

Personality Traits, Entrepreneur's Ambidexterity, and Knowledge Brokerage: Evidence from Technology Firms

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Abstract: The study aims to identify the knowledge sources for opportunity recognition and to examine the relationships between personality traits, ambidexterity, knowledge brokerage, and firm performance. Data were collected from 132 entrepreneurs in the technology sector using a questionnaire survey. The study finds that the mostly used knowledge sources for opportunity recognition are Internet/social media, online media, and customers. The findings reveal that personality traits of entrepreneurs relates with ambidexterity, specifically, openness to experience relates positively with engagement in exploration activities, and conscientiousness relates positively with engagement in exploitation activities. Furthermore, entrepreneur's ambidexterity and knowledge brokerage have a positive relationship, which in turn, affect firm performance.

1 INTRODUCTION

Entrepreneurs are facing increasingly competitive global environments which are characterized by uncertainty, complexity and rapid technological change. Drawing on the literature on managerial ambidexterity, entrepreneurs divide their time and resources to exploit existing knowledge to solve short-term problems and explore new knowledge for long-term opportunities. Entrepreneurs tend to prioritize exploitation to exploration as the returns from the latter are less certain and take longer time to accomplish (March, 1991). Entrepreneurs who could allocate balanced resources to exploration and exploitation are considered to be ambidextrous (O'Reilly and Tushman, 2004).

An ambidextrous entrepreneur tends to tap various sources and gain knowledge in order to exploit business opportunities and help solve internal problems. In this connection, knowledge brokerage is viewed as an essential practice to tackle the problem. The literature refers to knowledge broker as an intermediary (an individual or an organization), who provides links, knowledge sources and knowledge itself to an organization.

Knowledge brokers may consist of the employees within the organization or professional knowledge firms external to the organization (Hargadon, 1998).

Recent literature relates personality traits of managers with their engagement in exploration and exploitation activities as the latter represent learning behavior (Keller and Weibler, 2014; Mom et al., 2007). Keller and Weibler (2014) claimed that their study is the first to empirically test the personal characteristics and engagement in exploration and exploitation activities, which provides important for the conceptualization of ambidexterity at the individual level.

The probable relationships among personality traits, ambidexterity, knowledge brokerage and firm performance motivate the conduct of this study. Ambidexterity research has mainly been conducted at the organizational, unit, and team levels (Gibson and Birkinshaw, 2004; Keller and Weibler, 2014), research at the individual level is still scarce (Birkinshaw, and Gupta, 2013; Keller and Weibler, 2014; Lee and Lee, 2016). Moreover, knowledge brokerage is prevalent in science, technology and innovation fields (Verona, Prandelli, and Sawhney, 2006) as well as environment and sustainable

development policy (Sheate and Partidário, 2010), research on the role of knowledge brokerage in entrepreneurial enterprises remains limited. Therefore, the study attempts to examine the relationships between personality traits and entrepreneur's ambidexterity, and between entrepreneur's ambidexterity, knowledge brokerage, and firm performance. Besides, the study also attempts to identify knowledge sources for opportunity recognition among technology entrepreneurs. Data were collected from 132 entrepreneurs in the technology sector in Malaysia via a questionnaire survey. Quantitative technique was adopted in this study as the survey instrument is available in the literature and the number of entrepreneurs in the technology sector is sufficient to generate meaningful quantitative research findings. Researchers and entrepreneurs are expected to benefit from this study by gaining insights into personality traits and its relationship with ambidextrous entrepreneurs, and specific functions of knowledge brokerage which lead to enhanced firm performance.

The paper is structured as follows. The next section reviews the literature of personality traits, entrepreneur's ambidexterity, and knowledge brokerage and develops research hypotheses. Research methods about data collection, sampling procedures, and operationalization of variables are then presented and that is followed by a report on research findings. The last section concludes the study by discussing research implications, limitations and recommendations for future research.

2 LITERATURE REVIEW

2.1 Personality Traits

The Big Five personality traits – neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness have been dominant in studying personality in organization and management literature as they cover a broad scope of human personality. Having the similar pattern of learning behavior, openness to experience and conscientiousness are aligned to the study of exploration and exploitation of managers' activities (Colquitt and Simmering, 1998; Mom et al., 2007).

