

The Role of Human Capital and Knowledge Management in Innovation

Muthia Roza Linda^{1*}, Gesit Thabrani², Firman Firman³

Universitas Negeri Padang, Jl. Prof. Dr. Hamka Padang^{1,2,3}

**Corresponding author. Email: muthia@fe.unp.ac.id¹, thabrani@fe.unp.ac.id², firmanfeunp@gmail.com³*

ABSTRACT

The purpose of this study was to examine the impact of human capital and knowledge management in innovation. This study was conducted in Indonesia. Research respondents were bank employees who had structural positions. Data had been collected by using a survey with questionnaires. Based on data analysis by using Partial Least Square (PLS smart 3.0), this study found a direct relationship between human capital and innovation but not significant. However, surprisingly we found that it had significant indirect impact through knowledge management as a mediator. Human capital also had significant direct effect on knowledge management. Knowledge management had significant direct effect on innovation. Implications of this study results suggest and reinforce that knowledge management is not a major determinant to create innovation, but its presence is an important input from the implementation of human capital, in order to improve innovation.

Keywords: *Human capital, knowledge management, innovation.*

1. INTRODUCTION

At the end of 2016, Indonesia was the fourth investment destination in the world after India, Japan and China. The investment was mostly in the banking industry. The result of a survey conducted by United Nations Conference on Trade and Development (UNCTAD) in the World Investment Report 2017, Investment and the Digital Economy revealed that foreign direct investment in Indonesia globally increased by 5% to 1.8 trillion USD in 2017. [1].

Banking, or known as financial institution, functions as a medium for fund distribution for members of society who are overfunded or underfunded. A bank is a company of which its main orientation is based on the principle of trust. A bank is also required to be able to adapt to current development and advances in information technology in order to provide more value in banking sector and to increase company growth [2].

To be able to increase the company growth, it is necessary for a financial institution to do various innovations in business development to maintain company sustainability. The challenge of innovation can be anticipated by the company through its human resources. Doing innovation in a company is an important thing to do in order to make it better in achieving its goals. A company that has skilled and knowledgeable human resources means that it has high human capital and is more likely to create knowledge, make right decisions and have better innovation [3]. Human capital is a characteristic owned by employees which is determined by the knowledge they have and is used to create value for the company [4].

Besides the role of human capital in knowledge-based business, knowledge management is also needed as a factor that will affect the success of a company. Knowledge management consists of infrastructure and

information technology with the aims to acquire and share the resulted knowledge. The ability to exploit knowledge is an important component of the ability to innovate. This means that we must have the knowledge related to what we will do, so that we can recognize the value of new information, how to apply knowledge-sharing about customer needs, how to cope with market changes and competitors' reactions, and how to conduct technology evaluations in order to be superior to competitors. [5]. Knowledge is a fundamental basis for competition [6] and specifically tacit knowledge can be a source of excellence, because it is unique and cannot be imitated. The paradigm shift from resource-based view to knowledge management requires the company to further improve the management and use all knowledge owned by the company and the employees [7]. In addition, knowledge management is also a very important potential for a company in facing increasingly high competition and increasing the ability of employees to create innovation.

The objectives of this research were to know the direct effect of human capital on innovation, the direct effect of human capital on knowledge management, the direct effect of knowledge management on innovation, and the indirect effect of human capital on innovation.

2. LITERATURE REVIEW

2.1 Human Capital

Human capital reflects a company's collective ability to find out the best solutions based on the knowledge of employees in the company. Human capital refers to the process related to training, education, and other professional initiatives aimed to increase the level of knowledge, skills, abilities,

values, and social assets of an employee which will lead to his/her satisfaction and performance, and ultimately affect company performance [8].

Human capital represents individual knowledge stock of an organization that is represented by its employees [9]. Human capital comprises knowledge, skills, and experiences employees bring when leaving the company including the know-how, education, vocational qualification, knowledge-associated work, work assessment, psychometric assessment, competence-associated work, entrepreneurial spirit, innovative spirit, proactive and reactive abilities, and the ability to change [10].

Human capital in a company can be described through indicators of Learning and Education, Experience and Expertise, Innovation and Creation. [11].

