

CONTENT VALIDITY FOR INNOVATION LEVEL OF UTM UNDERGRADUATE STUDENTS: A QUANTITATIVE APPROACH

Nor Aisyah Che Derasid*, Aede Hatib Musta'mal, Nor Fadila Mohd. Amin, Abdul Rashid Husain

Department of Technical & Engineering Education, Faculty of Education, Universiti Teknologi Malaysia

*Corresponding author: noraisyahchederasid@gmail.com

Abstract

Innovation has become one of the vital aspects of a nation's human capital development. Most countries including Malaysia are now putting their best effort to increase their innovation capability in order to be more competitive in various aspects, especially in economy and technology. As one of Malaysian leading universities in engineering and technology, Universiti Teknologi Malaysia (UTM) emphasizes on innovation to all its students by establishing the Centre for Student Innovation (CSI). Its' objectives are to foster and enhance the innovation ability amongst UTM undergraduates. A question rising from this is, 'to what extent this objective has been achieved?' Therefore, it is very important for the UTM-CSI to ensure the effectiveness of their innovative programs that involved undergraduate students. Hence, the aims of this study are to develop and propose an instrument to facilitate UTM-CSI in assessing the level of innovation among UTM undergraduate students. A quantitative approach has been undertaken which includes document analysis from literature review, integration models and theories related to innovation and proposed human capital, and culture and leadership as constructs to develop the instrument in measuring the level of students' innovation. This article will report on the analysis of content validity and reliability using the Fleiss' Kappa Index where the inter-rater agreement on constructs studied is analyzed. The finding shows that the constructs and sub constructs indicated a high degree of agreement values that determine the validity and reliability of the development of instrument.

Key words: innovation, instrument, inter-rater agreement and content validity

1.0 INTRODUCTION

For the past 4 years, CSI-UTM has been facing a challenge in measuring the level of innovation among UTM students since it is very important for the UTM-CSI to know how the effectiveness of their innovative programs that involve students. Most of the existing instruments are focused on measuring the user's perceptions of IT innovation (Moore & Benbasat, 1991) and measuring the organization's innovativeness (Gamal et al., 2011). Thus, based on previous literature there is a lack of instrument to measure the innovation performance from the students' perspectives and it is essential (Adams et al., 2006) to put this forward as it should be developed further.

This study aims to develop an instrument for measuring the undergraduate students' innovation level that will provide useful data in facilitating UTM-CSI to assess the effectiveness of their prior and current innovation activities. Based on the issues highlighted, development of such instrument for measuring the level of students' innovation is crucial.

2.0 INNOVATION

Innovation can be defined as doing new things (Oxford University Press, 1998; Rosegger & Gerhard, 1986; West, 2002). Some authors' perceived that innovation is related to the establishment of new idea, experiment and process (Kanter, 1984; Urabe, 1988; West, 2002) which can be utilized in various aspects. Innovation leads to improvements and adaptations to the thought and ideas available to provide added value that can be applied, utilized and be used as a product or service that can be commercialized (Zaini, 2010). An innovative individual has the ability to reform or modify something to build better, exquisite and high quality, as a way of introducing new ideas to make something or create something new (Boon & Ragbir, 1998).

Many authors emphasized on the measurement of different dimensions of innovation. Founders with greater human capital are more likely to yield innovation outcomes (Kato et al., 2014). Thus, human capital can be seen as a catalyst in innovation (Leiponen, 2005) and to be an important driver of innovative performance, especially when the organizational support dimensions are limited. However, Subramaniam and Youndt (2005) found that human capital that interacts with social capital positively influence radical innovative capabilities whereas human capital by itself is not associated with radical innovative capability.

For example, Zhu (2015) considered seven factors of innovation which include organizational culture; goal orientation, participative decision making, innovation orientation, structured leadership, supportive leadership and shared vision. Hauser (1998) identified the

contents of organizational culture, which consists of (i.e. values, norms and knowledge), its strength, and structure (i.e. dealing with the culture-subculture problem).

A leader of an organization's characteristics in decision-making include introducing new ideas, setting specific goals and encouraging innovation initiative among subordinates, which is the most important leadership style and have also been stressed to influence the organization with innovation (Harborne & Johne, 2003; McDonough, 2000; Sethi, 2000).