Openness to experience is concerned with curiosity, creativity, intellect, and flexibility in terms of attitudinal and behavioral. This personality trait is associated with exploration activities which require changing the status quo, searching for new ways,

and experimenting new approaches, and innovating. Further, exploration activities need behavioral flexibility to disassociate from existing work practices and routines. On the other hand, conscientiousness is related to goal-directed behavior which requires predefined goals coupled with existing knowledge and competencies, and previous experience, in order to exploit for goal attainment.

Therefore,

H₁: Openness to experience relates positively with entrepreneur's engagement in exploration activities.

H₂: Conscientiousness relates positively with entrepreneur's engagement in exploitation activities.

2.2 Ambidexterity

The term ambidexterity was first cited in Duncan (1976) to study dual structure in organizations. Ambidexterity can be analyzed at the organizational, unit or individual levels. This study views ambidexterity at the individual level of entrepreneurs or managers. An ambidextrous organization manages business activities involving different time horizons and managerial capabilities. On the other hand, building on March's (1991) organizational learning framework, an ambidextrous entrepreneur or manager is said to be able to seek a balance between exploration and exploitation activities and thus enable them to perform better than others who focus on either type of activities.

Being one of the few studies that examined ambidexterity from the individual perspective, Mom, Van Den Bosch, and Volberda (2009) defined managerial ambidexterity as "a manager's behavioural orientation toward combining exploration- and exploitation-related activities within a certain period of time. Exploration activities involve identification of new market needs and technological opportunities which require the development of new knowledge. On the other hand, exploitation activities are focusing on efficient production of existing product-market positions which entail the use of existing knowledge (Tushman and O'Reilly, 1996).

Both exploration and exploitation activities are competing for limited resources such as time, money, and human capital, and require distinctive sets of skills and capabilities. To be ambidextrous, organizations trade off short-term productivity for long-term innovation, as well as stability for adaptability (Lewin, Long, and Carroll, 1999; March, 1991). An ambidextrous entrepreneur is

expected to engage in knowledge brokerage activities to improve both exploration and exploitation activities in their entrepreneurial endeavor. Knowledge brokers can be both internal and external to the firm. In the technology sector, the engagement with knowledge brokerage activities is higher as it requires more advanced level of technical knowledge and know-how, as well as business acumen and competency to market the products.

Therefore,

H₃: The higher the level of entrepreneur's ambidexterity, the higher the level of knowledge brokerage activities.

2.3 Knowledge Brokerage

Gould and Fernandez (1989) recognized five different types of brokers based on their role in facilitation of knowledge flows within and between organizations. Brokerage relations involve three actors. Two actors are the actual parties to the transactions and the third actor is the intermediary or broker. The first type of broker is called coordinator who enhances interaction between members of the group he belongs to. The second type is called cosmopolitan or itinerant where the principals belong to the same group while broker belongs to a different group (an outsider). The third type of broker is called gatekeeper who absorbs knowledge from a group and passes it to the group he belongs to. The fourth type is called representative who diffuses the knowledge of the own group to another group. The last type of broker is called liaison, an outsider who enhances interaction between two groups (Kirkels and Duysters, 2010).

On the other hand, knowledge brokerage can be discussed in terms of the value created in the firm (Burt, 2004). The first type of knowledge brokerage is to make individuals at both sides of a structural hole aware of interests and problems in another group. The second type of knowledge brokerage is to transfer best practices from one group to another. The third type of knowledge brokerage involves drawing analogies between groups which are seen to be irrelevant to one another. The final type of knowledge brokerage is concerned with synthesizing new belief and behaviors from both groups.

Prior research in knowledge brokerage mainly focused on science, technology and innovation fields (Verona, Prandelli, and Sawhney, 2006) as well as environment and sustainable development policy (Sheate and Partidário, 2010), research on the role of knowledge brokerage in entrepreneurial enterprises

remains limited.

Knowledge brokers play an important role to transfer new and specific knowledge and best practices to ambidextrous entrepreneurs who may not possess such knowledge. With the new knowledge acquired through knowledge brokerage activities, entrepreneurs are able to improve the business operations and opportunities exploitation which lead to enhanced business performance. As such, this study argues that the level of knowledge brokerage practice increases with the level of firm performance.