2.2 Knowledge Management

Humans in the context of Knowledge Management are the source of knowledge, innovation, and renewal. Humans are intangible resources that are believed to be able to develop the knowledge. That is, the better the knowledge acquired by humans is, the better new knowledge will be able to be created [12]. Knowledge can inform and change business arena with continuous improvement or radical innovation, both of which drive the change for the better, because they assimilate new and relevant knowledge in an organization (McDermott and O Connor, 2002 in [13]).

Knowledge management programs are usually related to organizational goals of achieving specific results, such as sharing intelligence, increasing performance, increasing competitive advantage, or driving innovation in a higher direction (Nonaka and Takeuchi (1995) in [14].

The indicators used to measure Knowledge Management according to [15] are as follows:

1. New knowledge for the process of sustainable development.
2. Development and process for new ideas
3. Exchange of knowledge between departments
4. Development and process of creating works

2.3 Innovation

Innovation is a change in the process or development of knowledge to achieve better results. According to [16], innovation is the process of creating new ideas and putting them into practices. It is the means by which creative ideas find their way into everyday practices, which are the ideal practices that contribute to improved customer service or organizational productivity. Innovation is also defined by [17] as the ways used by a company to create new resources producing wealth or fostering the potential of existing resources to increase wealth.

The ability of a company to innovate will guarantee its ability to compete [18]. According to [19], innovation is one of the determinants of company performance in an increasingly high competition environment. [20] identified five main areas that determine the overall innovation of an

organization, namely (1) product innovation, (2) market innovation, (3) process innovation, (4) behavioral innovation, and (5) strategy innovation. According to [5] in addition to product innovation, more efforts must be made on changing procedures, because the product-life cycle becomes shorter.

[5] measured innovation by using three indicators which were developed into the following statements:

- 1) Product innovation
- 2) Process innovation
- 3) Management innovation

2.4 Conceptual Framework

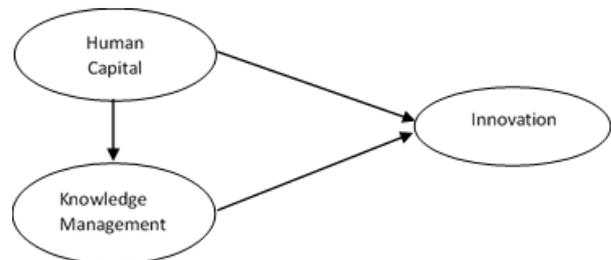


Fig. 1. Conceptual Framework

2.5 Hypothesis

Based on theory and conceptual framework, hypotheses developed in this research are:

- 1) Human Capital has significant effect on Innovation
- 2) Human Capital has significant effect on Knowledge Management
- 3) Knowledge Management has significant effect on Innovation
- 4) Human capital has significant effect on Innovation through Knowledge Management as mediating variable

3. RESEARCH METHOD

This study was conducted in Padang, a city in West Sumatera, Indonesia. The population was the employees who worked in banking companies in Padang. The number of populations was unknown. This study used purposive sampling technique with the criteria that each respondent was an employee of a company who had structural position at least as a manager or the head of an auxiliary cashier office and that she/he had served for more than 2 years. This study was a survey. One of the advantages lies in the generalization—the more respondents are used, the better the results will be [21]. The number of respondents for survey research is at least 30 respondents [22]. Therefore, the researcher tried to get respondents more than the minimum requirement. The research data was obtained through questionnaires.

The data that had been collected was analyzed by using data analysis method through SmartPLS software. The data will

be valid if the outer loading > 0.7, communality > 0.5, Average Variance Extracted (AVE) > 0.5, Cronbach's Alpha or composite reliability > 0.7. All the criteria were used for measurement model. Structural model was evaluated by R-square. A model will be fit if the SRMR is less than 0.11 and NFI value is closer to 1 [23]. The NFI value above 0.9 usually represents acceptable fit. Hypothesis testing used t-statistical value (p- Value). If t-statistics is less than 1.96, then the hypothesis will be rejected.

4. RESULTS AND DISCUSSION

4.1. Validity and Reliability of the Data

To test the convergent validity, usually the rule of thumb is used with the conditions that the value of loading factor must be greater than 0.7 and the value of Average Variance Extracted (AVE) must be more than 0.5. When testing the convergent validity for the first time, there were several indicators with the values of loading factor < 0.7, so the indicators were excluded. This test was carried out 5 times in order to get the values of loading factor > 0.7. The values of loading factor for all indicators (the value > 0.7 for each) can be seen in Table 1 as follow.

