Assessing the Impact of Competence Utilisation in Innovation Strategy: A Correlational Analysis

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Abstract: This study is concerned about the role of competence utilisation in innovation strategy. Using a correlational analysis based on non-parametric statistics, it validates the impact of competence utilisation in relation to venture performance by testing three hypotheses. Data was gathered via a survey instrument to extract *ex post facto* information from firms of three industry sectors in Singapore.

The findings are as follows: (1) The level of utilisation in technology, product and market competencies, as manifested by its role in innovation strategy, is positively correlated to venture performance; (2) The impact of competence utilisation is the strongest on sales profitability, followed by company growth and then organisational effectiveness; and (3) In terms of relative impact on venture performance, technology competence is the most effective, followed by product and market competence.

Keywords: Innovation Strategy; Competence Utilisation and Venture Performance.

1. Introduction

Innovation strategy is highly complex, haphazard, multi-faceted and prone to failure, and yet, firms implement innovation strategy to improve venture performance. Descriptive evidence has shown that innovation strategy enhances firm growth in general, but research has continually produced diverse results (D' Amboise and Muldowney, 1988; Damanpour, 1991). Studies have revealed that factors that lead to innovation success are predominantly internal to firms (Thomas and Evanson, 1987; Shailer, 1989; Kelmar, 1994; Langlois and Foss, 1999). Given that the body of innovation strategy literature is vast and ever growing, research has shifted toward analysing a firm's internal factors; and amongst them lies the competence concept whose emergence has generated much awareness due to its relevance in the dynamics of inter-firm competition (Wernerfelt, 1995; Teece, Pisano and Shuen, 1997; Hodgson, 1998). While innovation strategy research continues to be explanatory, the competence concept has become a preferred foundation for theory building in many fields of study (Sanchez, Heene and Thomas, 1996; Durand and Guerra-Vieira, 1997; Giget, 1997).

The field of innovation strategy has thus proposed that competence-based research must gain prominence (Henderson and Cockburn, 1994; Verdin and Williamson, 1994). Recent debate has argued that whether a firm's innovation efforts will actually lead to better venture performance depends on the extent to which its competencies are utilised (Filion, 1997; Bogner, Thomas and McGee, 1999). Since few innovation strategy studies have explicitly focused on the theme of establishing a link with competence utilisation, examining its role appears to cast the right-size 'conceptual net' to explore the 'sea' of competitive interactions occurring in innovation strategy (Barney, 1996; Subramanian and Nilakanta, 1996). To provide insights, this study conducts an empirical analysis of measures involving constructs and associated variables to assess the impact of competence utilisation; and aims to address the following research questions:

a) What are the competencies which are relevant and applicable to a firm for utilisation that may result in innovation success?
b) Is the role of competence utilisation in innovation strategy, if employed by a firm, important to venture performance?
c) To what extent does competence utilisation influence a firm's venture performance?
d) Which of the competencies identified in (a), in comparison, are more influential in terms of the impact on venture performance?

2. Literature review

The apparent lack of competence-based innovation research can be attributed to the Schumpeterian (1965) view of

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innovation process – wherein there exists a perceived preoccupation with discontinuities and creative destruction that all innovations undergo a finite life cycle leading to eventual obsolescence (Grossman and Helpman, 1992). However, the role of competence utilisation reflects more accurately the dynamics of competition and the associated competitive interactions occurring in innovation strategy (Bogner, Thomas and McGee, 1999). Of the contemporary writings relating to competence utilisation, three literature streams seem to capture preliminary insights: (a) resource-based theory of the firm, (b) organisational learning and knowledge management, and (c) impact of environmental change.

Firstly, the resource-based theory, which is inherently an internal view of a firm, is concerned with attaining competitive advantage over rival firms. Originally, the theory has its foundations in international trade to explain why and how nations trade because of resource endowments. Subsequently, it was employed to explain firm growth in relation to resource constraints such as labour inputs and financial capital (Mahoney and Pandian, 1992). Since then, it has broadened to examine the function of internal resources in terms of a firm's competencies to compete effectively (Barney, 1996). Based on the resource-based theory, researchers argue that the possession, allocation and deployment of internal resources are linked to competence utilisation, whose impact results in distinct value to firms as a form of endogenous capability (Grant, 1991). In addition, the theory also explains why a firm's possession of competencies leads to difficulties for any competitor to imitate, substitute for, or surpass a firm's venture performance.

