The Role of Human Capital and Knowledge Management in Innovation
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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

![Conceptual Framework](image)

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.

|       | Cronbach's Alpha | rho_A | Composi te Reliability | Avera ge 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.

**Table 5. Path Coefficient**

| No. | Hypothesis               | 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    |

**4.4. The Direct Effect Analysis**

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

**Table 6. Indirect Effect**

| Hypothesis                    | 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 | 0.519      | 0.086      | 6.002    | 0.000       |

**4.5. The Indirect Effect Analysis**

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

**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
decision makers 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 α = 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 α = 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 α = 0.05, because 0.302 > 0.05), while the value of indirect relationship between human capital and innovation was 0.000 (significant at α = 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.

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