Based on previous researches, three main constructs that determine the students' overall innovativeness were classified. They are Human Capital Innovativeness, Culture Innovativeness and Leadership Innovativeness. These dimensions are briefly summarized in Table 1. In line with these, students who tend to have the tendency to be innovative have the ability to foresight and have first class mentality in fostering a culture of innovation through a combination of innovation leadership styles.

Table 1 Dimensions of students' innovativeness

Author	Human Capital	Culture	Leadership
Lee et al. (2015)	X	X	
Schumpeter (2000)	X		
George Couros, (2014)		X	X
Chesbrough (2006)	X	X	X
Love et al. (2014)	X		X

2.1 Human Capital Innovativeness

Human capital consists of a set of knowledge, abilities and skills of individuals to boost the innovation process (Popescu & Diaconu, 2008), where the present set is highly required by young people equipped with the advancement of science and technology (Ramma et al., 2015). Santos-Rodrigues et al. (2010) focused on three dimensions of human capital; knowledge creation, innovative behavior and incentives for innovation. However, Human

Capital Innovativeness is most often referred to reduce the barriers of innovation represented by knowledge shortages and market uncertainties (D'Este et al., 2014) that comprised of three types of obstacles to innovation: cost, knowledge and market barriers.

Human capital innovativeness in this study refers to boosting the capacity of knowledge and innovation as well as nurturing first class mentality to stimulate the process of innovation. The desired human capital should be knowledgeable and skillful. Innovation knowledge has been recognized to play an important role (Rogers & Amidon, 1993) as an organizational attribute in fostering innovation (Dougherty, 1992). Innovation skills are practically the types of skills that allow individuals to become innovative in what they do (Certo et al., 2009). Among the skills referred to are cognitive skills, behavioral skills, functional skills and technical skills. To be an innovative student, problem-solving capabilities (Engestrom, 1999; Nickerson & Zenger, 2004; Von Hippel, 1994) must be brought together.

2.2 Culture Innovativeness

Culture innovativeness in this study refers to the characteristics, values, belief or willingness to change and trying something new that allows for innovation. Obviously, the key factor for success of an organization is a culture of innovation. Previously, the measurement of innovation culture in the context of company organization was endorsed by (Dobni, 2008) and the students' innovation product (Kamarudin et al., 2014). Research, program development and the involvement of members are very crucial in ensuring that the organization can persistently pursue innovation and compete in an ever-changing world. This form of cultural identity becomes the guidelines for workers in thinking, feeling and acting (Kalyani, 2011).

