Innovations

The Antecedents and Consequences of Radical Innovation in the Start-Up Industry

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Abstract

This research aims to examine the variables that affect and are affected by innovation in a start-up industry. The respondents were managers who work in companies that carry out product marketing using digital technology and online media through websites. The results showed human, structural, and relational capital, as well as technological innovation has a positive impact on company performance. However, technological innovation cannot mediate the relationship between intellectual capital and performance.

Introduction

Since the emergence of the COVID-19 pandemic, many companies have experienced a decline in turnover and even went bankrupt. However, those whose services are based on digital technology seem to be less affected. This is evident from new companies (start-ups) that bring innovations in products, processes, and systems which provide easy service to the community.

The advancements in digital technology have also led to high competition, and every organization seeks to optimize all its assets and continue its existence. In an effort to survive, companies are trying to change their strategy from labor-based to a knowledge-based business (Sawarjuwono, 2013). They strive to create transformation and capitalization of the knowledge itself. Therefore, there have been improvements in the ability to meet consumer needs by increasing added value and organizational performance (Stewart, 1997; Hong, 2007).

Start-ups are expected to always focus on creating more value for buyers or market orientation. This orientation is a means of searching for information about the market related

to current and future consumer desires which is important for the organization (Kohli et al, 1993). This is expected to become a culture that is applied to meet external needs, desires, and market demands in the implementation of strategies to increase the organization's success (Inkinen, 2015).

Strategic planning is very important for a company's survival and its ability to compete in the market. To increase competitiveness, technological innovation is considered a very strategic tool to create products, streamline operations, expand marketing networks, and create business models that meet customer demands (Fizgerald et al., 2014). Moreover, companies need to utilize technology to create digital innovations that can improve their performance.

In creating this innovation, optimal use of knowledge and management of intellectual capital is required (Jashapara, 2011). The resulting ideas can be developed and integrated with the context of organizational processes, activities, and policies. Successful innovation starts with an irrational idea, but it can be transformed into the right form of knowledge, hence, increasing performance cannot be separated from proper management. Increasing innovation in terms of technology plays an important role in an organization. This implies the management of intellectual capital is indispensable in creating innovations which will improve company performance. Therefore, this research aims to investigate the effect of human, structural, and relational capital, as well as innovation on company performance. The next sections highlight the literature review and hypothesis development in section 2, methods, results, discussion in section 3, and finally the conclusions.

Literature Review

The Effect of Human Capital on Company Performance

The constantly changing business environment requires companies to strive and achieve competitive advantage through dynamic plans that combine creativity and innovation. The role of human capital is considered the most important asset in a company because it increases assets and productivity to maintain a competitive advantage with individual capabilities, commitment, knowledge, and personal experience (Mayo, 2000). Furthermore, human capital is a source of innovation and strategy renewal that is obtained through the brainstorming process, laboratory research, management dreams, re-engineering, improvement processes, as well as the development of employee skills.

Bontis et al (2000) found that individual capability affects performance with indicators of learning and education, experience and expertise, as well as creativity. Based on the description above, the following hypothesis was formulated.

H1: Human Capital has a positive effect on company performance

The Effect of Structural Capital on Company Performance

Structural capital (SC) is the ability of an organization to fulfill its routine processes and structures that support employees' efforts to produce optimal intellectual and overall business performance. These include the operational system, manufacturing process, organizational culture, management philosophy, and all forms of intellectual property owned by the company (Sawarjuwono, 2003). According to Bontis (1998), there is a positive and significant relationship between capital structure and business performance using the system and program indicators, research and development, as well as patents owned by companies. Based on the description above, the following hypothesis was formulated

H2: Structure capital has a positive effect on company performance

The Effect of Relational Capital on Company Performance

Relational capital (RC) is the interaction ability between a company and its suppliers, customers, competitors, shareholders, stakeholders, and the community. One of the advantages of good interrelation with stakeholders is that the companies can interact directly, therefore they have a better ability to maintain a long-term relationship.

Bontis (1998) found a positive and significant correlation between relational capital and company performance using the indicators of cooperative partnership, customer relations, and knowledge. Based on the description above, the following hypothesis was formulated.

H3: Relational capital has a positive effect on company performance

The Effect of Digital Innovation on Company Performance

Innovation capacity is a measure of a company's ability to create new products that meet customer demands. When these demands are met, then efforts to maintain customer relationships can also be met. According to Teece (2013), the dynamic capability approach provides the organization with a coherent framework. Through development and management, these capabilities can build a competitive advantage for the organization. Khin (2018) stated that digital capabilities can complement a company's orientation because only those with the skills can adopt and manage new technologies. Moreover, companies need to be committed and ready to adopt new technologies by developing new products that have an impact on competitive advantage.