Secondly, the fields of organisational learning and knowledge management also offer insights into the concept of competence utilisation (Huber, 1991; Helfat, 1994; Grant, 1996). On the one hand, organisational learning enables a firm to improve its venture performance through competence utilisation, thus giving rise to competitive advantage over rival firms (Fiol and Lyles, 1985; Helleloid and Simonin, 1994; Spender, 1996). On the other hand, knowledge management literature suggests the need to identify the elemental components and interactions of innovation strategy that lead to higher venture performance. The elemental component and interaction that the fields of organisational learning and knowledge management are mutually common, as far as competitive advantage is concerned, seems to be competence utilisation and its influence on venture performance (Garud and Nayar, 1994; Helfat, 1994; Spender, 1996).

Thirdly, another stream of literature also seems to support the role of competence utilisation in the dynamics of competition. It argues that a firm selects an environmental change which provides it with the opportunity to utilise its competencies and hence able to compete more effectively (Tushman and Anderson, 1986; Meyer, Brooks and Goes, 1990). Basically, there are two kinds of environmental change termed 'competence-enhancing' change and 'competence-destroying' change. The former is continual, gradual whereby evolutionary processes are experienced, while the latter is revolutionary and radical whereby adaptive processes are encountered. Whatever the nature of these processes, a firm will naturally select the environment that presents it with the opportunity to strengthen its competitive advantage through competence utilisation, and will thus refrain from selecting an environment associated with competence-destroying change (Gersick, 1991; Prahalad and Hamel, 1994).

3. Competence construct

Despite the need to link the role of competence utilisation with competition dynamics occurring in innovation strategy, the competence construct has been criticised for 'failures of operationalisation' in empirical research (Day, 1994). What actually constitutes a unit of analysis for competence has remained debatable. It embraces not only all forms of capabilities, knowledge, know-how and skills as most literature would suggest, but also assets that contribute to competitive potential (Sanchez, Heene and Thomas, 1996; Mosakowski and McKelvey, 1997). Although references to a firm's internal resources were frequently made, the concept was also applied with a holistic notion wherein lies acquired expertise or proficiency in executing complex task(s).

The debate on the competence construct continues to be discursive as stated below:

Focusing on human characteristic(s) rather than on firms, Boyatzis (1982) defined competence as 'an underlying characteristic of a person whether it may be a motive, trait or an aspect of one's role or a body of knowledge that he or she uses'. Without specifying exactly what a competence is, Woodruffe (1990) provided a narrower definition of competence as 'behavioural dimensions that affect performance' to emphasize the importance of behavioural elements regardless of how and where the dimensions originate from. To make sense of a multitude of dimensions related to competencies, Spencer and Spencer (1993) suggest a generalised approach of grouping competencies into clusters resulting in a more generic conceptualisation.

Other pioneering works championed by an increasing number of authors have consciously referred to the competence construct as lying within the confines of 'capabilities', 'dynamic capabilities' or 'core competencies' (Langlois and Foss, 1999, Williamson, 1999). The decomposition of the competence construct yielded disparate results due to the fact that it is embedded in a firm's routines and is tacit in nature. Being multi-dimensional, the construct is difficult to be measured as precise data and the problems associated with developing an accurate construct are, in part, a direct result of the generality that the concept connotes. Construct operationalisation hence hinges on the supporting logic to identify dimensions recognisable in practice (Sastry, 1997; Hodgson, 1998).