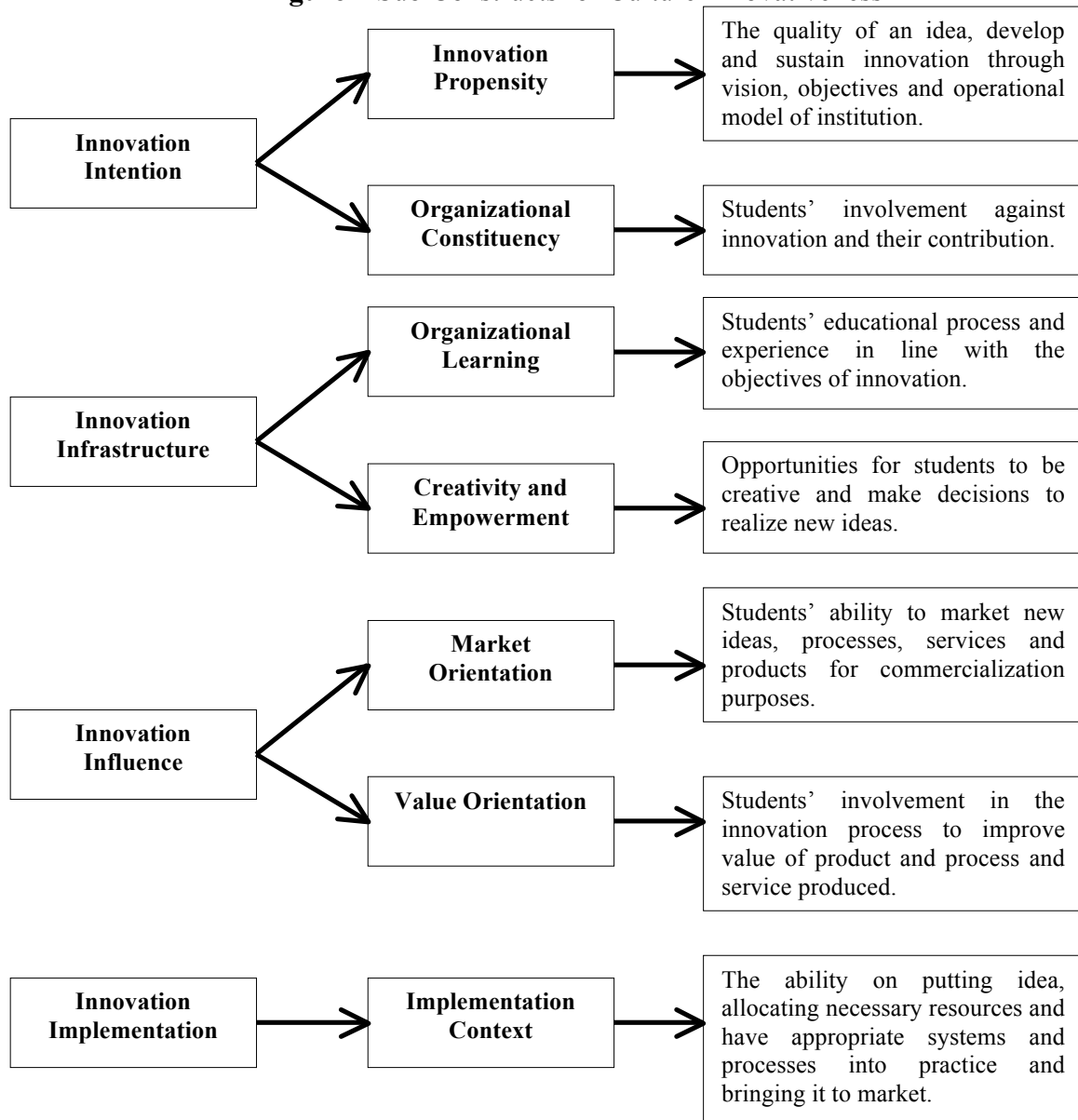
Empirical study on developing valid measures to assess innovation culture specifically, have been carried out by Dobni (2008) and he proposed an innovation model. In this study, the model was adopted as a measuring tool to assess the students' innovation culture. A few dimensions have been identified to measure the culture of organizations and they are emphasized in Table 2. It also becomes the basis to assess the students' innovation culture at UTM. Based on the dimensions, seven factors have been identified and they are used for sub constructs as shown in Figure 1.

Table 2 Dimension of Innovation Culture

Dimension	Author
Innovation intention	(Christensen et al., 2003; Dobni, 2006, 2008; Martins & Terblanche, 2003; Tesluk et al., 1997)
Innovation infrastructure	Dobni & Luffman, 2003; Hurley & Hult, 1998; Martins & Terblanche, 2003; Syrett & Lammiman, 1997; Tushman & O'Reilly, 1997; Wang & Ahmed, 2004
Innovation influence	Aldas-Manzano et al., 2005; Day, 1990; Deng & Dart, 1994; Hult et al., 2004; Hurley & Hult, 1998; Kohli et al., 1993; Narver & Slater, 1990; O'Cass & Viet Ngo, 2007
Innovation implementation	Bossidy & Charan, 2002; Day, 1990; Kohli & Jaworski, 1990; Marinova, 2004; Wang & Ahmed, 2004

Source: (Dobni, 2008)

Figure 1 Sub Constructs for Culture Innovativeness



2.3 Leadership Innovativeness

Processes of influence or examples by leader to followers in order to achieve organizational goals are known as leadership. Besides that, it is the ability to guide others without any force into a direction or decision that leaves them feeling empowered and accomplished. Based on De Jong and Den Hartog (2007) findings, leadership refers to a process of influencing others towards achieving some kind of desired outcome, and leadership behaviors stimulate the employees' idea generation and application behavior. Most definitions

of leadership reflect some basic elements, including a "group", "influence" and "goals" (Bryman, 1992).