Technological innovation (TI) is considered a strategic tool to improve competitiveness and performance. Organizations that develop digital innovation are expected to be the best and compete in the current era. According to Fizgerald et al. (2014), companies should successfully adopt transformation through digital technology to enable huge business enhancements such as improving customer experience and engagement, streamlining operations, and creating new models. When companies do not carry out this step, they will not have a competitive advantage. Therefore, they need to adopt technology to create innovations that improve their performance. According to previous research in national and international journals, there is a relationship between digital innovation and company performance. Based on the description above, the following hypothesis was formulated.

H5: Technological innovation has a positive effect on company performance

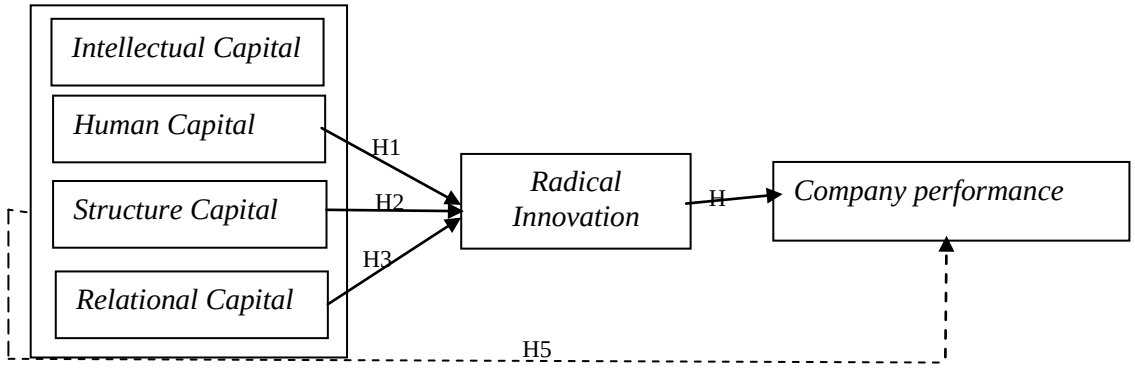
The Effect of Intellectual Capital on Company Performance Through Technological Innovation

To make changes in a firm's economic and social potentials, innovation as an agent is an essential tool for any corporate leader (Drucker, 1993). Innovation is concerned with changes related to risk because it is often the outcome of research and development activities whose results cannot be ascertained. Furthermore, it begins with a creative idea which is not always an effort to achieve something "big" but can also be a small change to improve current practices. The size of the change can create added value for employees.

Intellectual capital (IC) consists of three elements, namely human, structural, and rational. According to Hermana (2004), IC needs to be encouraged by the development of information technology, which can be used as a tool to facilitate business processes. This will be the main capital for companies to encourage innovative work behavior. The intellectual capital reflected in knowledge is the integration of information, ideas, and valuable lessons that create added value in improving company performance (Dana et al., 2005). Based on the description above, the following hypothesis was formulated:

H6: Intellectual capital affects a company's performance through technological innovation

Research Model



Research methods

Research Methods

This research used a quantitative descriptive method with a correlation approach. Furthermore, the hypothesis testing was carried out by explaining phenomena in the form of relationships between variables (causal research).

Population and Sample

The population is start-up companies located in Banten, Indonesia. The criteria include managers who work in organizations that market their products using digital technology and usually operate through online websites, those that are still within three years of operation, and those owned by young entrepreneurs because they have the potential to create a combined mindset (explorative and exploitative).

Data analysis

Hypothesis Testing Tool

Data processing was carried out using a structural equation model (SEM) with partial least squares (PLS) software. The partial least squares statistic was used because the single-model estimation method considers all dependencies at the same time (Chin, 1998). Due to the nature of the research, a comprehensive approach was recommended to test how well the hypothetical model fits the empirical sample data (Hair et al., 1998). Also, the structural equation model is a multivariate equation that allows investigating the relationship between complex recursive and non-recursive variables to obtain a complete picture of the model. In contrast with the ordinary multivariate models (multiple regression factor analysis), SEM can be collectively tested.

