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THE IMPACT OF INTANGIBLE ASSETS AND RESEARCH AND DEVELOPMENT ON FIRM VALUE (Empirical Study of e-Commerce Companies Listed on the United States Stock Exchange for Years 2014–2019)

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Abstract: In the era of globalization, advances in science and developments in information technology encourage the world's economic growth. New forms and methods of economic activities, such as e-commerce, are born. As a technology-based industry, e-commerce is assessed by its intangible assets. The sustainability of this sector is proven by its research and development activities. In recent years, China has become the country that dominates the world's e-commerce market. Now, e-commerce is one of the industries highlighted by investors in the trading world. This research aims to analyze the effect of intangible assets and research and developments on Chinese e-commerce firm value. The samples used in this study were 17 Chinese e-commerce companies listed on the 3 largest United States Stock Exchanges, namely NASDAQ, NYSE and NYSE American during the 2014–2019 period. Data collection uses secondary data derived from each annual report. The analysis was conducted using multiple regression supported by SPSS version 22. This study showed that intangible assets and research and development positively affected firm value. The result indicates that both intangible assets and research and development have a positive effect on firm value.

Keywords: e-commerce, intangible asset, research and development, firm value

INTRODUCTION

The era of the Industrial Revolution 4.0 is an era where it is not easy for companies to compete in the business world. One of the new forms of business found in this era is e-commerce. E-commerce or electronic commerce can be

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interpreted as exchanging goods or services between humans using information technology with the internet as the medium (Febriantoro, 2018). A survey by the Hong Kong Trade Development Council (HKTDC) shows that the growth in the use of electronic devices with internet access is one of the factors driving e-commerce growth (HKTDC Research, 2017). Thus, this triggered the rapid development of the e-commerce industry, which was in line with the development of information technology.

China and the United States are the world's top two leading countries in the e-commerce market, but recently, China has shown its dominance by beating the United States in revenues. China's revenues proved twice as high in 2018 and 2019 as that of the United States. In 2019, the world's e-commerce revenue reached 3.4 billion USD, almost half of which was donated by Chinese e-commerce. In the same year, 4 out of 6 e-commerce companies dominating 58% of the world's e-commerce market also comes from China (Koetsier, 2020). This shows that China is a country that can be used as a role model.

In recent years, e-commerce has become one of the industries highlighted by investors in the trading world. Therefore, this industry continues to compete, attracting investors in various ways by giving signals regarding the company's good performance and prospects (Abadiah et al., 2017). Investors' perceptions of company performance and prospects are frequently associated with the share price it owns (Yulianto & Widyasari, 2020). The stock price and company value move in the same direction; when the stock price increases, the firm value will move in the same direction. This encourages companies to signal to investors through stock prices to show their quality and superiority (Rahayu & Sari, 2018).

As a relatively new industry, e-commerce should continue developing its business by conducting research and development. This must be done to fulfill market conditions and needs through the innovations offered (Pariadi, 2018). As an industry with a close relationship with advancing technology, research, and development are carried out to increase productivity, growth, and long-term performance. Furthermore, research and development can also demonstrate the company's progress because it shows the level of its innovation (Susanti et al., 2017; Safitri & Gamayuni, 2019). Vanderpal (2019) also said that companies

allocating R&D expenses would receive a higher income than those who do not; hence, this is also a positive signal for investors.

Some research on intangible assets, as well as research and development, has been done before. Existing research shows different results. Research conducted by Kuniawati & Asyik (2017) shows that both research and intangible assets development do not affect firm value. Kombih & Suhardianto (2017) found a similar finding with intangible assets. Khoyriah & Idayati (2018) and Buchdadi et al. (2018) also found the same finding regarding research and development. On the other hand, Abadiah et al. (2017), Susanti et al. (2017), Yuhelmi (2018), Safari et al. (2018), and Bahuwa et al. (2020) found that both intangible assets and research and development have a positive effect on firm's value. The researcher is interested in re-examining this topic due to inconsistent results from previous studies and the growing trend of the e-commerce industry. The reason for choosing e-commerce companies is due to the industry's global growth and trend—its unique characteristic of having little fixed assets and technology that is still developing. The second-biggest Initial Public Offering (IPO) supports the reason for the 2014–2019 research period in history from an e-commerce company, Alibaba Group, and the rise of e-commerce's IPO that year.

Based on the introduction above, problem formulation can be obtained as follows: intangible assets and research and development affecting firm value. This study aims to obtain empirical evidence of the effect of intangible assets and research and development on firm value. Therefore, there will be two hypotheses in this research as follows:

H1: Intangible asset positively affects firm value.

H2: Research and development positively affect the firm.

METHOD

Variables related to this study can be stated as follows: Firm value as dependent variable (Y), Intangible Asset (X1) and Research and Development (X2) as independent variables. This research used a quantitative approach using secondary data with descriptive statistic models to analyze the relationship between variables and examine hypotheses that have been formulated (hypothesis testing). This study's secondary data sources are annual reports of e-commerce

companies listed on NASDAQ, NYSE, and NYSE American in the 2014–2019 period through the company's official website. Using multiple linear regression analysis, the statistical analysis method is designed to examine independent variables that affect this study's dependent variables. The measurement scale used in this study is a ratio and nominal data.