In the context of this research, leadership in innovation is the result of a combination of styles of leadership in the organization that aims to influence students to generate creative ideas, products, services and solution. Therefore, the researcher has to use the Big Five model of innovation to develop the measuring item. A sub construct identified through this model that is abbreviated to OCEAN consists of five elements. The sub constructs are based on the five-factor model. The big five factors which are openness, conscientiousness, extraversion, agreeableness and neuroticism are respectively defined in Table 3.

Table 3 Factors of Leadership Innovativeness

Leadership Innovativeness	Definition	Author
Openness	Innovative students are curious, original, creative and open to new ideas.	(Feist, 1999; King et al., 1996; Love et al., 2014; Martindale & Dailey, 1996; McCrae, 1987; Yi-Ching et al., 2013)
Conscientiousness	Innovative students lack in conscientiousness. They are not punctual, disorganized, independent and doubtful.	(Barron & Harrington, 1981; Feist, 1999; King et al., 1996; Patterson et al., 2000; Patterson et al., 2009; Walker et al., 1995)
Extraversion	Students that are extraverts are generally outgoing, sociable, assertive, talkative, energetic and optimistic.	(Aguilar-Alonso, 1996; Anderson et al., 2004; Graen & Scandura, 1987; King et al., 1996; Martindale & Dailey, 1996; Shin & Zhou, 2003)
Agreeableness	Innovative individuals are frequently described as hostile, challenging, rebellious, non-conforming and argumentative.	(Cooper & Robertson, 1997; Costa & McCrae, 1992; Hsieh et al., 2011; King et al., 1996)
Neuroticism	Innovative student tend to have greater emotional stability with low in neuroticism. Moderate levels of anxiety may enhance the innovation level.	(Chell & Karataş-Özkan, 2014; McCrae, 1987; McShane & Von Glinow, 2015)

3.0 METHODOLOGY

The Quantitative methods are used to estimate the qualitative data resulting from the analysis of documents, literature review and meta-data analysis to generate constructs and sub constructs in developing the instrument. Three expert panels in innovation were selected to assess the instrument that consists of three main constructs, 15 sub-constructs and 107 items on a three-point scale (0 = disagree, 1= agree with modification 2 = strongly agree). The

Fleiss Kappa Index is used to identify the coefficient kappa, κ which represents the ratio of agreement for examining the inter-rater agreement among the experts. The Fleiss Kappa is a statistical measure of inter-rater reliability. It is also related to the Cohen's kappa statistics, but it works only for two raters whereas the Fleiss Kappa works for three raters and above to give agreement on the categorical ratings.

The table below denotes the number of constructs and sub-constructs that represents the maximum number of each agreement achieved. This means that the value representing the sub constructs and item for each constructs multiplied by 2 is the maximum value on the three-point scale that indicates strongly agree.

Table 4 Actual Agreement Value

CONSTRUCTS	ACTUAL AGREEMENT VALUE	SUB-CONSTRUCTS	ACTUAL AGREEMENT VALUE
Human Capital Innovativeness	3 sub-constructs = 6	Knowledge	7 items = 14
		Skills	18 items = 36
		Towering Personality	6 items = 12
Culture Innovativeness	7 sub-constructs = 14	Innovation Propensity	6 items = 12
		Organizational Constituency	6 items = 12
		Organizational Learning	5 items = 10
		Creativity and Empowerment	8 items = 16
		Market Orientation	4 items = 8
		Value Orientation	5 items = 10
		Implementation Context	8 items = 16
Leadership Innovativeness	5 sub-constructs = 10	Openness	6 items = 12
		Conscientiousness	7 items = 14
		Extraversion	11 items = 22
		Agreeableness	5 items = 10
		Neuroticism	5 items = 10