1. Structural model: The relationship between independent and dependent structures.
2. Measurement model: The relationship (load value) between indicators and components (latent variable). When analyzing with PLS, it is necessary to carry out two things:
   a. External model evaluation or measurement
      Three criteria are used to evaluate the external model including convergent and discriminatory validity, as well as multiple reliability. The convergent validity with the reflex index was evaluated based on the correlation between the item scores calculated by PLS. The individual reflection measurements are considered high when they correlate more than 0.70 with the measured configuration. However, according to Chin, 1998

(Ghozali 2006), a load value of 0.5 to 0.6 is considered sufficient for initial research in size development. The discriminatory validity of the measurement model using the reflection index was evaluated using a cross-loading measurement with components. When the correlation between construct and gauge is greater than the size of the other constructs, then the latent construct predicts the block size better than the other. Another way to assess the validity of discrimination is to compare the mean extract variance root (AVE) of each configuration with the correlation between others in the model. When the AVE score for each configuration is greater, then a good score is obtained for the discrimination validity (Fornell and Larcker, 1981 in Ghozali 2006). The formula for AVE is as follows:

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum_I \text{var}(\varepsilon_i)}$$

Where λ_i is component loading to indicator and var $(\varepsilon_i) = 1 - \lambda_i^2$. When all the indicators are standardized, then this measure is equal to the Average Communalities in the block. Fornell and Larcker, 1981, (in Ghozali 2006) stated that this measurement is used for the component score reliability of latent variables and the results are more conservative than composite reliability. Hence, it is recommended that the AVE value should be greater than 0.50.

The composite reliability indicator block that measures a construct can be evaluated with two kinds of measures. The first is internal consistency which was developed by Wert et.al 1979 (in Ghozali 2006). By using the output produced by PLS, the composite reliability can be calculated by the formula:

$$\rho c = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum_i \text{var}(\varepsilon_i)}$$

Where λ_i is component loading to indicator and var $(\varepsilon_i) = 1 - \lambda_i^2$. When compared to Cronbach Alpha, this measure does not assume equivalence between measurements, provided that all indicators have the same weight. Therefore, Cronbach Alpha tends to have lower bound estimate reliability. The ρc is a closer approximation with the assumption that the estimated parameter is accurate. However, ρc as a measure of internal consistency can only be used for indicator reflective constructs.

b. Assessing the Inner or Structural Model.

This is carried out to determine the relationship between the construct, significance value, and R-square of the research model. The structural model was evaluated using R-square for the dependent construct, Stone-Geisser Q-square test for predictive relevance, and t-test, as well as the coefficients significance of the structural path parameters. The model assessment with PLS begins by looking at the R-square for each dependent latent variable. Therefore, changes in the R-square value can be used to assess the effect of certain independent latent variables on the dependent and whether it has a substantive effect. The effect of the magnitude of f^2 can be calculated by the following formula:

$$f^2 = \frac{R^2_{\text{included}} - R^2_{\text{excluded}}}{1 - R^2_{\text{included}}}$$

Where R^2 included and R^2 excluded is the R-square of the dependent latent variable when the predictor is used or excluded in the structural equation.

Results and Discussion

Data Quality Test

Validity test

The PLS software was used to test the data validity and is seen by the value of the square root of average variance extracted (AVE) on each construct where the value should be greater than 0.5.

Table 4.1 : Average Variance Extracted (AVE)

Variable	The average variance extracted (AVE)	Description
Human Capital	0.649	Valid
Structure Capital	0.700	Valid
Relational Capital	0.612	Valid
Innovation	0.605	Valid
Company performance	0.660	Valid

Source: Output Smart PLS, 2022

The table above showed the AVE value of all variables is greater than 0.5. Therefore, it can be concluded that the discriminant validity is good.

Reliability Test

Assessing the reliability test can be seen from the output of the PLS composite reliability software. The data are said to be reliable when the composite reliability is more than 0.7.

Table 4.2 : Composite Reliability

Variable	Composite Reliability	Description
Human Capital	0.880	Reliable
Structure Capital	0.893	Reliable
Relational Capital	0.844	Reliable
Innovation	0.845	Reliable
Company performance	0.826	Reliable

Source: Output Smart PLS, 2022

The table above showed the composite reliability extracted from all variables has a value greater than 0.7. Hence, it can be concluded that the discriminant validity is good.