Therefore,

H₄: The higher the level of knowledge brokerage activities the higher the level of firm performance.

The conceptual framework is presented in Figure 1.

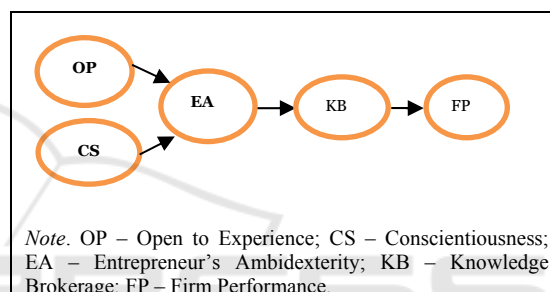


Figure 1: Conceptual Framework.

3 METHOD

This study is non-experimental, cross-sectional and with individual entrepreneurs as the unit of analysis.

3.1 Data Collection Method

Primary data are collected using an interviewer-administered questionnaire survey. Interviewers are present when respondents are filling out the questionnaire to answer any doubts they might have about the survey questions.

3.2 Sample and Sampling Procedures

The population of the study consists of business firms in the technology sector in Malaysia. The sector is selected based on the basis that a high level of specific knowledge is needed in research and development of products and services. The sample was selected from the business directories such as Federation of Malaysian Manufacturers. A total of

500 firms were randomly selected and 132 firms participated and returned completed survey forms, a response rate of 26.4%.

As presented in Table 1, more respondents were not the owner (58%) than the owner (42%) of the firm. More than half (56%) of the respondents have a Bachelor's degree (56%). About 60% of the entrepreneurial firms have been established for more than 5 years. The size of the firm is equally divided into micro (33%), small (34%) and big (33%). Slightly less than half (48%) of the firms have an RandD department/unit.

Table 1: Sample Profile (n=132).

Demographic Variable		Per cent
Owner	Yes	42
	No	58
Highest Educational Level	Secondary	9
	Diploma / Advanced Diploma	14
	Bachelor's Degree / Professional Certificate	56
	Master's Degree	18
	Doctorate Degree	2
Firm Characteristics		Per cent
Year Firm Established	1 year and below	2
	2 to 5 years	38
	6 to 10 years	19
	Above 10 years	41
No. of Employees	Micro (1 to 4)	33
	Small (5 to 69)	34
	Big (70 and above)	33
RandD Unit	Yes	48
	No	52

3.3 Variables and Measurement

Personality Traits. Two personality traits – openness to experience and conscientiousness are chosen as they are closely linked to entrepreneur's ambidexterity (Keller and Weibler, 2014). Nine items are used to measure conscientiousness and ten items for openness to experience (John, Robins, and Pervin, 1991). Sample item for conscientiousness is "I am a reliable worker", and for openness to experience is "I have an active imagination".

Entrepreneur's Ambidexterity. Entrepreneur's ambidexterity is viewed as a personal attribute that refers to the ability to pursue both exploration and exploitation activities at the same time. Ambidexterity is computed by multiplying the score of both activities. The measures for exploration and exploitation activities are adopted from Mom, Van Den Bosch, and Volberda (2009) and consist of seven items respectively. All items are measured along the scales of 0: not used at all; 1: low, 2: medium, and 3: high. Sample item for exploration

activities include "Evaluating diverse option with respect to products/services, processes, or market" and for exploitation activities include "Activities which you carry out as if it were routine".

Knowledge Brokerage. Knowledge brokerage activities are measured in terms of its value created. Four items adopted from Burt (2004) are used to collect the frequency of knowledge brokerage activities, measured along the scales of 1: not used at all, 2: low, 3: medium and 4: high. Sample item includes "Transferring of best practices from other firms to my firm".

Knowledge Sources. To capture the knowledge sources, 25 items covering knowledge obtained from five categories – government departments and agencies, business organizations, social organizations, print and online media, and personal contact (Foss et al., 2013). Respondents are asked to indicate the extent to which they used the knowledge from each source over the last three years for opportunities recognition, along the scale of 0: not used at all, 1: low, 2: medium, and 3: high.