Theoretically, in the Fleiss Kappa statistics, agreement can be considered as follows; if a fixed number of people assign numerical ratings to a number of items, then the kappa will give a measurement of how consistent the ratings are. The kappa, κ , can be defined as:

$$\kappa = \frac{\bar{P} - \bar{P}_e}{1 - \bar{P}_e}$$

Thus, from the above equation we can conclude that the kappa coefficient is equal to the degree of agreement that is attainable above chance by the raters over the degree of agreement actually achieved. The range value of κ is between $0 \leq \kappa \leq 1$. To demonstrate the consistency among observational ratings, the researcher computed the Fleiss Kappa for Human Capital Innovativeness construct as below:

Table 5 Fleiss Kappa Calculations

Expert 1	Expert 2	Expert 3	Kappa Value (κ)
4/6 = 0.66	5/6 = 0.83	6/6 = 0.83	$\frac{0.66 + 0.83 + 0.83}{3}$ $\kappa = 0.77$

4.0 FINDINGS

The reliability index for all constructs in measuring the students' level of innovation is rated to obtain the Kappa statistics value as presented in Table 6.

Table 6 Reliability Index for Each Construct of Students' Innovation.

No	Innovation Constructs	ID Item	Total of Items	Kappa Statistics
1	Human Capital Innovativeness	HC01-HC31	31	0.77
2	Culture Innovativeness	CL32-CL73	42	0.69
3	Leadership Innovativeness	LD74-LD107	34	0.78
Total			107	0.74

The overall value of kappa statistics indicates 0.74 and based on Table 6, it comprises of 107 items showing that it has between intermediate and good level of agreement. Human Capital Innovativeness and Leadership innovativeness showed high agreement respectively, with 0.77 and 0.78 Kappa Statistics values. They were very significantly associated with the Fleiss' Kappa Benchmark Scale (refer Table 7) as they indicate a high degree of agreement values, which are more than 0.75. Meanwhile, Culture Innovativeness indicated between intermediate and good level of agreement as it recorded a kappa value of 0.69.

Table 7 Fleiss' Kappa Benchmark Scale

Kappa Statistic	Strength of Agreement
< 0.40	Poor
0.40 to 0.75	Intermediate to Good
More than 0.75	Excellent

Source: (Fleiss, 1981)

Based on Table 8, the researcher emphasizes on the reliability of each sub-construct. Thus, the knowledge was its highest agreement among other sub-constructs under the Human Capital Innovativeness. Respectively, knowledge, skills and towering personality recorded kappa values of 0.83, 0.74 and 0.72.

However, in Culture Innovativeness, Market Orientation achieved a kappa statistics value of 0.35 among 7 sub-constructs, indicating the lowest value compared to other sub-constructs. In contrast, Value Orientation indicated 0.90, Implementation Context and Organizational Learning 0.80, while Innovation Propensity showed 0.78, which is a very high value of inter-rater agreement. Meanwhile, Creativity and Empowerment, and Organizational Constituency respectively showed 0.67 and 0.50, which classified the sub-constructs between intermediate and good level of agreement among raters.

Significantly, the sub-construct Openness consisting of 6 items recorded the highest agreement where all raters agreed with the items proposed. Neuroticism and Extraversion also indicated excellent strength of agreement between raters where both sub-constructs recorded 0.93 and 0.91 values of the kappa statistics, whereas Agreeableness and Conscientiousness demonstrated between intermediate and good level of agreement that correspondingly showed 0.57 and 0.48.

Table 8 Reliability Index for Each Sub-Constructs of Students' Innovation

Constructs	Sub-constructs	ID item	Total of items	Kappa statistics
Human Capital Innovativeness	Knowledge	HC01-HC07	7	0.83
	Skills	HC08-HC25	18	0.74
	Towering Personality	HC26-HC31	6	0.72
Culture Innovativeness	Innovation Propensity	CL32-CL37	6	0.78
	Organizational Constituency	CL38-CL43	6	0.50
	Organizational Learning	CL44-CL48	5	0.80
	Creativity and Empowerment	CL49-CL56	8	0.67
	Market Orientation	CL57-CL60	4	0.35
	Value Orientation	CL61-CL65	5	0.90
	Implementation Context	CL66-CL73	8	0.80
Leadership Innovativeness	Openness	LD74-LD79	6	1.00
	Conscientiousness	LD80-LD86	7	0.48
	Extraversion	LD87-LD97	11	0.91
	Agreeableness	LD98-LD102	5	0.57
	Neuroticism	LD103-LD107	5	0.93

5.0 DISCUSSION & CONCLUSION

In summary, Human Capital, Culture and Leadership innovativeness are positively associated in measuring the innovation level among UTM undergraduate students. Besides that, the sub constructs that have kappa statistics values of above 0.75 are Knowledge, Innovation Propensity, Organizational Learning, Value Orientation, Implementation Context, Extraversion, and Neuroticism. Meanwhile, Towering Personality, Organizational Constituency, Creativity and Empowerment, Conscientiousness, and Agreeableness have moderate level of agreement among raters.