Table 1. Loading Factor

	Human Capital	Knowledge Management	Innovation
HC10	0.848		
HC11	0.759		
HC12	0.810		
HC13	0.818		
HC8	0.804		
HC9	0.832		
KM1		0.818	
KM2		0.836	
KM7		0.703	
KM8		0.702	
IN1			0.807
IN2			0.794
IN4			0.739
IN5			0.789
IN6			0.744

Besides the value of loading factor 0.7, to ensure the convergent validity, the values of AVE, Cronbach's Alpha, and composite reliability must also be considered.

Table 2. Construct Validity and Reliability

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Human Capital	0.897	0.901	0.921	0.660
Knowledge Management	0.768	0.783	0.850	0.589
Innovation	0.835	0.844	0.883	0.601

Table 2 about the values of construct validity and reliability showed that the AVE values of all variables met the required rule of thumb (AVE > 0.50), the values of Cronbach's Alpha and reliability are greater than 0.70.

4.2 Discriminant Validity

Discriminant validity test can be done in two ways, by using cross-loading table or by comparing the square-root value of AVE.

Table 3. The Square-Root Value of AVE

	Human Capital	Innovation	Knowledge Management
Human Capital	0.812		
Innovation	0.376	0.775	
Knowledge Management	0.705	0.632	0.767

From the output results shown in Table 3, the diagonal is the square-root value of AVE and the value below is the inter-construct correlation. So, it can be seen that the square-root value of AVE was higher than the correlation coefficient. Therefore, it can be concluded that the estimated model was valid because it met the criteria of discriminant validity.

4.3. Structural Model (Inner Model) Testing

R-Square

After the estimated model had met the criteria of convergent and discriminant validity, the structural model (inner model) was then tested. Structural model testing was carried out by noting the value of R-square as goodness-of-fit model testing. The following is the table of R-square value in this study.

Table 4. R-Square

Variable	R-Square
Innovation	0,409
Knowledge Management	0,497

The coefficient of determination uses R-square which shows some percentage of variation in dependent variable that can be explained by the variable that is hypothesized to influence it. The higher the R-square value of a variable is,

the better the model will be. To be noted, R-square is only found in endogenous constructs. Table 4 above shows that the R-square value of innovation (Y) was 0.409. This means that human capital and knowledge management contributed to innovation by 40.9% while the rest was explained by other variables not mentioned in this study. Likewise, for the variable of knowledge management (Z), the R-square value was 0.497. Therefore, it can be concluded that knowledge management got contribution of 49.7% from human capital and the rest of the percentage was explained by other variables outside this research model.

Goodness-of-Fit (GoF)

According to [23] a model is to be fit if the SRMR value is lower than 0.11. The SRMR value in this study was 0.109. It was lower than 0.11 and the NFI value closer to 1. It means that this research model met the goodness-of-fit.

4.4. The Direct Effect Analysis

From Table 5 below, we can see the direct effect between the variables in this research.

Table 5. Path Coefficient

No.	Hypotesis	Ori. Sample	Sample Mean	Std. Dev	T Statistics	P Values
H1	Human Capital --> Innovation	-0.138	-0.129	0.134	1.031	0.302
H2	Human Capital --> Knowledge Management	0.705	0.709	0.051	13.839	0.000
H3	Knowledge Management -> Innovation	0.729	0.728	0.104	7.044	0.000

4.5. The Indirect Effect Analysis

From Table 6 below, we can see the indirect effect among the variables in this research.

Table 6. Indirect Effect

Hypotesis	Ori. Sample	Sample Mean	Std. Dev	T Statistics	P Values
Human Capital -> Innovation	-0.138	-0.129	0.134	1.031	0.302
Human Capital -> Knowledge Management -> Innovation	0.514	0.519	0.086	6.002	0.000

5. DISCUSSION

5.1 Direct Effect of Human Capital on Innovation

Table 5 shows the result of inter-construct correlation. As it can be seen in the table, human capital had negative but not significant effect on innovation with the parameter coefficient of -0.138, significant at α 0.05 (p-Value = 0.302). This could also be proven by noting that the value of t-Statistics was lower than that of t-Table (t-Statistics 1.031 < t-Table 1.96). Thus, the first hypothesis in this study was **rejected**.