The actual forms of competence, as allegedly utilised in innovation strategy, are widely varied and situation-specific, and specifications can be extensive and diverse. Without categorising and specifying all different competencies, competence dimensions are identifiable and as such, can be characterised broadly. Studies analysing overly numerous competence dimensions tend to encounter 'causal ambiguity' that produces 'weak theories', especially for insensitive dimensions (Verdin and Williamson, 1994; Hodgson, 1998). Including more competence variables may not necessarily be superior for research purpose because all theory building requires some degree of parsimony (Durand, 1997; Williamson, 1999). Incorporating myriad variables may result in model over-fitting with substantial multi-collinearity. Although fitting numerous variables within a model can be highly accurate for explaining the sample data, it is less predictive for the population data. On the other hand, having too few variables to represent the competence construct may introduce unintended biases that lead to statistically large generalisation error. Despite the need to strike a balance for a practical number of variables, one issue stays unarguably consistent. That is, competence, albeit intangible and intricate to measure, should be linked to venture performance with its dimensions being causally related to the latter; and the attainment of venture performance depends on the measure of these dimensions (Dean and Sharfman, 1996).

This study thus deliberately avoids a comprehensive classification but uses an objective treatment of generic dimensions covering most situations to ensure that the competence concept is theoretically significant and experimentally measurable (Durand, 1997; Mahoney and Sanchez (1997). These dimensions are identified through a literature review by 'distilling' through those that are most relevant, applicable and valid; and assessed to give a more complete, integrated and synthesised view of a firm's role in innovation strategy. Using these dimensions as a guide for variable selection, technology competence (TECHCOMP), product competence (PRODCOMP), and market competence (MARKCOMP) are chosen for empirical analysis.

Empirical data of competence variables are collected from multiple firms to offer relative, distinguishable and inter-firm comparisons of measurement. To gather quantifiable data based on managerial experience via a survey instrument, three kinds of questions are posed to 'identified respondents': (a) actual utility; (b) availability and usefulness; and (c) desirability. First, the respondents are required to reply as a binary option whether they are involved in the role of competence utilisation when implementing innovation strategy. Second, respondents

are requested to indicate their firm's level of competence utilisation ranging from basic to intermediate to advanced levels on a 7-point Likert scale, as evidence of availability and usefulness. Third, respondents are asked to rate the extent of desirability along the three dimensions of the competence construct in terms of, whether it is important for innovation strategy. Higher scores are associated with higher levels, that is, a greater extent to which a firm experiences, utilises and desires in terms of measures for various dimensions. Likewise, lower scores are associated with lower levels of a particular competence dimension.

4. Venture performance construct

The primary objective of any innovation strategy is linked to business viability whose measurement may be represented by the venture performance construct (Helleloid and Simonin, 1994). Despite the importance of quantifying the venture performance construct, what really constitutes a suitable measure has been a subject of intense debate (Venkatraman and Ramanujam, 1986; Eisenhardt and Bourgeois, 1988). For instance, studies have applied binary indicators (e.g. success or failure) to quantify the construct. At the same time, opposing views were expressed, offering arguments in conflict with quantifying the venture performance construct along the same continuum as binary indicators. It was disputed that the venture performance construct as either success or failure appears to be theoretically fallible because the measure does not present itself at two ends of a continuum. Instead, a multi-factorial approach gives a more representative and reliable measure of the venture performance construct, implying that it should be at least two-dimensional mathematically (Kelmar, 1994).

With a consensus towards a multi-variate measure of venture performance, financial indicators (sales growth, return on investment and sales profits, for example) were employed to rate venture performance (Venkatraman and Ramanujam, 1986). Yet, cost-based measures alone do not adequately quantify the outcomes attributable to competence utilisation (Hart, 1992; Bruns and McKinnon, 1994). Arguments prevail that if one quantifies the venture performance construct around financial indicators but fails to incorporate parameters that reflect a firm's goals, the 'chain of causality' in hypothesis testing tends to be weak. Hence, a broader conceptualisation of the venture performance construct is proposed to include indicators other than purely financial ones, taking into account other quantifiable indicators of organisational outcomes (Ramanujam and Venkatraman, 1987; Cooper and Gascon, 1992). Also, while venture performance measures are traditionally confined to profitability-related factors, both quantitative and qualitative criteria are included. Objective and subjective measures are used even though data precision may be slightly compromised. Hence, venture performance variables are quantified by: (1) objective self-reported financial variable(s); and (2) subjective self-evaluated satisfaction level concerning non-financial variable(s) to give greater data reliability. Selected through a purification process based on validity appearance in innovation strategy literature, the variables are: (a) sales profitability (SALPROF); (b) company growth (COGRWTH); and (c) organisational effectiveness (ORGEFFN).

