

Linking personality and innovation: the role of knowledge management

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ABSTRACT: The purpose of this study was to explore the relationship among the *Big Five* personality traits, innovation, and the mediating role of knowledge management. The research method in this study was a survey questionnaire. The researchers distributed 550 questionnaires to biotechnology companies in Taiwan with a 95.27% response rate. Through statistical analysis, the findings offer empirical support that the Big Five personality traits affect individual and organisational innovation performance. Further, the Big Five personality traits have an impact on the application of knowledge management. As well, utilising knowledge management gives rise to individual and organisational innovation. In addition, the Big Five personality traits bring about innovation through the mediating effect of knowledge management.

INTRODUCTION

In a fast-changing era, the resource focus of most modern enterprises turns from tangible assets to intangible ones. Two of the most concerning issues are staff experience and their own capacity and knowledge [1-5]. When companies encounter changes, innovative knowledge can bring about unexpected benefit: such as how to develop staff's professional knowledge and the effective application of knowledge - both become critical activities. However, different personality traits possibly affect the willingness to share knowledge and the effectiveness of knowledge management, which accordingly enhance innovation performance. Therefore, exploring innovation performance from the perspective of personality traits was one of the main motivations for this study.

During a period of knowledge explosion, how to apply knowledge to create unlimited value surely plays an important role. In addition, innovation has been the goal that a business enterprise seeks to achieve. In particular, after recent financial turmoil, most enterprises encountered unprecedented challenges. If a company can seize emerging market opportunities and build strong competitiveness, it will be of great help in enhancing their performance [6][7]. Therefore, effective application of knowledge management to create better innovation performance is another important motivation for this study.

LITERATURE REVIEW

The Big Five Model

Buss and Polmin defined personality as the performance of individual behavior, explained by factors such as the control of individual emotional and psychological feelings, as well as social skills to get along with others [8]. Personality will determine the interaction mode of individuals and the environment, and indirectly drive their behavior [9]. In addition, there is a lot of research to support the Big Five model, i.e. extroversion, agreeableness, conscientiousness, emotional stability and openness to experience. It has been shown to be the basic predictor of behaviour at work, and it is useful in the professional field of psychology [10].

Innovation Performance

Austrian economist Schumpeter first proposed the concept of *innovation*. A number of scholars, e.g. Backhaus, Schumpeter and Swedberg, thought of innovation as a new way of using innovative internal and external resources for production to meet the needs of the market; it is also the driving motivation for economic growth [11][12]. Innovation can be driven through training and learning, referring to changes in resource output [2][13].

Personality and Innovation Performance

Sung and Choi pointed out that people with outgoing personalities and openness to experience have significant impact on performance, because their absorption of information affects and improves innovation [14]. Further, people who are conscientious are achievement-orientated and have a strong sense of responsibility. They have outstanding individual performance, but can cause negative effects on organisational performance [15]. Thus, the first hypothesis was proposed as follows:

H1: Different personality traits tend to have positive effects on personal innovation performance and organisational performance; but conscientiousness tends to have a negative impact on organisational innovation performance.

Knowledge Management

Knowledge is the information formed by way of subjective cognition and objective analysis, comparison and summary, including structured experience, values and information through language-processing that is a unique insight into, or integration after, new experiences [16-18]. Knowledge management is the formal decision-making process; the decision is made to grasp and make use of the new knowledge, and then to ensure that useful value is created for staff [19-21].

Knowledge is obtained from learning not from teaching [22]. Davenport and Prusak put forward ideas of knowledge management as: 1) knowledge acquisition; 2) knowledge accumulation; 3) knowledge sharing; and 4) application of knowledge [16]. The practices of knowledge management can be divided into four categories: First, the pooling of knowledge and reuse; second, identification of problems and applying knowledge to solve problems; third, organisational learning and the accumulation of knowledge; and finally, there is innovation and creation of knowledge. All four areas are relevant and good in enhancing enterprise value [17][21][22].

Personality and Knowledge Management

The main factor of application for knowledge management is the participation of staff [1][23]. Those who are agreeable are willing to follow directions and make good use of knowledge management [24]. Further, Li and Lin pointed out there are significant positive correlations between agreeableness, extroversion, conscientiousness and knowledge sharing [15]. Accordingly, another hypothesis was defined in this study:

H2: Different personality traits will tend to have positive effects on knowledge management.