Table 4.3 : R-Square Value

Variable	R-square
Human Capital	
Structure Capital	
Relational Capital	
Innovation	0.696
Company performance	0.956

Source: Output SmartPLS, 2022

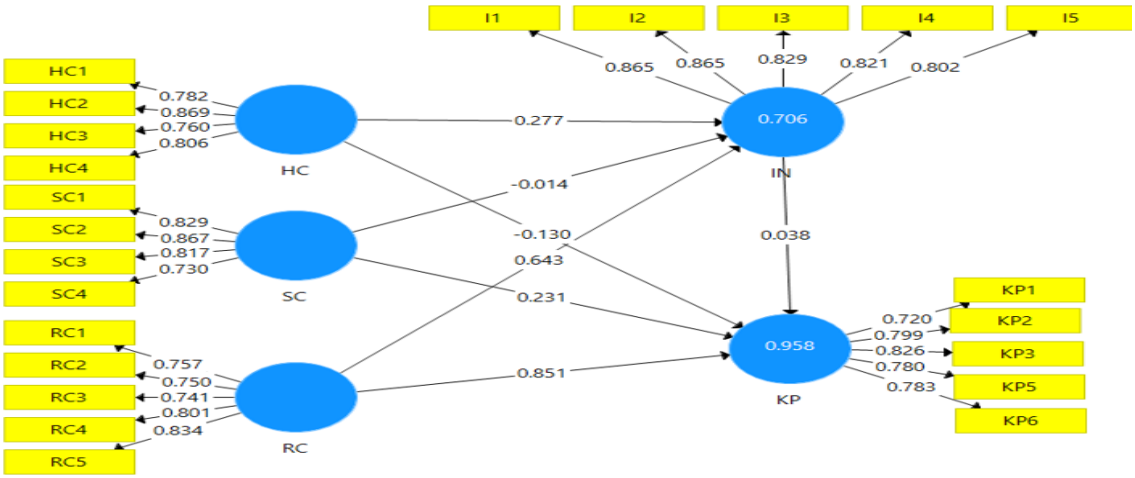
Based on the R Square table above, it can be explained that the path 1 model has a value of 0.696. This implies the technological innovation variable in explaining the company's performance is 69.6%. Meanwhile, the R Square model of path 2 has a value of 0.956. This means the human, structural, and relational capital, as well as technological innovation variables in explaining performance is 95.6%.

Data analysis

Assessing the Outer Model (Measurement Model)

The overall correlation of each variable can be seen in Figure 4.1. This figure shows the relationship between elements of intellectual capital (human, structural, relational) and technological innovation on company performance.

Figure 4.1: Full Model Structural



Source: Output Smart PLS (2022)

Based on Figure 4.1 above, after elimination, the correlation of each variable has a value of over 0.7, therefore each variable met the convergent validity criteria.

Direct Effect Hypothesis Testing

Table 4.4: Results for inner weights

	original sample estimate	*mean of subsamples*	*Standard deviation*	*T-Statistic*	*P Values*
HC -> IN	0.277	0.277	0.110	2.511	0.012
HC -> KP	0.130	-0.131	0.047	2.732	0.007
IN -> KP	0.038	0.030	0.048	0.790	0.430
RC -> IN	0.643	0.646	0.079	8.100	0.000
RC -> KP	0.851	0.854	0.037	23.017	0.000
SC -> IN	0.014	-0.014	0.142	0.101	0.919
SC -> KP	0.231	0.231	0.059	3.939	0.000

Source: Output Smart PLS (2022)

Based on table 4.2 above, human capital (HC) has a positive influence on innovation as indicated by the original sample estimate value of 0.277 and is significant with a t-statistic value of 2.511 which is greater than t-table of 1.96. Human capital has a positive effect on company performance as indicated by the original sample estimate value of 0.130 and significant with a t-statistic value of 2.732 which is greater than t-table of 1.96. Meanwhile, technological innovation does not have a positive effect on performance as indicated by the original sample estimate value of 0.038 and as indicated by the t-statistic value of 0.790 which is smaller than the t-table of 1.96.

The relational capital (RC) has a positive effect on technological innovation as represented by the original sample estimate of 0.643 and is also significant with a t-statistic value of 8.100, which is larger than the t-table of 1.96. Also, RC has a positive effect on performance as indicated by the original sample estimate value of 0.851 and a significant t-statistic value of 23.017. However, the capital structure does not affect technological innovation as signified by the original sample estimate value of 0.014 and insignificant as indicated by the t-statistic value of 0.101 which is smaller than the t-table of 1.96. The capital structure has an effect on performance as indicated by the original sample estimate value of 0.231 and is significant as denoted by the t-statistical value of 3.939 which is greater than the t-table of 1.96.