5. Hypothesis development

One important part of this research focuses on hypothesis development, which relies on empirical data extracted from firms involved in innovation strategy, to draw conclusions. Hypothetically, this study conjectures that a firm's venture performance may be attributable to the role of competence utilisation in innovation strategy by assessing statistical consistency on the correlations between competence variables (TECHCOMP, PRODCOMP, MARKCOMP) and venture performance variables (SALPROF, COGRWTH, ORDEFFN). To evaluate the degree of statistical consistency, hypotheses are tested to determine whether the competence construct is positively correlated to the venture performance construct. This study analyses the extent to which competence utilisation, as evidently manifested in the context of innovation strategy, correlates to venture performance. Three hypotheses are developed as follows:

Hypothesis 1: (H1)	When firms employ competence utilisation in innovation strategy to compete with rival firms, venture performance (SALPROF, COGRWTH, ORGEFFN) will be higher for those with a higher measure of technology competence, than for those with a lower measure of technology competence (TECHCOMP).
Hypothesis 2: (H2)	When firms employ competence utilisation in innovation strategy to compete with rival firms, venture performance (SALPROF, COGRWTH, ORGEFFN) will be higher for those with a higher measure of product competence, than for those with a lower measure of product competence (PRODCOMP).
Hypothesis 3: (H3)	When firms employ competence utilisation in innovation strategy to compete with rival firms, venture performance (SALPROF, COGRWTH, ORGEFFN) will be higher for those with a higher measure of market competence, than for those with a lower measure of market competence (MARKCOMP).

Since ordinal data can be used for non-parametric hypothesis testing, measures for both competence variables and venture performance variables employ rank statistics to satisfy the mathematical requirements of ordinal scaling. The Spearman rank-order correlation test is chosen, as it is one of the most powerful tests developed (Siegel and Castella, 1988). Based on a measure of association between two constructs, a pair-wise comparison between variables is made by calculating the correlation coefficients using rank statistics of two ordered series of the constructs. The validity of hypothesised relationships between variables is demonstrated by the test results of pair-wise Spearman correlation test. Statistical results of hypothesis testing are reported at the conventional 5% level of significance unless otherwise stated. Proxied by respondents' opinions to a mail survey, responses measured on binary (YES or NO) and 7-point Likert scales are used to quantify empirical data. Responses to the survey questions on venture performance construct, measured by both objective and subjective self-evaluated data, are reported on a Likert-type scale. For the analysis of competence variables, items that are selected with a score of four or more on the 7-point Likert scale are considered as empirical evidence of 'utilisation'. If nominal statistics are required, observed scores on a Likert-type scale may be converted to form categories for a nominal scale (NO or 0 for levels 1 to 3 and YES or 1 for levels 4 to 7, for example).

6. Research methodology

To avoid being beleaguered by data problems that may yield less reliable results, trade-offs were made to strike a balance amongst factors relating to speed, cost and control. A three-stage sampling plan is designed to select suitable sample firms, which suit the approach of hypothesis testing, as a representation of the population. The first stage selects the industry sectors to implement a cross-sectional study of firms, and the second stage involves a randomised selection of firms, while the third stage constitutes data collection from selected firms. A longitudinal study was not undertaken since it would involve data gathering from a few subjects and waiting for sufficient data to be accumulated over an extended period of time, which may take many months and even years to complete. Instead, the sampling plan was specially devised to: (a) strengthen the reliability of empirical data; (b) improve the homogeneity of sample firms; (c) enhance the availability of data measures; and (d) enable respondents who are likely to possess the most relevant knowledge to provide answers to the survey. With all firms resident in Singapore as the population base and sampling techniques suggested by Kish (1965) and Tortora (1978), the research methodology covers the following areas: (a) Selection of Industry Sectors, (b) Random Sampling, and (c) Data Collection.