From the data obtained, the researcher needs to modify and reword the sentence structure for the sub-constructs that have kappa statistics values between 0.40 and 0.75. If the constructs, sub-constructs and items evaluated by the three experts need to be modified or do not meet the criteria as an instrument, the researcher needs to repair the item first, and if it still does not fulfill the requirement, it should be dropped entirely. Besides that, this study demonstrates that the raters disagreed with putting Market Orientation as a sub-construct in Culture Innovativeness. Previous studies identified that Market Orientation is considered to produce; innovative organizations (Narver & Slater, 1990), superior performance in terms of

innovative business (Drucker Peter, 1954) and service industries (Grönroos, 1990). The researcher listed the items dropped in Table 9. Thus, the reliability and validity of instrument can be improved.

Table 9 List of Items Dropped to Improve Reliability

ID	ITEMS CONTENTS
CL57	Observed demands of the market first before create any innovation product.
CL58	Always see business opportunities everywhere.
CL59	Able to see gap in the market for new product that others may not be able to do that.
CL60	Always seeking for ideas which competitors will target which set of customers.

The use of the Kappa Statistics indicates the strength of agreement among raters as well as guiding the researcher to develop high reliability and validity of instrument, and assisting the researcher to create measurement items to cover the construct being measured.

In conclusion, all of the constructs are maintained as they have a relatively high value of agreement among raters. However, one of the total 15 sub constructs, Market Orientation, has been dropped and therefore, only 14 sub constructs and 103 items are maintained. Then, the researcher prepares and rearranges the item content to be used as a complete questionnaire. The researcher will carry out the pilot study by involving 30 undergraduate students who are studying at UTM.

6.0 REFERENCES

- Adams, Richard, Bessant, John, & Phelps, Robert. (2006). Innovation management measurement: A review. *International Journal of Management Reviews*, 8(1), 21-47.
- Aguilar-Alonso, Angel. (1996). Personality and creativity. *Personality and individual differences*, 21(6), 959-969.
- Anderson, Neil, De Dreu, Carsten KW, & Nijstad, Bernard A. (2004). The routinization of innovation research: A constructively critical review of the state-of-the-science. *Journal of organizational Behavior*, 25(2), 147-173.
- Barron, Frank, & Harrington, David M. (1981). Creativity, intelligence, and personality. *Annual review of psychology*, 32(1), 439-476.
- Boon, P.Y, & Ragbir. (1998). *Psychology 2*. Kuala Lumpur: Utusan Publications and Distribution.
- Bryman, Alan. (1992). *Charisma and leadership in organizations*: Sage Pubns.
- Certo, Samuel C, Certo, S Trevis, & Barman, Shayak. (2009). *Modern management: Concepts and skills*: Pearson Education International.

