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# Using the triple helix model to determine the creativity a capabilities of innovative environment

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**Abstract.** The purpose of this study was to examine the impact of the triple helix concept in improving the capabilities of Small and Medium Enterprises (SMEs) innovative environment. The design of this research was explanatory research, which is tried to explain causal relationships. The data collection method is done by a survey method in the form of a questionnaire. The populations were all (SMEs) in Palopo city, Indonesia. The sample taken was as many as 200 samples, as a consideration of the minimum sample for the Structural Equation Model (SEM), which is 100 samples and an error rate of 5%. For SEM-PLS Smart PLS 3.2.8 could be run on a small sample of 30-100. Wherein the sampling technique used is Random Sampling. The results of the research of the triple helix model are proven to be able to describe the phenomenon of collaboration between intellectuals, government, and business in enhancing the creativity and capabilities of innovation of SMEs environment.

## 1. Introduction

Economic growth in Indonesia is closely associated with the role of Micro, Small and Medium Enterprises (SMEs). Where, one form of SMEs business in supporting the economy in Indonesia is as a supplier of Gross Domestic Product (GDP). Based on data from Bank Indonesia, 2015 [1] that SMEs have contributed around 60% of GDP and open job opportunities. Nevertheless, various obstacles still faced by SMEs included internal factors consist of capital, human resources, law, and accountability, while external factors consist of the business climate, infrastructure, and access [1]. Ikbal and Rahmad [2] found that the creativity of young entrepreneurs in Palopo City who utilize technology media have started to grow and develop. It is indeed a positive step for Palopo City government to continue to increase the number of SMEs. The current conditions lie in the human resources capabilities related to the creativity and capability of innovation that has an impact on the competitive advantage possessed by the SMEs. This is certainly inseparable from the involvement and role of academics, government, and companies, to collaborate to encourage innovation in SMEs.

SMEs development is inseparable from the support and cooperation among intellectuals, business, and government, which is referred to as the Triple Helix system. The aim of this triple helix model is to realize an innovative environment consisting of university spin-off companies, trilateral initiative of knowledge-



based economic development (knowledge-based economy), and strategic alliances between companies (large and small, operate in different areas, and with different levels of technology), government laboratories, and the academic research group Etzkowitz, Leydesdorff [3].

One of the main claims of the Triple Helix thesis is that intellectuals, business, and government provide optimal conditions for innovation Etzkowitz and Leydesdorff [3]. Intellectual capital can increase innovation capabilities Xiaobo and Sivalogathan [4]. The university has an important role in innovation equivalent to industry and government in society James and Henry [5]. Intellectuals were a significant driver in transferring knowledge, technology and intellectual fund to the formation of a new commercial venture Cinzia and Porlezza [6].

The relationship between intellectuals, business, and government can measure the extent to which innovation is programmed Loet [7]. The role of business/company is as an organizational entity created to provide goods or services to consumers Mulyana and Sutapa [8]. Privately owned businesses are generally set up to generate profits and increase prosperity for its owners and can be formed through a sole proprietorship, partnership, corporation, and cooperatives. Relations between business people in the creative industry will create creativity and innovation through community and supply chains Hasan and McVittie [9]. Institutionally each triple helix element must promote innovation and development Etzkowitz [10]. The business community can encourage creativity and innovation Hasan and McVittie [9]. Creativity is the main foundation for being innovative Mobarok [11]. Furthermore, creativity and innovation affect small entrepreneurs Hidayati [12].