The rejection of this research hypothesis occurs, because in banking sector in Padang, human capital as one of the main production factors for banking companies is often placed second after other production factors such as capital, technology, and money. Many company leaders are less aware that actually the profits obtained by the company come from human capital. Through human capital, the

company can make creative innovations, so that it can compete by using the competitive advantage obtained from the such innovations created. This production resource in form of human capital is neglected, because company leaders only see the company activities from a business perspective. Company leaders do not see the company as a unique unit of knowledge and skills, or a unique set of business assets that can differentiate its products or services from those of competitors'.

The result of this study conducted to banking employees in Padang is not in line with what is stated by [24], that human resources are very important because they are a source of innovation and strategic renewal. The result of this study is also not in accordance with the findings of previous studies. Based on an empirical study conducted in Denmark, [25] found that human capital increased the ability to innovate; therefore it is important to upgrade the skills of employees especially in high-tech sector. This is in line with what is conveyed by [26], that human capital which is represented by professional knowledge, skills, abilities and health can make a person increase his/her creativity. However, the result of this study is in line with the result of [27], which

indicated that human capital has negative and significant effect on innovation.

5.2 Direct Effect of Human Capital on Knowledge Management

Based on Table 5 which is the result of inter-construct correlation, human capital had positive and significant effect on knowledge management with the parameter coefficient of 0.705, significant at $\alpha = 0.05$ (p-Value = 0.000). This could also be proven by noting that the value of t-Statistics was higher than that of t-Table (t-Statistics 13.839 > t-Table 1.96). Thus, the second hypothesis in this study was **accepted**.

Therefore, it can be concluded that human capital influences knowledge management. Human capital is very instrumental in creating and organizing knowledge management dimensions or indicators. Through knowledge management indicators, all strategic and operational company policies, primarily in terms of knowledge management, can be carried out immediately and well.

[28] stated that the intellectual asset in form of human capital is needed in the implementation of knowledge management, therefore knowledge management can become a strategic asset for a company. This is supported by [24] and [10], who also mentioned that human capital represents knowledge wealth of individuals in an organization that supports the implementation of knowledge. The result of this study supports the studies conducted by [29] and [30], who revealed that human capital influences knowledge management.

5.3 Direct Effect of Knowledge Management on Innovation

Effective knowledge management involves the creation, capture, sharing, implementation and exploitation of knowledge [20]. Knowledge management is a useful instrument for creating innovation by obtaining, creating, sharing, storing, and applying the knowledge—the material needed for innovation work in an organization. Knowledge Management can enhance innovation, because it allows the sharing and codification of tacit knowledge, that helps to change the tacit knowledge into explicit knowledge, to create the culture that promotes the creation and sharing of knowledge and the collaboration [21].

Based on Table 5 which is the result of inter-construct correlation, knowledge management had positive and significant effect on innovation with the parameter coefficient of 0.729, significant at $\alpha = 0.05$ (p-Value = 0.000). This could also be proven by noting that the value of t-Statistics was higher than that of t-Table (t-Statistics 7.044 > t-Table 1.96). Thus, the third hypothesis in this study was **accepted**.

Many studies have suggested that knowledge management can provide information about customers, so that it can help

a company achieve success in implementing the innovation [31]. The finding of this study supports an empirical study conducted by [13] entitled "The Impact of HRM Capabilities on Innovation Mediated by Knowledge Management Capability". They discovered that knowledge management ability was positively correlated to innovation. The result of this study pointed out that the banking employees in Padang had made pretty good efforts in creating knowledge management. In addition, the knowledge created through knowledge management process was proven to be able to improve the ability of banks to innovate. [32] said that a more innovative company is the one that is able to acquire, disseminate, and respond to knowledge.

5.4 Indirect Effect of Human Capital on Innovation

After testing the hypotheses above, the next step was testing the indirect effect of the variables used. The model in this study was full mediation. In this model, independent variable can directly affect dependent variable through or involving mediating variable [33]. The presence or absence of indirect effect among variables could be seen from the indirect relationship between human capital and innovation through the variable of knowledge management.