- Chell, Elizabeth, & Karataş-Özkan, Mine. (2014). *Handbook of research on small business and entrepreneurship*: Edward Elgar Publishing.
- Chesbrough, Henry. (2006). Open innovation: a new paradigm for understanding industrial innovation. *Open innovation: Researching a new paradigm*, 1-12.
- Christensen, Clayton M, Raynor, Michael E, Caplan, Samantha, *et al.* (2003). *The Innovator's Solution: Creating and Sustaining Successful Growth*. Boston, MA: Harvard Business School Press.
- Cooper, Cary L, & Robertson, Ivan T. (1997). *International Review of Industrial and Organizational Psychology, 1996*: John Wiley & Sons.
- Costa, Paul T, & McCrae, Robert R. (1992). Four ways five factors are basic. *Personality and individual differences*, 13(6), 653-665.
- D'Este, Pablo, Rentocchini, Francesco, & Vega-Jurado, Jaider. (2014). The role of human capital in lowering the barriers to engaging in innovation: evidence from the Spanish innovation survey. *Industry and Innovation*, 21(1), 1-19.
- De Jong, Jeroen PJ, & Den Hartog, Deanne N. (2007). How leaders influence employees' innovative behaviour. *European Journal of Innovation Management*, 10(1), 41-64.
- Dobni, C Brooke. (2006). The innovation blueprint. *Business Horizons*, 49(4), 329-339.
- Dobni, C Brooke. (2008). Measuring innovation culture in organizations: The development of a generalized innovation culture construct using exploratory factor analysis. *European Journal of Innovation Management*, 11(4), 539-559.
- Dougherty, Deborah. (1992). Interpretive barriers to successful product innovation in large firms. *Organization Science*, 3(2), 179-202.
- Drucker Peter, F. (1954). *The practice of management*. NY: Harper & Row.
- Engestrom, Yrjd. (1999). 23 Innovative learning in work teams: Analyzing cycles of knowledge creation in practice. *Perspectives on activity theory*, 377.
- Feist, Gregory J. (1999). 14 The Influence of Personality on Artistic and Scientific Creativity. *Handbook of creativity*, 273.
- Fleiss, JL. (1981). *Statistical methods for rates and proportions*: John Wiley and Sons.
- Gamal, Dalia, Salah, Eng Tarek, & Elratty, Eng Nesreen. (2011). How to measure organization Innovativeness? *Technology Innovation And Entrepreneurship Center*.
- Graen, George B, & Scandura, Terri A. (1987). Toward a psychology of dyadic organizing. *Research in organizational behavior*.
- Grönroos, Christian. (1990). *Service management and marketing: managing the moments of truth in service competition*: Jossey-Bass.
- Harborne, Paul, & Johne, Axel. (2003). Creating a project climate for successful product innovation. *European Journal of Innovation Management*, 6(2), 118-132.
- Hauser, Markus. (1998). Organisational culture and innovativeness of firms-an integrative view. *International Journal of Technology Management*, 16(1), 239-255.
- Hsieh, Hsiow-Ling, Hsieh, Jia-Ru, & Wang, I-Ling. (2011). Linking personality and innovation: the role of knowledge management. *World Transactions on Engineering and Technology Education*, 9(1), 38-44.
- Kalyani, Muna. (2011). Innovative culture: an intervention strategy for sustainable growth in changing scenario. *International Journal of Business Administration*, 2(4), p84.
- Kamarudin, Md Tahir, Zuraidah, Ahmad, & Shamsuri, Abdullah. (2014). *Penilaian Budaya Inovasi Kementerian Pengajian Tinggi Malaysia*.
- Kanter, Rosabeth Moss. (1984). *Change masters*: Simon and Schuster.
- Kato, Masatoshi, Okamuro, Hiroyuki, & Honjo, Yuji. (2014). Does Founders' Human Capital Matter for Innovation? Evidence from Japanese Start-ups. *Journal of Small Business Management*.