Some empirical studies that have been conducted to examine the application of Triple Helix theory in improving innovation and creativity in SMEs still produce different findings or the existence of gaps. Research conducted by Asyhari and Wasitowati [13] shows that government, intellectual, and business provide a significant effect on innovation and competitive advantage. Another research conducted by Mulyana and Sutapa show a different finding where the government has no significant influence on creativity and innovation capabilities. The existence of a gap indicates that triple helix theory is still not effective in describing the collaboration between intellectual, government, and business. Also, other studies that have examined the use of Triple Helix Theory using a quantitative research approach is still very limited. Among them are Kim and Lee [14] the object of research in the casino industry using the cluster analysis method, Jones and Zubielqui [15] the object of research in Small and Medium Enterprises (SMEs), to see interactions between universities and Small and Medium Enterprises (SMEs). Herliana [16] the research objects are SMEs in the culinary sector and using qualitative descriptive analysis techniques, Mulyana and Sutapa [8] use the development version of Triple Helix Theory that is Quadruple Helix which focuses on the creative sector of the fashion sector. It is believed, that this condition will inspire other researchers to examine and confirm those previous studies by using a quantitative analysis approach on the issue of triple helix in enlarging the creativity and capability of SMEs' innovation. Accordingly, this research intends to assess triple helix model achievement on SMEs' innovation and creativity environment capabilities.

## 2. Methodology

This research was explanatory research, which tried to explain causal relationships (cause-and-effect). The data collection was conducted using questionnaire survey media. Data on prospective respondents was obtained from the SMEs Office in Palopo City, Indonesia. Before being sent to the respondent, the pretest was conducted first, to ensure that the sentence in the questionnaire could be understood correctly by the respondent. The questionnaire was derived from the previous studies with a little development so that they have been tested for validity and reliability. The rate of return was assumed to be 80% by distributing questionnaires carried out proportionally based on population and sample. To enhance the response rate, souvenirs were included when distributing questionnaires for respondents. Data variables in this study were ordinal Likert Scale data with a score of 1 to 5. The population was all SMEs in Palopo City, Indonesia. Samples were taken using non-probability methods. There were 200 samples taken, taking into account the minimum sample for Structural Equation Model (SEM), which is 100 samples and an error rate of 5%. For SEM-PLS (SmartPLS 3.2.8) could be run on a small sample of 30-100 [17–19]. Data

analysis methods used are descriptive and Partial Least Square (PLS) Analysis with the help of SmartPLS 3.2.8 application. Partial Least Square (PLS) is a multivariate analysis technique that aimed to test the predictive relationship between constructs by looking at whether there was a relationship or influence between these constructs [18]. The researcher chose to use PLS analysis because of the number of samples to be used in the number of 100 SMEs samples in Palopo City. Besides, it was taken into consideration that the development of SMEs based on creative industries in Palopo City is not evenly distributed and the number is still small so that the precision value for determining the sample of researchers uses a value of 10%. The stages of analysis using PLS-SEM were carried out through five stages of process where each stage would influence the next stages, namely (1) conceptualization of the model, (2) determining the algorithm analysis method, (3) determining the re-sampling method, (4) drawing path diagrams and (5) evaluation model [19].

### 3. Result and discussion

#### 3.1. *Analysis of descriptive statistics (characteristics of respondents)*

From the recapitulation results of respondents' profile data in this study showed that based on the the gender of respondents, it was dominated by female respondents as many as 38 people (52.05%) followed by the male as many as 35 (47.95%) The age of respondents was dominated by the age group of 33 to 37 years old as many as 30 people (41.09%) followed by the age group 28 to 32 years old as many as 15 people (20.55%), age group 38 years old and over as many as 12 people (16.44%), age group 28 to 32 years old as many as 15 people (20.55%), and the age group 23 to 27 years old as many as 10 people (13.69%).

#### 3.2. *Measurement model (outer model)*

In the data analysis techniques using SmartPLS 3.2.8, there are three criteria were conducted to assess the models outer namely (i) convergent validity, which can be seen from the loading factor and AVE, (ii) the discriminant validity can be seen from the square root value AVE and the correlation between latent construct, (iii) to test reliability can be seen from the composite reliability value and Cronbach's alpha.