Based on Table 6, the p-value of direct relationship between human capital and innovation was 0.302 (not significant at $\alpha = 0.05$, because $0.302 > 0.05$), while the value of indirect relationship between human capital and innovation was 0.000 (significant at $\alpha = 0.05$, because $0.000 < 0.05$). In the test, the value of indirect effect was higher than that of direct effect. So, the model in this study was called full mediation, because the mediating variable, i.e. knowledge management, could mediate the relationship between the independent variable, i.e. human capital, and the dependent variable, i.e. innovation, which means that the fourth hypothesis in this study was **accepted**. Human capital is defined as a collection of talents, skills and abilities of employees who bring economic value to an organization. Knowledge management is defined as the experience and understanding of individuals that can be communicated and shared [34]. Another conclusion that can be drawn in this study is that humans can enhance innovation if being mediated by knowledge management. This is because the value of indirect effect is higher than that of direct effect in the relationship between human capital and innovation. From the findings of this study, it can be seen that human capital and knowledge management need to be integrated, because both have been proven to be able to enhance the value of a company. This is in line with the results of studies conducted by [30].

6. CONCLUSION

Based on the results of data analysis, the conclusions of this research are: a) human capital has no significant effect on

innovation, b) human capital has significant effect on knowledge management, c) knowledge management has significant effect on innovation, and human capital has significant effect on innovation through knowledge management as mediating variable.

REFERENCES

- [1] <https://keuangan.kontan.co.id/news/transaksi-digital-perbankan-makin-ramai>
- [2] Kasmir. Analisis Laporan Keuangan. Edisi Satu. Cetakan Ketujuh. Jakarta : PT Raja Grafindo Persada. (2014)
- [3] Hitt, M. A. Direct and moderating effects of human capital on strategy and performance in professional service firms: a resource-based perspective, *Academy of Management Journal*, 44(1), pp. 13–28. (2006)
- [4] Collins, C. J. and Clark, K. D., Strategic human resource practices, top management team social networks, and firm performance: The role of human resource practices in creating organizational competitive advantage, *Academy of Management Journal*, 46(6) : 740–751. (2003)
- [5] Liao, S. H., Fei, W. C., & Chen, C. C. Knowledge sharing, absorptive capacity, and innovation capability: An empirical study of Taiwan’s knowledge-intensive industries. *Journal of Information Science*, 33(3), 340–359. (2007).
- [6] Agarwal Ravi, Wolfgang Grassl dan Joy Pahl. Meta-SWOT: Introducing A New Strategic Planning Tool. *Journal of Marketing Management*, Vol. 33 NO. 2, pp. 12-21. (2012)
- [7] Tobing, Paul L. Manajemen Pengetahuan: Konsep, Arsitektur dan Implementasi. Jakarta: Graha Ilmu. (2007).
- [8] Bontis, N., Crossan, M. and Hulland, J. “Managing an organizational learning system by aligning stocks and flows”, *Journal of Management Studies*, Vol. 39 No. 4, pp. 437-69. (2002).
- [9] Marimuthu, M., Arokiasamy, L. and Ismail, M. Human capital development and its impact on firm performance: Evidence from developmental economics’, *The Journal of International Social Research*, 2 (8), pp. 265-272. (2009).
- [10] Bontis, n. W. c. s Richarson. Intellectual Capital and Business Performance in Malaysian Industries. *Journal of Intellectual Capital*. Vol 1. No 1. pp 85-100. (2000).
- [11] Starovic, D. and Marr, B. “Understanding Corporate Value: managing and reporting Intellectual Capital”. Chartered Institute of Management Accountants. (2004).
- [12] Gloet M, Terziovski M. Exploring the relationship between knowledge management practices and innovation performance. *J. Manuf. Tech. Manag.*, 15(5): 402 – 409. (2004).
- [13] Gönül Kaya Özbağ, Murat Esen, Dilek Esen. The Impact of HRM Capabilities on Innovation Mediated by Knowledge Management Capability. *Procedia 9th International Strategic Management Conference*. (2013).
- [14] Rofiaty, Try Noviyanti, dan Angga Dwi Mulyanto. Pengaruh Knowledge Management Terhadap Inovasi, Omlplementasi Strategi dan Kinerja Organisasi. *Jurnal Ekonomi Bisnis*, No. 1, Maret 2015. 1-52. (2015).
- [15] Bontis. Intellectual capital: an exploratory study that develops measures and models. *Management Decision*, 36(2), 63–76. <https://doi.org/10.1108/00251749810204142>. (1998).
- [16] Schermerhorn, Jr, John R, James G. Hunt, Richard N. Osborn. *Organizational Behavior Essentials*. Ninth Edition. John Wiley & Sons, New York USA. (2006).
- [17] Bessant, John., dan Joe Tidd. *Innovation and Entrepreneurship*. Second Edition. John Wiley & Sons, Ltd. (2011).
- [18] Sharabati, Abdel-Aziz Ahmad; Jawad, Shawqi Naji and Bontis, Nick. Intellectual Capital and Business Performance in The Pharmaceutical Sector of Jordan. *Management Decision*. Volume 48, Issue 1. Pages 105-131. (2010).
- [19] Lee, V. H., Foo, A. T. L., Leong, L. Y., & Ooi, K. B. Can competitive advantage be achieved through knowledge management? A case study on SMEs. *Expert System With Applications*. Volume 65. Pages 136-151. (2016).
- [20] Egbu, Charles O. Managing Knowledge and Intellectual Capital For Improved Organizational Innovations In The Construction Industry: An Examination Of Critical Success Factors, *Engineering, Construction and Architectural Management*, 11(5). (2004).
- [21] Madhoushi Mehrdad, Sadati Abdolrahim, Delavari Hamidreza, Mehdivand Mohsen and Mihandost Ramin. Entrepreneurial Orientation and Innovation Performance: The Mediating Role of Knowledge Management, *Asian Journal of Business Management* 3(4): 310-316. (2011).