Indirect Effect

	original sample estimate	*mean of subsamples*	*Standard deviation*	*T-Statistic*	*P Values*
SC -> IN-> KP	0.001	0.002	0.007	0.007	0.939
HC -> IN-> KP	0.010	0.009	0.015	0.704	0.482
RC -> IN-> KP	0.024	0.020	0.032	0.776	0.444

Source: Output Smart PLS (2022)

Based on the table above, the relationship between structure capital and company performance through technological innovation has a p-value of 0.039 > 0.05. This signifies there is no direct effect between capital structure and performance. In other words, technological innovation does not act as a mediating variable that links the capital structure variable with performance. The relationship between human capital and company performance through technological innovation has a p-value of 0.482 < 0.05. This denotes there is no direct effect between human capital and performance, in other words, technological innovation does not act as a mediating variable that links human capital with performance. It can be seen that the influence between relational capital and performance through technological innovation has a p-value of 0.444 > 0.05. This indicates there is no direct influence between relational capital and performance. Therefore, technological innovation does not act as a mediating variable that links the relational capital variable with company performance.

Hypotheses Discussion

Human Capital on Performance

Human capital has an effect on company performance. The results of testing the first hypothesis are in accordance with (Al-Jinini et al., 2019: Dimov, 2017; Khalique et al., 2011; Dada & Watson, 2017; Ramadan et al., 2017). Quality human resources have knowledge in conducting business development and innovation, therefore workers who have good knowledge and experience will help organizations to adopt information, especially in learning to improve performance.

These results imply that the implementation of intellectual capital will greatly promote the development of business organizations. Well-established human capital will facilitate the implementation of strategies for increasing human resources to become an entrepreneur. Human resources with high knowledge will show a tendency to behave more purposefully. Additionally, human capital shown by a high educational level and experience can increase choices and applications in improving company performance.

Structural Capital on Performance

Structural capital (SC) has an effect on company performance, which is in accordance with (Demartini & Beretta, 2020; Azmi et al., 2013; Hofstede, 2010). This implies that SC greatly affects the ability of an organization or company to meet its targets and structure that supports employees' efforts to produce optimal intellectual and overall performance.

An individual with a high intellectual level as well as good company systems and procedures can achieve optimal performance and create a good culture. Meanwhile, the operationalization of the work culture includes attitudes, values, and behavior, all of which

will become the basis for entrepreneurs to understand the management of their business. This signifies some of these cultural dimensions will bridge the informal sector actors in understanding the philosophy of business management, therefore the company's targets will be achieved.

Relational Capital to Performance

Relational capital (RC) affects the company's performance. These results are in line with the opinion of (Gruber-Muecke & Hofer, 2015; and Al-Jinini et al., 2019). This indicates RC is a good basis for the development of entrepreneurial activities in facilitating the achievement of company competitiveness. Moreover, it plays an important role in entrepreneurship because the socio-economic process depends on the relationship between the company and external parties. A good business will be established between the product results of the social environment. Business is a social activity whose existence is greatly affected by social relationships and connections. The implication is that RC is a component of intellectual capital that provides real value in improving company performance.

Rational capital is a harmonious relationship or association network owned by the company and its partners. Additionally, RC can come from outside the company environment which can add value by improving performance.

The Technological Innovation Effect on Performance

Technological innovation (TI) affects performance. These results are in accordance with (Nambisan et al., 2017; Khin, 2018). This implies TI can be considered the main strategic tool for companies to improve competitiveness and performance. Therefore, those that develop digital innovation are expected to be the best and effectively compete in the current era.

According to Khin (2018), the role of digital innovation for start-up companies is contextualized as a solution that can change products and services, as well as improve performance. Based on the results of these innovations, new products can be created, which are appropriate to the expectation and needs of customers, therefore they can be used as a source of competitive advantage (Bharadwaj, 1993).

Intellectual Capital Effect on Company Performance through technological innovation

It was concluded that technological innovation cannot mediate the relationship between intellectual capital (IC) and company performance. These results are in accordance with Mura et.al (2012) who showed intellectual capital in start-up companies produced unique and innovative features. The innovations produced by newly established companies are not entirely new and tend to operate within safe limits without risk. Therefore, innovation in start-ups is still in the phase of looking for an identity of intellectual capital which cannot be optimally implemented in improving performance.

IC requires other factors to realize innovative work behavior. It also necessitates internal and external support from the company to promote the realization of innovative work behavior in improving performance.

Conclusion

Based on the results and discussion, it can be concluded that there is a direct effect between intellectual capital and technological innovation on company performance. However, innovation cannot mediate the relationship between IC (human, structural, and relational

capital) and performance. Further research may consider examining the effect of intellectual capital on future company performance. Managers need to know the importance of IC as a tool to increase value, especially in knowledge-based companies, therefore, they can continue to compete in the global market.

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