6.1 (a) Selection of Industry Sectors

Selected firms constitute those registered in Singapore, with no attempt made to measure industry factors as the contextual elements are principally similar since all are subject to the same legal, political, social, cultural, economic and demographic environment within a single national economy. Three industry sectors were chosen: (a) electronics and electrical equipment and components; (b) information technology and computer equipment; and (c) multimedia products, as they are widely acknowledged to be actively involved in innovation strategy. To check for differences across the three

industry sectors, standard t-tests were used and yielded t-values less than 0.4448, much smaller than the critical t-value of 1.998 at α=5.0%, confirming that they were statistically insignificant. In addition, a minimum gestation period of three years is imposed on firms' innovation experience to allow for the effects under study to be felt and hence improve the reliability of 'historical data'.

6.2 (b) Random sampling

Ideally, data should be sampled exclusively from those firms with actual experience of the phenomenon under study. However, firm selection efforts were hindered by the difficulties associated with selecting such firms, unless one knows exactly how they can be identified. To obtain representative data, random sampling was used as it allows a survey to be conducted at a single point of time so that respondents' opinions are comparable. For the sample data to be non-biased, stratified random sampling is implemented. First, the population firms were compiled from business directories, electronic company guides, industry contacts and networking referrals. They are then short-listed and separated into non-overlapping sampling frames of equal size, consisting of potential subjects for each industry sectors. Second, units are randomly selected from these sampling frames; and randomisation was implemented by the use of a random number generator. Such a method is generally adequate because the chances of being selected are equal for each sampling unit; and it also ensures that the differences in sampling probabilities from beginning to the end of sampling process are negligible.

6.3 (c) Data collection

For data collection, a self-administered survey instrument is used to *explicate ex post facto* information. Extra attention was paid to balance the need for reliable empirical measures and the potential complications that may arise due to managers' sensitivities when releasing firms' information. A pre-test on 'dummy respondents' was conducted to check the survey's content validity. Inputs from these respondents were incorporated to further refine and improve the quality of questions. Designed as a five-part structured questionnaire containing twenty questions, the survey instrument is cost-effective and provides better control and consistency across measurement situations since each respondent answer identical questions. A cover letter accompanying the questionnaire was addressed personally to the head of firms as they typically possess the most comprehensive and experiential knowledge about their firms and hence could furnish more reliable and relevant information. A self-addressed, postage-paid, return envelope was also provided to all respondents. The protocol for mail implementation involved three major mailings, including thank-you notes and replacement surveys to a total of 300 firms. Of the 128 returned questionnaires, 104 were usable as the written answers provided the required information for data analysis, yielding a response rate of 34.7%.

7. Test results

The three hypotheses under test are concerned with the conjecture about the role of competence utilisation, in terms of effectiveness in innovation strategy, to be manifested by its impact on venture performance. A correlational analysis is used to establish statistical significance of the hypothesised relationships between measures of competence variables and venture performance variables. The level of competence utilisation is represented by ordinal data and measured by rank statistics. Ordinal data scores are converted to ranks via frequency counts at each level of utilisation, and the ranks of venture performance are similarly determined.

Spearman rank-order correlation test is employed to measure the extent of correlation between constructs. As a non-parametric statistical test, the Spearman coefficient (r_s) is based on a measure of association between two variables using pair-wise comparison, calculated on the basis of the differences in rank between two ordered series. The null hypothesis states that if the differences between the two ordered series are small, the correlation is positive or close to one; and if the differences between the two ordered series are large, the correlation will be small or close to zero. If the correlation coefficient r_s is equal to or greater than the critical correlation coefficient $r_{s(critical)}$ for a

particular level of significance (α), then the null hypothesis is accepted; otherwise, it is rejected. A high correlation is interpreted as reflecting that the role of competence utilisation was indeed important; and conversely, a low correlation implies that a given competence, even if utilised, does not produce positive results in venture performance. Hypotheses are rejected or accepted by comparing empirical correlation coefficients with critical Spearman correlation values.

7.1 (a) Results of Hypothesis 1

H1 states that venture performance (SALPROF, COGRWTH, ORGEFFN) of a firm, which engages in innovation strategy, is higher for those with a higher level of utilisation in technology competence (TECHCOMP), than for those with a lower level of utilisation. Since the magnitude of Spearman rank-order correlation coefficients measures the relative importance of TECHCOMP in innovation strategy, H1 anticipates that higher rank ratings of utilisation in TECHCOMP will lead to higher rank ratings of venture performance; and vice versa. The ordered series of TECHCOMP in relation to venture performance variables (SALPROF, COGRWTH, ORGEFFN) based on differences in rank order, with fractional halves denoting ties between ranks, are displayed in Table 1.