#### 3.3. *Convergent validity*

Convergent validity related to the principle that the gauges (manifest variables) of a construct should be highly correlated. The convergent validity test of the reflexive indicator with the SmartPLS 3.2.8 program could be seen from the value of loading factors for each construct indicator. Rule of thumb that usually used to assess convergent validity, that is the value of the loading factor must be more than 0.7, for confirmatory studies and the loading factor value between 0.6 - 0.7 for exploratory research is acceptable and the average variance extracted value (AVE) must be greater than 0.5. However, for the initial stage of the development of the measurement scale, the factor loading value of 0.5 - 0.6 is still considered sufficient [20]. The results of testing convergent validity are as follows:

#### 3.4. *Value of loading factor*

From the results of convergent validity testing with the loading factor value parameters presented in table 2, it can be seen that the loading factor values for each indicator have the above values ( $> 0.70$ ). Thus it can be concluded that the indicators forming the construct of Business, Government, Intellectual, Innovation Capability, Competitive Advantage, and categorized Creativity are valid.

#### 3.5. *Value of Average Variance Extracted (AVE)*

Based on table 2, it can be seen that the value of Average Variance Extracted (AVE) for each construct is Business = 0.894, Government = 0.924, Intellectual = 0.821, Innovation Capability = 0.797, and Creativity = 0.822 already has a value above 0.50, it means that the five constructs are categorized as valid.

3.5.1. *Discriminant validity.* The results of convergent validity testing with square root value (AVE) parameter can be presented in table 1.

**Table1.** Latent variable correlation

	Business	Capability of innovation	Creativity	Government	Intellectuals	Average variance extracted (AVE)	AVE square
Business	1.000	0.638	0.531	0.446	0.319	0.894	0.992
Capability of innovation	0.638	1.000	0.618	0.601	0.517	0.797	0.893
Creativity	0.531	0.618	1.000	0.649	0.456	0.822	0.907
Government	0.446	0.601	0.649	1.000	0.424	0.924	0.961
Intellectuals	0.319	0.517	0.456	0.424	1.000	0.821	0.906

From table 1 above, it can be seen that the square root value of the AVE for each construct is greater when compared to the correlation value between constructs in the model, i.e. for business = 0.992 greater than the value of the inter-construct correlation, 0.638; 0.531; 0.446; and 0.319. For government = 0.961 greater than the value of the correlation between constructs is = 0.446; 0.601; 0.649; and 0.424, for Intellectual = 0.906 greater than the value of the correlation between constructs is = 0.319; 0.517; 0.456; and 0.424;. For innovation capability = 0.893, greater than the value of the correlation between constructs is = 0.638; 0.618; 0.601 and 0.517. Furthermore, the AVE value of the creativity construct = 0.907 is greater than the correlation value between constructs that is = 0.531; 0.618; 0.649; and 0.456.

