacturers in Malaysia, findings and conclusions may not be generalised to STAs formed by manufacturers from other countries. Therefore, it is believed that future comparative studies on STAs formed by manufacturers from other countries or other industries may be beneficial to further understand the model proposed in this study.

6. Discussion and Conclusion

Collaborations should be seen as opportunities to create, store and apply knowledge. Consequently, managers have to consider how to manage such partnerships to enhance their capabilities and performance. This form of learning, according to Huber [38] adds to the organisation's knowledge base by internalising knowledge not previously available to it. Furthermore, as managers seek to incorporate new production methods, there must be a willingness to risk vulnerability and confidence of forbearance among partners.

Additionally, this study offers valuable insights to government institutions and policy makers in offering incentives for manufacturing technologies. There are also opportunities for additional public investment and industry support by increasing the number of programs and incentives such as rebates, tax relief and technology grants, for Malaysian firms to enhance their technological competencies. However this research has demonstrated that there may be insufficient capabilities present in Malaysian manufacturing firms for developing new products. Therefore, a more pressing strategy is to better understand the key performance objectives of Malaysian manufacturers and shaping the manufacturing environment as managers could focus on improving their absorptive capacity and learning capabilities in terms of technology acquisition.

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