Firm Performance. Firm performance is defined as the degree to which firms attain all the purposes they are supposed to (Strasser et al., 1981). Respondents are asked to indicate their level of agreement on their firm performance relative to their major competitors in the past three years in terms of operating profit, revenue growth, ROA, and ROI (Dess and Robinson, 1984), measured along the scale of 1: among the worst, 2: bottom half, 3: average, 4: top half, and 5: among the best.

4 RESULTS

4.1 Descriptive Analysis

As shown in Table 2, among all sources of knowledge listed, Internet and social media was used to the highest extent in recognizing new business opportunities among the entrepreneurs, followed by customers, and online media. The medium usage includes personal friends, suppliers/vendors, and print media. On the other hand, social organizations such as sports/leisure club, NGO/third sector, and religious community were the least used knowledge sources in recognizing new business opportunities.

On the other hand, all activities of knowledge brokerage were practised at a moderate level among

the entrepreneurs, of which “*creating awareness of interests and problems of other firms in the organization*” received the highest score by the entrepreneurs.

Table 2: Source of Knowledge (in per cent).

Source	0	1	2	3
1. Federal Government	31	29	27	13
2. State Government	33	36	24	7
3. Local Council	34	30	28	8
4. Media – Print	14	27	40	19
5. Media – Online	8	18	38	36
6. Internet/Social Media	6	8	36	50
7. Chamber of Commerce	31	31	24	14
8. Conference/Trade Fair/Exhibition	14	14	35	27
9. Industry Association	25	30	27	18
10. Professional Association	27	29	30	14
11. Bank/Financial Inst.	38	21	25	16
12. Consulting Firm	38	27	25	10
13. NGO/Third Sector	49	23	23	5
14. University/College/Research Institute	25	31	30	14
15. Social Community	27	32	32	9
16. Religious Community	48	28	20	4
17. Sports/Leisure Club	49	25	21	5
18. Family Member/Relative	16	24	33	27
19. Personal Friend	11	19	44	26
20. Internal Employee	14	25	35	26
21. Board Member	25	23	32	20
22. Business Partner/Alliance	19	20	34	27
23. Customer	4	23	30	43
24. Competitor	17	38	30	15
25. Supplier/Vendor	4	22	41	33

Note: 0 – Not used at all; 1 – Low; 2 – Medium; 3 – High. The highest frequency within the source is bolded.

4.2 Hypothesis Testing

Partial least squares path modeling (PLS-PM) with R (Sanchez, 2013) was used in data analysis and hypothesis testing. PLS-PM is a multivariate statistical technique that allows simultaneous evaluation between multiple variables. PLS-PM involved two stages of analysis – assessment of measurement model and structural model. The measurement model evaluates reliability and validity of the items and constructs while the structural model evaluates effect size, direction, and significance of the hypothesized relationships. As the sample size is considered small at this stage, additional test was conducted to ensure the data analysis is sufficient to minimize Type II error (Statistical power of more than 80%). GPower 3.1 was used to compute a statistical power analysis. This study chose to detect a population effect size represented by $f^2=0.25$, based upon the findings of

past research, and is also the moderate effect size proposed by Cohen (1988). For controlling Type I error, α is set at the 0.05 significance level, which is the norm in social science research. For controlling Type II error, the power of the test is set at 0.80, the level recommended by (Cohen, 1988) and adopted generally by researchers. Using G*Power 3.1.9.2 F tests (Faul, Erdfelder, Lang, and Buchner, 2007), the required number of sample size is 95. As the sample size for this study is 132 which exceeds the required number, it can therefore be concluded that the study has sufficient power to detect the required effect size of 0.25.

4.3 Assessment of the Measurement Model

As shown in Table 3, all constructs were deemed reliable and valid. All scores exceeded the minimum requirement of Cronbach’s alpha (0.78 – 0.94), composite reliability (0.86 – 0.96), and average variance extracted (AVE) (0.50 – 0.84) (Nunally, 1978). The discriminant validity of the items was evaluated by comparing the squared roots of AVE and correlation coefficients between constructs. All the squared roots of AVE on the diagonal line are higher than the correlation coefficients between constructs, indicating discriminant validity at the construct level. All items were loaded higher than 0.60 within the respective constructs – openness to experience (0.61 – 0.81), conscientiousness (0.76 – 0.81), knowledge brokerage (0.75 – 0.79), and firm performance (0.88 – 0.93), and were loaded low across other constructs, indicating adequate convergent validity and discriminant validity at the item level. As the requirements of reliability, convergent validity, and discriminant validity at both construct and item levels are met, the data analysis proceeds to evaluate the structural model.