Table 1: Spearman correlation table (TECHCOMP)

Level	TECHCOMP	SALPROF	d_i	COGRWTH	d_i	ORGEFFN	d_i
1	1.5	1.5	0	1.5	0	1	+0.5
2	3	3	0	1.5	+1.5	3	0
3	1.5	1.5	0	3	-1.5	4	-2.5
4	5	6	-1	7	-2	6	-1
5	7	7	0	6	+1	7	0
6	6	5	+1	5	+1	5	+1
7	4	4	0	4	0	2	+2
		$\Sigma d_i^2 = 2.0$		$\Sigma d_i^2 = 10.5$		$\Sigma d_i^2 = 12.5$	
	r_s =	0.9636		0.8091		0.7748	

Correlations, based on empirical Spearman rank-order coefficients, between TECHCOMP and the three venture performance variables were found to be statistical significant at α=5.0%, with values ranging from 0.7748 to 0.9636. By comparing the magnitude of these coefficients with critical correlation coefficient ($r_{s(critical)}$=0.714 at α=5.0% for N=7), the test results confirmed that TECHCOMP was positively correlated with venture performance, showing the most pronounced impact on SALPROF (r_s=0.9636, α=5.0%), followed by COGRWTH (r_s=0.8091, α=5.0%) and then finally ORGEFFN (r_s=0.7748, α=5.0%). Additionally, the influences of TECHCOMP on SALPROF and COGRWTH except ORGEFFN (fell short by less than 1.5% of $r_{s(critical)}$) were also statistically significant at α=2.5% ($r_{s(critical)}$=0.786 for N=7). The correlation between TECHCOMP and SALPROF was also statistically significant at α=1.0% ($r_{s(critical)}$=0.893 for N=7). Of the three venture performance variables, the correlation with TECHCOMP was the strongest for SALPROF, followed by COGRWTH and then ORGEFFN. Overall, it showed that technology competence utilisation was positively correlated to venture performance; and the magnitude of correlation was in a decreasing order of sales profitability, company growth and organisational effectiveness.

7.2 (b) Results of Hypothesis 2

H2 states that a firm utilising competence in innovation strategy, will attain a higher level of venture performance (SALPROF, COGRWTH, ORGEFFN) under a higher measure of product competence (PRODCOMP), than under a lower measure of product competence. Essentially, this hypothesis evaluates the importance of yet another competence variable. A statistically significant correlation for PRODCOMP with venture performance implies a significant role in innovation strategy. The ordered series of PRODCOMP in relation to the three venture performance variables, and the results of Spearman rank-order correlation coefficients in comparison with critical r_s values were shown in Table 2.

Table 2: Spearman correlation table (PRODCOMP)

Level	PRODCOMP	SALPROF	d_i	COGRWTH	D_I	ORGEFFN	d_i
1	1	1.5	-0.5	1.5	-0.5	1	0
2	3	3	0	1.5	+1.5	3	0
3	2	1.5	+0.5	3	-1	4	-2
4	5	6	-1	7	-2	6	-1
5	6	7	-1	6	0	7	-1
6	7	5	+2	5	+2	5	+2
7	4	4	0	4	0	2	+2
		$\Sigma d_i^2 = 6.5$		$\Sigma d_i^2 = 11.5$		$\Sigma d_i^2 = 14.0$	
	r_s =	0.8829		0.7928		0.7500	

Based on empirical Spearman correlation coefficients, PRODCOMP was found to be positively correlated to venture performance, with the largest influence on SALPROF (r_s=0.8829, α=5.0%), followed by COGRWTH (r_s=0.7928, α=5.0%) and the smallest influence on ORGEFFN (r_s=0.7500, α=5.0%). Like H1, SALPROF and COGRWTH were also statistically significant at α=2.5%. The largest Spearman correlation coefficient for PRODCOMP (with SALPROF) was marginally less than the critical r_s of 0.893 ($r_{s(critical)}$ at α=1.0% for N=7) by only 1.2% and no correlation for PRODCOMP was statistically significant at α=1.0%. H2 is thus supported, affirming that PRODCOMP was important in innovation strategy, and the level of PRODCOMP utilisation correlates with venture performance in descending order of SALPROF, COGRWTH and ORGEFFN.