**Table2.** Value of loading factor, average variance extracted (AVE), cronbach's alpha, and composite reliability

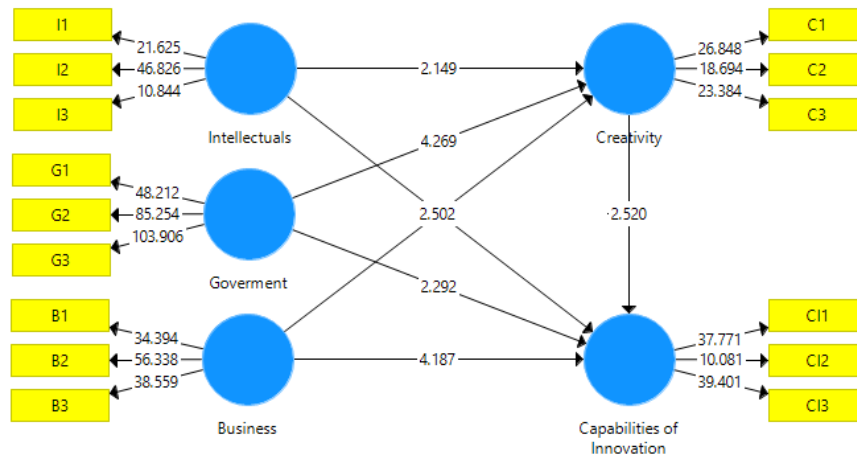
Variable	Indicator	Loading factor	Average variance extracted (AVE)	Cronbach's alpha	Composite reliability
Business	Collaboration (b1)	0.925	0.894	0.940	0.962
	Protection	0.956			
Government	Business climate (b3)	0.955	0.924	0.959	0.973
	Government regulation (g1)	0.943			
	Regulation (g2)	0.966			
	Policy (g3)	0.973			
Intellectual	Coaching (i1)	0.908	0.821	0.893	0.932
	Management concept (i2)	0.952			
	Networking (i3)	0.855			
Capability of innovation	Technology innovation (ci1)	0.935	0.797	0.870	0.922
	Product innovation (ci2)	0.808			
	Market innovation (ci3)	0.930			
	Originality (c1)	0.922			
Creativity	Idea uniqueness (c2)	0.856	0.822	0.891	0.933
	Idea variation (c3)	0.941			

### 3.6. Reliability of composite reliability test

Based on the results of the analysis in table 5 above, it can be seen that the value of composite reliability for each construct is business = 0.962, government = 0.973, intellectual = 0.932, capability of innovation = 0.922; and creativity = 0.933 has a value above than 0.70, meaning that the four constructs are categorized as reliable.

### 3.7. Assessing structural models (inner model)

The following results of the evaluation of the structural model (inner model) through the bootstrapping procedure for testing the hypotheses proposed in this study are presented in figure 1.



**Figure 1.** Inner model measurement

### 3.8. Evaluation of $r$ square value

From the results of analysis obtained the value of R Square for each construct, namely the construct of capabilities of innovation of 0.569, which means that the innovation capability variability that can be explained by the intellectual, government, business and creativity variables in the model is 56.9% and is included in the model category moderate. Then for creativity construct is 0.519, which means that creativity variability can be explained by intellectual, government, business in the model by 51.9% and is included in the moderate category.

### 3.9. Discussion of hypothesis testing results

**3.9.1. The effect of intellectual on creativity.** Intellectuals have a positive and significant direct effect ( $0.032 < 0.05$ ) on creativity, it means that increasing Intellectuality will be followed by an increase in Creativity. This means that the SMEs has a positive perception of the role of intellectuals or universities, they assume that universities can play a role in increasing creativity through the transfer of science and technology. Intellectual can strengthen the innovation base. These findings are in line with the findings Cinzia and Porlezza [6] that are intellectuals as a significant driver in transferring knowledge and technology and intellectual capital for the formation of new commercial ventures.

**3.9.2. The effect of intellectual on capability of innovation.** Intellectuals have a positive and significant direct effect ( $0.030 < 0.05$ ) on innovation capability, it means that increasing intellectuals will be followed by increased innovation capability. This means that the SMEs sector has a positive perception of the role of intellectuals or universities; they assume that universities can play a role in improving innovation capabilities through the transfer of science and technology. In line with the increasing needs and desires of consumers, it has been proven that SMEs can be well received by innovating continuously to be able to produce several products that fit the consumer needs. These findings were in line with the results of research conducted by Maria and Cuato [20] intellectual as part of the triple helix has a positive relationship with new product innovation and ecological innovation.

**3.9.3. The effect of government on creativity.** Government has a positive and significant effect ( $0,000 < 0.05$ ) on creativity; it means that with increasing support and the role of government, it is followed by an increase in creativity. This means that SMEs actors have a positive perception of the government's role

through protection and assistance. The government can provide stimulus to SMEs assets by providing capital assistance, then providing proportional protection using political power, as well as providing public services that make it easier for SMEs. These findings are in line with the results of research conducted by Mulyana and Sutapa [8] that the role of government is as an institution that has the authority to develop creative industries, both by central and regional governments, as well as linkages in substance and administrative linkages.