- King, Laura A, Walker, Lori McKee, & Broyles, Sheri J. (1996). Creativity and the five-factor model. *Journal of Research in Personality*, 30(2), 189-203.
- Lee, P. C., Lin, C. T., & Kang, H. H. (2015). The influence of open innovative teaching approach toward student satisfaction: a case of Si-Men Primary School. *Quality and Quantity*.
- Leiponen, Aija. (2005). Skills and innovation. *International Journal of Industrial Organization*, 23(5), 303-323.
- Love, James H., Roper, Stephen, & Vahter, Priit. (2014). Learning from openness: The dynamics of breadth in external innovation linkages. *Strategic management journal*, 35(11), 1703-1716. doi: 10.1002/smj.2170
- Martindale, Colin, & Dailey, Audrey. (1996). Creativity, primary process cognition and personality. *Personality and individual differences*, 20(4), 409-414.
- Martins, EC, & Terblanche, F. (2003). Building organisational culture that stimulates creativity and innovation. *European Journal of Innovation Management*, 6(1), 64-74.
- McCrae, Robert R. (1987). Creativity, divergent thinking, and openness to experience. *Journal of personality and social psychology*, 52(6), 1258.
- McDonough, Edward F. (2000). Investigation of factors contributing to the success of cross-functional teams. *Journal of product innovation management*, 17(3), 221-235.
- McShane, Steven L, & Von Glinow, Mary Ann. (2015). *Organizational Behavior* 7/e.
- Moore, Gary C., & Benbasat, Izak. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*, 2(3), 192-222 @ 1047-7047.
- Narver, John C, & Slater, Stanley F. (1990). The effect of a market orientation on business profitability. *The Journal of Marketing*, 20-35.
- Nickerson, Jack A, & Zenger, Todd R. (2004). A knowledge-based theory of the firm—The problem-solving perspective. *Organization Science*, 15(6), 617-632.
- Oxford University Press. (1998). *The New Oxford Dictionary of English*. 942.
- Patterson, Fiona, Ferguson, Eamonn, Lane, Pat, et al. (2000). A competency model for general practice: implications for selection, training, and development. *British Journal of General Practice*, 50(452), 188-193.
- Patterson, Fiona, Kerrin, Máire, & Gatto-Roissard, Geraldine. (2009). Characteristics and behaviours of innovative people in organisations. *Literature Review prepared for the NESTA Policy & Research Unit*, 1-63.
- Popescu, Cristian, & Diaconu, Laura. (2008). Human Capital and Innovation. *Available at SSRN 1099025*.
- Ramma, Y., Samy, M., & Gopee, A. (2015). Creativity and innovation in science and technology: Bridging the gap between secondary and tertiary levels of education. *International Journal of Educational Management*, 29(1), 2-17.
- Rogers, & Amidon, Debra M. (1993). Knowledge Innovation System: The Common Language. *Journal of Technology Studies*, 19(2), 2-8 %@ 1071-6084.
- Rosegger, Gerhard, & Gerhard, Rosegger. (1986). *The economics of production and innovation: an industrial perspective*: Pergamon Press Oxford, UK.
- Santos-Rodrigues, Helena, Dorrego, Pedro Figueroa, & Jardon, Carlos Fernandez. (2010). The influence of human capital on the innovativeness of firms. *International Business & Economics Research Journal (IBER)*, 9(9).
- Schumpeter, Joseph A. (2000). Entrepreneurship as innovation. *Entrepreneurship: The social science view*, 51-75.
- Sethi, Rajesh. (2000). New product quality and product development teams. *Journal of Marketing*, 64(2), 1-14.

- Shin, Shung Jae, & Zhou, Jing. (2003). Transformational leadership, conservation, and creativity: Evidence from Korea. *Academy of Management Journal*, 46(6), 703-714.
- Subramaniam, Mohan, & Youndt, Mark A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48(3), 450-463.
- Tesluk, Paul E, Farr, James L, & Klein, Stephanie R. (1997). Influences of organizational culture and climate on individual creativity. *The Journal of Creative Behavior*, 31(1), 27-41.
- Urabe, Kuniyoshi. (1988). Innovation and the Japanese management system. *Innovation and Management International Comparisons*, Walter de Gruyter.
- Von Hippel, Eric. (1994). "Sticky information" and the locus of problem solving: implications for innovation. *Management science*, 40(4), 429-439.
- Walker, A, Koestner, Richard, & Hum, Andrew. (1995). Personality correlates of depressive style in autobiographies of creative achievers. *The Journal of Creative Behavior*, 29(2), 75-94.
- West, Michael A. (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology*, 51(3), 355-387.
- Yi-Ching, Wu, Bou-Wen, Lin, & Chung-Jen, Chen. (2013). How Do Internal Openness and External Openness Affect Innovation Capabilities and Firm Performance? *IEEE Transactions on engineering management*, 60(4), 704-716. doi: DOI: 10.1109/TEM.2013.2262050.
- Zaini, Ujang. (2010). *Budaya Inovasi Prasyarat model baru Ekonomi*. Johor: Universiti Teknologi Malaysia Press.
- Zhu, C. (2015). Organisational culture and technology-enhanced innovation in higher education. *Technology, Pedagogy and Education*, 24(1), 65-79.