7.3 (c) Results of Hypothesis 3

H3 states that when a firm engages in innovation strategy, its venture performance (SALPROF, COGRWTH, ORGEFFN) is higher for those with a higher measure of utilisation in market competence, than for those with a lower measure of utilisation in market competence (MARKCOMP). Similar with the tests of H1 and H2 based on pair-wise comparison between two variables, the ordered series of MARKCOMP with the three venture performance variables for calculating Spearman coefficients based on differences in rank order, with fractional halves denoting ties between ranks at various levels were shown in Table 3.

Table 3: Spearman correlation table (MARKCOMP)

Level	MARKCOMP	SALPROF	d_i	COGRWTH	d_I	ORGEFFN	d_i
1	1	1.5	-0.5	1.5	-0.5	1	0
2	2	3	-1	1.5	+0.5	3	-1
3	3	1.5	+1.5	3	0	4	-1
4	4	6	-2	7	-3	6	-2
5	7	7	0	6	+1	7	0
6	6	5	+1	5	+1	5	+1
7	5	4	+1	4	+1	2	+3
		$\Sigma d_i^2 = 9.5$		$\Sigma d_i^2 = 12.5$		$\Sigma d_i^2 = 16.0$	
	r_s =	0.8289		0.7748		0.7143	

According to the magnitude of empirical Spearman rank-order coefficients, MARKCOMP correlated positively to the venture performance construct, with the largest impact on SALPROF (r_s=0.8289, α=5.0%), followed by COGRWTH (r_s=0.7748, α=5.0%) and the smallest impact on ORGEFFN (r_s=0.7143, α=5.0%), lending support to H3. The same pattern as in H1 and H2, in decreasing order of correlation from SALPROF to COGRWTH to ORGEFFN, was detected. But in comparison with TECHCOMP and PRODCOMP, only the correlation with SALPROF exceeded the critical r_s of 0.786 (for N=7) at α=2.5%. Overall, the test results were consistent, indicating a positive correlation with venture performance to manifest the role of MARKCOMP utilisation in innovation strategy.

8. Summary

The Spearman rank-order correlation coefficients between competence

variables and venture performance variables for the three hypotheses (H1, H2, H3) are summarized in Table 4 as an inter-correlation matrix of pair-wise variables.

Table 4: Spearman rank-order correlation coefficients (r_s) between competence and venture performance

SPEARMAN RANK-ORDER CORRELATION COEFFICIENT (r_s)		VENTURE PERFORMANCE		
		SALPROF	COGRWTH	ORGEFFN
Competence	TECHCOMP	0.9636	0.8091	0.7748
	PRODCOMP	0.8829	0.7928	0.7500
	MARKCOMP	0.8289	0.7748	0.7143

Note: All the Spearman rank-order correlation coefficients are statistically significant at α=5.0%.

All nine empirical Spearman rank-order coefficients were found to be statistically significant at α=5.0% affirming that TECHCOMP, PRODCOMP and MARKCOMP constitute competencies that are influential in innovation strategy. The correlation between TECHCOMP and SALPROF was the strongest, while that between MARKCOMP and ORGEFFN was the weakest. Amongst the venture performance variables, correlation was the strongest for SALPROF compared with COGRWTH and ORGEFFN. From TECHCOMP to PRODCOMP to MARKCOMP, the correlations with SALPROF were in decreasing order from 0.9636 to 0.8289 and were all statistically significant at α=2.5%. Following a similar decreasing order of competencies, the correlations with COGRWTH ranged from 0.8091 to 0.7748. The correlation for COGRWTH with that of TECHCOMP and PRODCOMP also attained statistically significance at α=2.5%. Like the other two venture performance variables, the correlations of ORGEFFN traced an identical pattern, with values of 0.7748, 0.7500 and 0.7143 for TECHCOMP, PRODCOMP and MARKCOMP respectively. No Spearman coefficient for ORGEFFN was statistically significant at α=2.5%. The discernible trend about the role of competence utilisation showed an increasing order of impact: MARKCOMP, PRODCOMP and TECHCOMP.