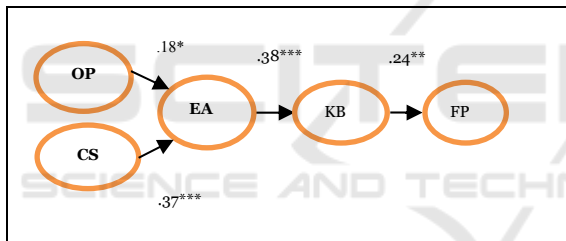
Table 3: Correlation Matrix.

Variable	M	SD	1.	2.	3.	4.	5.	6.
1. OP	3.50	.46	.71					
2. CS	3.72	.60	.55	.78				
3. ER	4.63	.98	.43	.45	.78			
4. EP	4.83	1.00	.29	.49	.65	.77		
5. KB	1.78	.63	.23	.40	.37	.39	.77	
6. FP	1.81	.74	.13	.28	.18	.11	.24	.92

Note. OP – Open to Experience; CS – Conscientiousness; ER – Exploration; EP – Exploitation; KB – Knowledge Brokerage; FP – Firm Performance.

4.4 Assessment of the Structural Model

The structural model as presented in Figure 2 shows that both openness to experience and conscientiousness are significantly related to entrepreneur's ambidexterity, supporting H₁ and H₂ respectively. However, the relationship between openness to experience and entrepreneur's ambidexterity ($\beta = .18, t = 2.02, p = .045$) is relatively weaker than the relationship between conscientiousness and entrepreneur's ambidexterity ($\beta = .37, t = 4.10, p < .001$). Both openness to experience and conscientiousness explain about a quarter of the variance for entrepreneur's ambidexterity ($R^2 = .25$). It is also found that entrepreneur's ambidexterity is positively and moderately related to knowledge brokerage ($\beta = .38, t = 4.61, p < .001$), and knowledge brokerage is positively related to firm performance ($\beta = .24, t = 2.81, p = .006$). Knowledge brokerage explains merely 6% of the variance for firm performance. Overall, the Goodness of Fit Index stands at 30.3%. In sum, all the hypotheses tested are supported by the data.



Note. *** $p > .001$; ** $p > .01$; * $p > .05$; GoF = .303; OP – Open to Experience; CS – Conscientiousness; EA – Entrepreneur's Ambidexterity; KB – Knowledge Brokerage; FP – Firm Performance.

Figure 2: Structural Model.

A second analysis was conducted to test the relationship between personality traits and the two dimensions of ambidexterity. The analysis found support for the positive relationship between openness to experience and exploration activities ($\beta = .43, t = 5.44, p < .001$), and between conscientiousness and exploitation activities ($\beta = .49, t = 6.45, p < .001$). The Goodness of Fit Index stands at 31.8%.

4.5 Discussion

The study finds that openness to experience is weakly but significantly related with exploration activities of entrepreneurs. Similarly, conscientious-

ness also significantly related with exploitation activities of entrepreneurs, but with a relatively stronger effect. The findings confirm the importance of fitting the personality traits and the dimension of entrepreneur's ambidexterity activities which are consistent with Keller and Weibler (2014). Furthermore, this study finds that entrepreneur's ambidexterity relates positively and moderately with knowledge brokerage. Lastly, knowledge brokerage relates positively with firm performance.

5 IMPLICATIONS AND CONCLUSION

5.1 Implications for Research

Firstly, the study introduced the ambidexterity concept in the context of individual level of entrepreneurs, which is lacking in the literature. Secondly, the study tested the antecedent of personality traits to entrepreneur's ambidexterity. The significant findings of the study confirmed the managerial ambidexterity literature in the context of technology entrepreneurs in an emerging economy. Thirdly, the study introduced knowledge brokerage activities as the consequence of ambidexterity, and antecedent to firm performance. The study underscores the importance of knowledge brokerage in enhancing business performance. Overall, the study provides empirical evidence for the conceptual framework.