*3.9.4. The effect of government on innovation capability.* The government has a positive and significant effect ( $0.022 < 0.05$ ) on the Capability of Innovation, which means that with increasing support and the role of the government, it is followed by an increase in the capability of innovation. This means that SMEs actors have a positive perception of the role of the government through assistance in the form of coaching and training that are considered capable of increasing the innovation and creativity possessed by SMEs. The results of this finding are in line with the results of research conducted by Mulyana and Sutapa [8] that the role of government is as an institution that has the authority to develop creative industries, both by central and regional governments, as well as linkages in substance and administrative linkages.

*3.9.5. The effect of business on creativity.* The business has a significant positive effect ( $0.013 < 0.05$ ) on creativity, it means that with an increase in the role of business it will enhance creativity. This means that SMEs actors have a positive perception of the role of business or industry in supporting the development of SMEs. Business can play a role in creating a business climate that is following ethics, cooperation, and the formation of a business community that will have an impact on the creativity of SMEs. The findings of this study are in line with the findings of Hasan and McVittie [9] that the business community can encourage creativity and innovation.

*3.9.6. The effect of business on innovation capability.* The business has a significant positive effect ( $0.000 < 0.05$ ) on innovation capability, it means that by increasing the role of business it will increase the capability of innovation. This means that SMEs sectors have a positive perception of the role of business or industry in supporting the SMEs development. Besides being able to present the climate and business community as a tool to share experiences so that it will encourage the capability of innovation. Besides, the role of the financial institution industry is considered to be able to play a positive role in funding support for SMEs. The findings of this study are in line with the findings of Hasan and McVittie [9] that the business community can encourage creativity and innovation.

*3.9.7. The effect of creativity innovation capability.* Creativity has a significant positive effect ( $0.010 < 0.05$ ) on innovation capability, means that by increasing creativity it will increase the capability of innovation. This means that the creativity gained through the transfer of science and technology from intellectual, government, and business has a positive impact on the innovative capabilities of SMEs actors. This means that SMEs actors can think creatively which is simple or simple so that it can be applied in the form of product innovation, technology, and services. The findings in this study are in line with the findings of Hendro [20] that creative mindsets can find new ideas, ideas, opportunities, and inspiration and find innovative solutions.

#### **4. Conclusion**

Based on the subject matter, the purpose of the research and its discussion, conclusions of the results of the study show that the nine hypotheses built into this study are acceptable, namely intellectuals have a positive and significant effect on creativity; intellectuals have a positive and significant effect on the capability of innovation; government has a positive and significant effect on creativity; government has a

positive and significant effect on the capability of innovation; business has a positive and significant effect on creativity; business has a positive and significant effect on the capability of innovation; and creativity has a positive and significant effect on the capability of innovation. Thus the findings in this study make an important contribution in the study of the role of intellectual, government, and business in enhancing the creativity of innovation capabilities and competitive advantages in SMEs in Palopo City. The consistency of the role of the government is needed to continue to create a comfortable climate for SMEs, especially for new entrepreneurs. The government also needs to make rules that make it easier for entrepreneurs to develop their business. The government should continue to hold events that can provide a stimulus for SMEs to continue to be creative and bring new/superior products to emerge that certainly utilize local wisdom in Palopo City. The government can also provide good rewards in the form of reward gifts in the form of technology and capital assistance. Although its role is not as much as compared to other stakeholders, collaboration with intellectual or tertiary institutions is certainly very much needed with the hope of the transfer of science and technology both through research and the form of service activities capable of producing superior products in Palopo City. Then collaboration with Industry is not limited to the state-owned and private banks in Palopo City. Accordingly, the triple helix model outcome justified by defined the partnership between intellectuals, government, and business in enhancing the creativity and capabilities of innovation of SMEs environment.

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