9. Conclusion

This paper has challenged the status quo of orthodoxy in the field of innovation strategy. It investigated the role of competence utilisation and provided a fresh perspective to the diverse ways in which conventional concepts associated to innovation strategy have been conceived previously. To offer insights, the inference of reasoning is grounded conjecturally on the proposition that a firm's competencies, if utilised in innovation strategy, impact on venture performance. Consistent with theoretical expectations, the test results of the proposition about competence utilisation were statistically supported at α=5.0%, to confirm that its role should be given due emphasis in innovation practice.

Considering that inductive research does not imply that there is an absolute reality of 'the truth exists in the world out there', it must be noted that different but compatible phenomena may co-exist together in innovation strategy. In other words, the role of competence utilisation is not a raison d'être for all the processes occurring in innovation strategy, but simply offers an alternative view for the rationalisation of another important phenomenon. While numerous phenomena seem to occur in innovation strategy and may merit consideration, not all are of credence in terms of practical significance and thus necessitate an in-depth analysis as this study entails. Essentially, what emerged from this study was a set of findings that lent weight to the assertion: there exists another domain of influence termed competence utilisation, in which firms may pursue innovation strategy. From an organisational viewpoint, firms must, in order to achieve higher venture performance, conceive competencies as "utilisable resources". At the operative level, managers should recognise the potential impact of these "utilisable resources", view the role of competence utilisation with greater

confidence, and rely on it to implement effective innovation strategy.

The level of consistency amongst the findings was evidently high. Correlations were significantly positive for all competencies, with relative impact on venture performance in decreasing order of sales profitability, company growth and organisational effectiveness. The relatively high impact on sales profitability was due to the variable being a highly objective financial indicator and was thus statistically affected to a larger extent. By contrast, subjective indicators of firm's outcomes like company growth (partially subjective) and organisational effectiveness (subjective) were statistically affected to a lesser degree. Nonetheless, the impact on venture performance was significant, but other prospective variables might need to be tested as proxies (e.g. replacing ORGEFFN for assessing the impact of competence utilisation).

The findings reported that technology competence utilisation was the most effective, while product competence had a lesser impact and market competence utilisation was the least influential. As far as the research methodology is concerned, the identification or categorisation of competencies is intrinsically an interdependent trade-off between an aggregated analysis and a finer-grained analysis. Technology competence, being directly related to internal resource endowments that impact on economic factors of production, was therefore more influential than product or market competencies. It is acknowledged that product competence is more closely linked to technology competence than market competence.

Although this study focuses specifically on competence utilisation, it has paved the way for exploring other behavioural phenomenon (e.g. knowledge transfer) that may be of practical significance in innovation strategy. However, one must note that the hallmark of a good theory is parsimony; but given the typically voluminous data in most innovation strategy studies, there is a tendency to build theory that captures too much detail and thus reduces the level of generality in theory development. The end result would then be theory that is very rich in micro-details, but lacks the simplicity of overall macro-perspectives. While the road to complete understanding of innovation strategy is a long one, the study has attempted to develop a theory and the findings have nevertheless moved us a step closer and sowed the seed for a new stream of innovation theories. In any case, the prophetic assertion of 'a good theory is one that holds together long enough to get a better theory' places the value of this study in the right perspective. But as to how long it will endure the test of time depends ultimately on future theory development.

Three areas of future research are recommended. Firstly, new approaches in construct identification (e.g. "competence clusters" via expert opinions), data capture and tools of analysis may be designed to contribute towards the ultimate goal of building more predictive theories. Secondly, the study can be replicated in other countries or industry sectors to broaden the range of applicability and generalisability of the empirical results. Thirdly, longitudinal analyses of similar hypotheses may also be conducted by a personal, face-to-face, open-ended, interview methodology, to further consolidate the interpretation of the reported findings.

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