5.2 Implications for Practice

Entrepreneurs should attempt to achieve ambidexterity, which is to seek a balance between exploration and exploitation activities in their business operations. Entrepreneurs with personality trait of openness to experience are more aligned to exploration activities while with conscientiousness are closely linked with exploitation activities. As it is difficult to change these personality traits by training, entrepreneurs themselves should be aware of the importance of seeking a balance between the two types of activities. While ambidexterity would not directly lead to enhanced firm performance, knowledge brokerage activities play an important role to improve business performance. Entrepreneurs should engage in knowledge brokerage practices to acquire new knowledge to sustain in an ever competitive business environment.

5.3 Limitations and Recommendations for Future Research

This study suffers from a number of limitations and further research in this area is recommended.

Firstly, the sample size of this study is considered small, which reduced its generalizability to the larger population. Further, the study only collected responses from technology firms where knowledge brokerage activities are more prevalent. Future researchers are recommended to conduct similar studies on specific groups of technology firms, such as start-ups or multi-national corporations, and on other sectors where knowledge brokerage activities are widely practised.

Secondly, common method bias may be present as the responses of both independent and dependent variables are obtained from the same source. Future researchers may consider collecting data for firm performance from other sources.

Thirdly, the study generally identified knowledge sources where new business opportunities are recognized. Future researchers may examine specific knowledge sources in relation to specific business opportunities.

Finally, the practice of knowledge brokerage activities may not have a direct impact on firm performance. As such future researchers may investigate its indirect impact on firm performance through product innovation.

6 CONCLUSION

The entrepreneur's ambidexterity is difficult to achieve as it requires an optimum balance between two activities that are on the opposite sides. Meanwhile, it is crucial to identify the antecedents and consequences of managerial ambidexterity as well as the potential moderators and mediators affecting the relationship between managerial ambidexterity and firm performance. This study hopes to contribute to the managerial ambidexterity literature by examining entrepreneur's personality traits as the antecedent to ambidexterity and knowledge brokerage as the consequence. Besides, entrepreneurs may benefit from this study by recognizing the roles played by knowledge brokerage activities in enhancing their business performance.

Survey Items

Personality Traits

A. Conscientiousness

1. I do a thorough job
2. I can be somewhat careless (R)
3. I am a reliable worker
4. I tend to be disorganized (R)
5. I tend to be lazy (R)
6. I persevere until the task is finished
7. I do things efficiently
8. I make plans and follows through with them
9. I am easily distracted (R)

B. Openness to Experience

10. I am original, come up with new ideas
11. I am curious about many different things
12. I am indigenous, a deep thinker
13. I have an active imagination
14. I am inventive
15. I value artistic, aesthetic experience
16. I prefer work that is routine (R)
17. I like to reflect, play with ideas
18. I have few artistic interests (R)
19. I am sophisticated in art, music, or literature

Entrepreneur's Ambidexterity

A. Exploration

1. Searching for new possibilities with respect to products/services, processes, or markets
2. Evaluating diverse options with respect to products/services, processes, or markets
3. Focusing on strong renewal of products/services or processes
4. Activities of which the associated yields or costs are currently unclear
5. Activities requiring quite some adaptability of you
6. Activities requiring you to learn new skills or knowledge
7. Activities that are not (yet) clearly existing company policy

B. Exploitation

8. Activities of which a lot of experience has been accumulated by yourself
9. Activities which you carry out as if it were routine
10. Activities which serve existing (internal) customers with existing services/products
11. Activities of which it is clear to you how to conduct them
12. Activities primarily focused on achieving short-term goals

13. Activities which you can properly conduct by using your present knowledge
14. Activities which clearly fit into existing company policy

Knowledge Brokerage

1. Creating awareness of interest and problem of other firms
2. Transferring of best practices from other firms
3. Drawing analogies from other firms that may seem to be invisible or irrelevant to your firm
4. Creating new beliefs and behaviors in your firm

Firm Performance

1. Operating Profit
2. Revenue Growth
3. ROI
4. ROA

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