Knowledge Management and Innovation Performance

In the knowledge economy, competitive advantage comes from the creation of new value. The majority of enterprises identify deeply with the notion of *knowledge is power*; they think that useful knowledge can bring about good performance by the enterprise [23]. When companies are faced with difficulties and need to change, companies should construct new knowledge to integrate with the existing knowledge into activities associated with the learning process [17][25]. Kitanovic defines technology as the knowledge used in products [25]. Also, the definition of innovation is new knowledge or a combination of knowledge [17]. Demarest and Harlow pointed out that knowledge management is a way to improve the profitability of enterprises [26][27]. Therefore, corporate managers might view knowledge management as a decisive factor in the success of innovation.

However, the process of knowledge management, although able to improve innovation performance, must upgrade employees' knowledge and ability to collect and absorb knowledge from blind obedience. Further, knowledge and learning contribute to innovation not only at the individual level, but also at the organisational level [6][7][17][25]. In consequence, the authors inferred the following:

H3: Knowledge management has positive effects on individual's innovation performance; it also has positive effects on organisational innovation performance.

Personality, Knowledge Management and Innovation Performance

Li and Lin's study found that people who are conscientious have a significant negative impact on organisational performance [15]. Nevertheless, due to characteristics such as diligence, perseverance and achievement-orientation, they have better individual innovation performance in the long run. Besides, people with positive traits such as extroversion and agreeableness tend to be more willing to share their knowledge to promote individual and organisational innovation performance. In addition, openness to experience implies having the characteristics of curiosity and creativity, which enable easier absorption of external information and the development of unique knowledge: thus, a good contribution to innovation performance. It was hypothesised:

H4: Personality traits have a positive impact on innovation performance through the mediating effect of knowledge management.

METHODOLOGY

Instruments

A survey instrument was developed to collect data. The questionnaire is divided into three parts: first, personality scale; second, knowledge management scale; and third, innovation performance scale. The measurement with a five-point Likert scale is scored from *strongly disagree* to *strongly agree* as 1 to 5 points respectively.

The three scales, originally a total of 68 questions, were evaluated after a process of pre-test and item analysis. There are a total of 50 items with discrimination to identify the responsiveness of different subjects. Later, the authors used factor analysis to identify construct validity in place of the original more complex data structure. For the study, factors by the method of principal component analysis were extracted, and then reliability analysis was carried out to test the internal consistency of each scale. The results showed that each subscale's α coefficient ranged from 0.870 to 0.940; that is, the internal consistency of each scale was relatively high. In general, the reliability and validity of the study's instruments are above the level of *good*.

Subjects

The study was designed to investigate the employees of the biotechnology industry in Taiwan, including biotech, food biotechnology and special chemical biotech. A total of 550 questionnaires were issued by mail. Finally, the data, 506 valid responses, were analysed, utilising the statistical method of hierarchical regression.

RESULTS AND DISCUSSION

Effects of Personality on Innovation Performance

To explore whether different personality traits influence innovation performance, the regression analysis in the study treated different personality traits as independent variables, and innovation performance as the dependent variable. According to Table 1, conscientiousness, agreeableness and extroversion have significant effects on technology innovation, β values are 0.122, 0.200 and 0.112; and the explanatory power (R^2) equals 0.255. It means that the more obvious the three personality characteristics, the better the technology innovation.

Conscientiousness, openness to experience, extroversion and emotional stability all have significant impact on innovation. β values are 0.150, 0.192, 0.180 and 0.128; R^2 is 0.330. It indicates that the four personality characteristics have positive effects on innovation performance; in other words, the more obvious these four personality tendencies, the more excellent the innovation capability.

The result corresponds to Li and Lin's study, showing that people with conscientiousness tend to be diligent and present more outstanding individual performance [15]. Besides, the study has the same result as Probst et al, pointing out that creative people are open to experiencing new things, making more individual innovation performance [17]. Hence, H1 is partially supported.

Table 1: Effects of personality on innovation performance.

| Input variables personalities | Innovation performance | |
|-------------------------------|-----------------------------------|-----------------------------------|
| | Technology innovation (β) | Innovation capability (β) |
| Conscientiousness | 0.122 * | 0.150 ** |
| Openness to experience | 0.115 | 0.192 ** |
| Agreeableness | 0.200 *** | 0.063 |
| Extroversion | 0.112 * | 0.180 ** |
| Emotional stability | 0.099 | 0.128 * |
| R^2 | 0.255 | 0.330 |
| F | 34.152 *** | 49.344 *** |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Effects of Personality on Knowledge Management

To explore whether different personalities have any impact on knowledge management, multiple regression was used in this study to analyse the collected data. As shown in Table 2, five personality traits have significant impact on knowledge acquisition; the β values are 0.157, 0.113, 0.113, 0.214 and 0.187; coefficient of determination R^2 is 0.389.