- [22] de Guimarães, J. C. F., Severo, E. A., & de Vasconcelos, C. R. M. The influence of entrepreneurial, market, knowledge management orientations on cleaner production and the sustainable competitive advantage. *Journal of Cleaner Production*, 174, 1653–1663. (2018).
- [23] Hair, et al., *Multivariate Data Analysis*, New International Edition., New Jersey : Pearson. (2014).
- [24] Bontis. Intellectual capital: an exploratory study that develops measures and models. *Management Decision*, 36(2), 63–76. <https://doi.org/10.1108/00251749810204142>. (1998).
- [25] Wu, S. H., Lin, L. Y., & Hsu, M. Y. Intellectual capital, dynamic capabilities, and innovative performance of organizations. *International Journal of Technology Management*, 39(3–4), 279–296. (2007).
- [26] Suci, Marta Christina & Alexandru Ghitiu-Bratescu. Intellectual capital, innovation and creativity as key drivers for long-run sustainable development in the context of the creative economy and knowledge-based society. *Proceedings of the 5th WSEAS International Conference on Economy and Management Transformation (Volume II)*. (2011).
- [27] Suyanto, Aluisius Hery Pratono. The Impact of Entrepreneurship Orientation, Human Capital, and Social Capital on Innovation Success of Small Firms in East Java. *Jurnal Manajemen Teknologi*. Vol. 13. No.1. (2014).
- [28] Bollinger, AS dan RD Smith. Managing Organizational Knowledge as a Strategic Asset, *Journal of Knowledge Management*, 5 (1), 8–18. (2001).
- [29] Zhou, A.Z., & Fink, D. Knowledge Management and Intellectual Capital: An Empirical Examination of Current Practice in Australia. *Knowledge Management Research & Practice*, Vol.1, No. 2, pp. 86-94. (2003).
- [30] Marr, B., Schiuma, G., and Neely, A. Intellectual Capital: Defining Key Performance Indicators for Organizational Knowledge Assets. *Business Process Management Journal*, Vol. 10, No. 5, pp. 551-69. (2004).
- [31] Basadur Min, Gelade A. Garry. The Role of Knowledge Management in The Innovation Process, *Journal Compilation*, 15-1. (2006).
- [32] Darroch, Jenny. Knowledge Management, Innovation and Firm Performance, *Journal of Knowledge Management*, 9 (3), 101. (2005).
- [33] Cohen, L., et al. *Research Methods in Education*. New York. Routledge. (2007).
- [34] Jalal Hayati Abdul, Toulson Paul and Tweed David. Exploring Employee Perceptions of the Relationships Among Knowledge Sharing Capability, Organisational Culture and Knowledge Sharing Success: Their Implications for HRM Practice, *Proceedings of the International Conference on Intellectual Capital, Knowledge Management & Organizational Learning*. (2011).