The finding is similar to that of Liang, et al, which suggested that, if the enterprise wants to promote knowledge acquisition, there are two types of staff with high levels of knowledge acquisition: one with agreeableness, who are willing to follow directions, and the other with emotional stability, making others feel at ease [24]. In addition, the results also correspond to Chen, Wei and Yang's finding that openness to experience contributes to obtaining knowledge and information [28].

In terms of knowledge accumulation, conscientiousness, agreeableness, extroversion and emotional stability have a significant influence on knowledge accumulation; β are equal to 0.207, 0.220, 0.158 and 0.237 respectively. The explanatory power of this analysis (measured by the R^2) is 48.8%. It indicated people of these four personalities tend to rate higher in accumulating knowledge.

However, openness to experience shows little impact on knowledge accumulation; the β value is 0.077 not reaching significant levels. It means employees with openness to experience have less knowledge accumulation. The results are the same as Mount and Barrick's study, which focused on different occupations [29]. In addition, the study has the same results as the findings of Peng et al that people who are friendly and emotionally stable have the tendency to accumulate knowledge [24].

As for knowledge sharing, personalities with conscientiousness, agreeableness and emotional stability have a significant impact. The β values are 0.126, 0.432 and 0.182 respectively. The determinant coefficient (R^2) was 0.410. It implies these three types of personalities tend to show a higher degree of knowledge sharing. However, openness to experience with low and negative value ($\beta = -0.041$) refers to those less willing to share knowledge with others. So is the personality characteristic, extroversion ($\beta = 0.070$). The result echoes Peng, et al and Mount and Barrick's findings [24][29]. The different personalities (e.g. agreeableness and emotional stability) could share their individual experience and then exchange knowledge.

On knowledge application, openness to experience, extroversion, and emotional stability have significant impact. Their β values are 0.281, 0.251 and 0.110. However, conscientiousness and agreeableness have no significant effect. The β values are 0.066 and 0.022. The analysis results yield the same conclusion as that of Peng et al, which proposed that the more stable the emotion, the more knowledge application is generated [24]. Therefore, H2 was partially supported.

Table 2: Effects of personality on knowledge management.

| Input variables | Knowledge management | | | |
|------------------------|-----------------------------------|------------------------------------|-------------------------------|-----------------------------------|
| | Knowledge acquisition (β) | Knowledge accumulation (β) | Knowledge sharing (β) | Knowledge application (β) |
| Conscientiousness | 0.157** | 0.207*** | 0.126** | 0.066 |
| Openness to experience | 0.113* | 0.077 | -0.041 | 0.281*** |
| Agreeableness | 0.113** | 0.220*** | 0.432*** | 0.022 |
| Extroversion | 0.214*** | 0.158** | 0.070 | 0.251*** |
| Emotional stability | 0.187*** | 0.237*** | 0.182*** | 0.110* |
| R^2 | 0.389 | 0.498 | 0.410 | 0.381 |
| F | 63.749*** | 99.087*** | 69.385*** | 61.641*** |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Effects of Knowledge Management on Innovation Performance

Regarding the effect of knowledge management on innovation performance, regression analysis was applied in this study to further investigate the prediction of their correlation. As shown in Table 3, knowledge acquisition, knowledge accumulation and knowledge application have greater effect on technology innovation. The β values are 0.269, 0.223 and 0.139; the determinant coefficient R^2 was 0.330.

It shows the greater the three kinds of knowledge management, the better the technological innovation. Ernst & Young, Firestone, Lloria, Probst et al, among others, share the consistent viewpoint that knowledge management can ensure good use of knowledge, to bring about benefits for an organisation.

Knowledge acquisition, knowledge accumulation and knowledge application have a significant impact on innovation. β values are 0.205, 0.189 and 0.449, and the explanatory power R^2 is 0.543. That implies the higher the frequency of managing knowledge, the greater the individual's innovation. Meanwhile, the β coefficient of knowledge sharing is -0.018, which means there is little effect of knowledge sharing on innovation. The results correspond to the Ernst & Young study [30]. Overall, H3 received partial support.

Table 3: Effects of knowledge management on innovation performance.

| Input variables | Innovation performance | |
|------------------------|-----------------------------------|-----------------------------------|
| | Technology innovation (β) | Innovation capability (β) |
| Knowledge acquisition | 0.269 * * * | 0.205 * * * |
| Knowledge accumulation | 0.223 * * * | 0.189 * * * |
| Knowledge sharing | 0.031 | -0.018 |
| Knowledge application | 0.139 * | 0.449 * * * |
| R^2 | 0.330 | 0.543 |
| F | 61.762 * * * | 148.655 * * * |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The Mediating Effect of Knowledge Management on Personalities and Innovation Performance

First, multiple regression proceeded with the exploration of five personalities on two levels of innovation performance, respectively. The results as shown in Table 4 indicate five personality traits tend to have a significant impact on innovation performance (see Model 1). In Model 2, conscientiousness, openness to experience, extroversion and emotional stability originally have a significant positive impact on innovation performance.

However, through the mediating effect of knowledge management, these four factors become insignificant; β values are modified to be 0.066, 0.043, 0.011 and 0.016. Only agreeableness still holds a significant effect ($\beta = 0.098$, $p < 0.05$). In addition, knowledge acquisition, knowledge accumulation and knowledge application have a significant impact on innovation performance; their β values are 0.240, 0.311 and 0.166. All these three dimensions have a positive effect on innovation performance. However, knowledge sharing did not have a significant impact ($\beta = -0.037$, $p > 0.05$). Thus, knowledge sharing's effect on innovative performance was relatively weak.

Table 4: Effects of personality and knowledge management on innovation performance.

| Input variables | Model 1 (β) | Model 2 (β) |
|------------------------|---------------------|---------------------|
| Conscientiousness | 0.154 * * | 0.066 |
| Openness to experience | 0.172 * * | 0.043 |
| Agreeableness | 0.152 * * * | 0.098 * |
| Extroversion | 0.164 * * | 0.011 |
| Emotional stability | 0.128 * | 0.016 |
| Knowledge acquisition | | 0.240 * * * |
| Knowledge accumulation | | 0.311 * * * |
| Knowledge sharing | | -0.037 |
| Knowledge application | | 0.166 * * |
| ΔR^2 | 0.366 | 0.187 |
| ΔF | 57.715 * * * | 51.697 * * * |
| R^2 | 0.366 | 0.553 |
| F | 57.715 * * * | 68.045 * * * |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Through the analysis of Table 4, it was found in the study that not only agreeableness but also knowledge acquisition, knowledge accumulation, and knowledge application significantly impact innovation performance (Model 2), and the effects are all positive ($p < 0.01$). As for prediction of innovation performance, the results showed the mediating effect is stronger than the direct effect of personality. In consequence, H4 was supported.

CONCLUSIONS

Exclusive of agreeableness, the personality traits, such as conscientiousness, openness to experience, extroversion and emotional stability, positively impact innovation capability. It indicates employees in biotechnology with these personality traits, will be more creative. As well, conscientiousness, agreeableness, and extroversion have a positive

impact on technology innovation. The more pronounced these three personality types, the more prominent the technology innovation.

In the biotech industry, the Big Five model has a positive influence on knowledge acquisition. It signifies that, whoever has the stronger personality tendency, the more the emphasis is on knowledge acquisition. Regarding knowledge accumulation, except openness to experience, all the other four personality characteristics (extroversion, agreeableness, conscientiousness and emotional stability) have a significant positive influence; that is, the more distinct the personality characteristic, the higher the degree of knowledge accumulation. Conscientiousness, agreeableness, and emotional stability have a significant and positive influence on knowledge sharing. The findings imply that the more these personality traits show the more knowledge application they effect in biotechnology.

Exclusive of knowledge sharing, it seems that knowledge acquisition, knowledge accumulation and knowledge application bring about a positive influence on innovation capability. Knowledge acquisition, knowledge accumulation and knowledge application have significantly positive effects on job performance. Those engaged in the bio-technology industry frequently make good use of these three processes at work, which will help to improve technology performance.

Through the mediating effect of knowledge management, the impact of conscientiousness, openness to experience, extroversion, and emotional stability on innovation performance have no significant effect. The explanatory power of agreeableness, knowledge acquisition, knowledge accumulation and knowledge application on innovation performance is stronger. All these five variables can account for 55.3% of the variance. As for the prediction of innovation performance, the results show the mediating effect of knowledge management is stronger than the direct effect of personalities.

REFERENCES

1. Drucker, P.F., The new productivity challenge. *Harvard Business Review*, 69, 6, 69-79 (1991).
2. Drucker, P.F., *Innovation and Entrepreneurship: Practice and Principles*. Oxford: Butterworth Heinemann, (2006).
3. Quinn, J.B., *Intelligent Enterprise: A Knowledge and Service Based Paradigm for Industry*. New York: The Free Press (1992).
4. Stewart, T.A., *Intellectual Capital: The New Wealth of Organizations*. London: Nicholas Brealey (1999).
5. Toffler, A., *Powershift: Knowledge, Wealth, and Violence at the Edge of the 21st Century*. New York: Bantam Books (1990).
6. Prajogo, D.I., Laosirihongthong, T., Sohal, A. and Boonitt, S., Manufacturing strategies and innovation performance in newly industrialised countries. *Industrial Management & Data Systems*, 107, 52-68 (2007).
7. Sáenz, J., Aramburu, N. and Rivera, O., Knowledge sharing and innovation performance: A comparison between high-tech and low-tech companies. *J. of Intellectual Capital*, 10, 22-36 (2009).
8. Buss, A.H. and Plomin, R., *A Temperament Theory of Personality Development*. New York: Wiley-Interscience, (1975).
9. Day, D.V. and Silverman, S.B., Personality and job performance: Evidence of incremental validity. *Personnel Psych.*, 42, 1, 25-36 (1989).
10. Henry, J., *Creative management*. (2nd Edn), London: SAGE. (2001).
11. Backhaus, J.G. and Schumpeter, J.A., *Entrepreneurship, Style, and Vision*. Boston: Kluwer Academic Publishers (2003).
12. Schumpeter, J.A. and Swedberg, R., *Capitalism, Socialism, and Democracy*. London: Routledge (1994).
13. Bessant, J.R. and Tidd, J., *Innovation and Entrepreneurship*. Chichester, England: John Wiley & Sons (2007).
14. Sung, S.Y. and Choi, J.N., Do big five personality factors affect individual creativity? The moderating role of extrinsic motivation. *Social Behavior and Personality*, 37, 7, 941-956 (2009).
15. Lee, C.H. and Lin, M.F., The Study of the Interrelation between Knowledge Sharing and Organizational Performance from Personality and Organizational Culture in High Technology Industry. *Diwan J. of Management*, 3, 1, 18-37 (2008).
16. Davenport, T. and Prusak, L., *Working Knowledge: How Organizations Manage What They Know*. Boston, Mass: Harvard Business School Press (1998).
17. Probst, G., Raub, S. and Romhardt, K., *Managing Knowledge: Building Blocks for Success*. Chichester, New York: Wiley & Sons (2000).
18. Thatchenkery, T. and Chowdhry, D., *Appreciative Inquiry and Knowledge Management: A Social Constructionist Perspective*. Cheltenham, UK: Edward Elgar (2007).
19. Firestone, J.M., On doing knowledge management. *Knowledge Management Research and Practice*, 6, 13-22 (2008).
20. Lundvall, B.A. and Nielsen, P., Knowledge management and innovation performance. *Inter. J. of Manpower*, 28, 207-223 (2007).
21. Lloria, M.B., A review of the main approaches to knowledge management. *Knowledge Management Research and Practice*, 6, 77-89 (2008).
22. Awad, E.M. and Ghaziri, H.M., *Knowledge Management*. New Jersey: Pearson Education (2004).

23. Magretta, J., *Managing in the New Economy*. Boston: Harvard Business School Press (1999).
24. Liang, T.P., Ouyang, Y.C. and Hsu, R.C., Factors affecting the adoption of knowledge management. *J. of Information Management*, 12, **3**, 1-38 (2005).
25. Kitanovic, J., The applicability of the concept of national innovation systems to transition economies. *Innovation: Management, Policy & Practice*, 9, **1**, 28-45 (2007).
26. Demarest, M., Understanding knowledge management. *Long Range Planning*, 30, **3**, 374-384 (1997).
27. Harlow, H., The effect of tacit knowledge on firm performance. *J. of Knowledge Management*, 12, **1**, 148-163 (2008).
28. Chen, C.Y., Chang, S.L., Wey, S.C. and Yang, C.C., An empirical study of the influence of personality traits, social capital and prior knowledge on entrepreneurial alertness. *J. of Entrepreneurship Research*, 2, **4**, 25-56. (2007).
29. Mount, M.K. and Barrick, M.R., The big five personality dimensions and job performance: A meta-analysis. *Personnel Psych.*, **51**, 849-857 (1998).
30. Ernst & Young, Executive Perspectives on Knowledge in the Organization. Ernst and Young Center for Business Innovation and Business Intelligence, Report (1997).