Population and Sample

In this study, the population group was e-commerce companies listed on the three most extensive United States Stock Exchange (NASDAQ, NYSE, and NYSE American) in 2014–2019, with 217 companies. Purposive sampling was used in this study to collect the data needed with specific criteria. Based on those criteria, a sample of 17 companies was obtained with 102 research data. Sample criteria used are:

1. The company published a complete financial report for the 2014-2019 period.
2. The company is engaged in the e-commerce industry.
3. The company uses the US GAAP accounting standard.
4. The company uses the fiscal year ended December 31.

Dependent variable

Firm value is the investor's perception of the company and is often associated with stock prices. High stock prices create a high company value. In this study, the measurement of firm value used can be seen in the following formula:

CMV (*Corporate Market Value*) = Number of Outstanding Stocks x Closing Price

Independent variable

The intangible asset is a nonmonetary asset that can be identified and has no physical form. The intangible asset is measured using the Intangible Asset Value (INTAV). INTAV is measured using the following formula:

INTAV (*Intangible Asset Value*) = CMV - BVNA (*Total Equity*)

Research and development are future-oriented activities in science and technology with a positive value in economic returns. A dummy variable measures research and development in this study. If a company includes its research and development costs in its report, then one is given. If the company did not include its research and development cost in its report, 0 is given.

Data Analysis Method

Descriptive statistical analysis provides a data overview that can be seen from minimum, maximum, mean, and standard deviation values. The data examined are intangible assets, research, development, and firm value. The classical assumption test is used to test the data before conducting multiple linear regression analyses, which are the normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test. The f-statistic test and coefficient of determination (Adjusted R^2 test) test are used to examine whether the research model is accepted. Hypothesis testing is done in the form of a t-test (partial test) with the regression equation as follows:

$$CMVrt = \alpha + \beta 1 INTAVrt + \beta 2\ RnDrt + ert$$

RESULTS

Descriptive Statistical Results and Classical Assumption Testing

The number of Chinese e-commerce companies listed on NASDAQ, NYSE, and NYSE American in the 2014–2019 period used as the sample group is 17 companies, resulting in 102 data that will be used in the study. Table 1 illustrates the descriptive statistics of the sample data from the annual reports processed in this study.

The minimum and the maximum values on the INTAV variable have a vast difference, with a negative minimum value of tens of billions and a maximum positive value of hundreds of billions. This can happen because the company has experienced a drastic decrease or increase in its stock price even though its asset and liability positions tend to be stable. The INTAV variable is the difference between the company's market value and the value book of net assets; therefore,

the value of INTAV also depends on the value of the company's stock. The minimum value was from Baidu, Inc. in 2019 due to the stock prices that dropped drastically by 20.3% from the previous year. Due to the decline in Baidu's performance in the first quarter, investors lower their stock expectations (Noonan, 2020). The maximum value was from NetEase, Inc. in 2017 because the stock price increased by 48%, resulting from positive reaction from investors regarding the launch of 40 new products at the end of 2016 (Tenebruso, 2017). The difference between the standard deviation and the average tends to be far due to the business and sector characteristics. E-commerce companies tend to vary in size, region operations, and goods or services traded.

Table 1 Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Intangible asset	102	-20378446391	236619698892	20054099155.82	44.232.190.700.581
R&D	102	0	1	0,73	0,448
Firm Value	102	13725225	243851126892	23376355290.93	45.117.646.880.258
Valid N (listwise)	102				

Furthermore, dummy variables were used to find an average value of 0.73 and a standard deviation of 0.448 for the RnD variable. This data shows that most existing e-commerce companies have shared the costs associated with research and development.

The dependent variable is CMV, almost the same as the INTAV variable, to have differences that tend to be vast at the minimum and maximum values. However, for this variable, both numbers are still positive. Therefore, the difference in numbers at the standard deviation, and the average value also tends to be far. The factor that most influences the appearance of these numbers is stock price fluctuation. Future Fintech Group, Inc. has a minimum value in 2018 with a stock price of 0.54. This happened because that year, the company experienced several internal changes, which caused performance to decrease drastically. Maximum value still owned by NetEase, Inc. in 2017.

Classic Assumption Test

The first classic assumption test is the normality test. A normality test is conducted to test if confounding variables or residual values are normally

distributed in a regression model. (Ghozali, 2018). Normality test conducted using normal probability plot. The result shown in Figure 1 shows that data has been normally distributed because the data used in this study spreads around the diagonal line and follows the direction of the diagonal line or histogram chart. Secondly, a multicollinearity test was performed. Multicollinearity testing aims to determine whether there is a correlation between independent variables in the regression model. A good regression model should not correlate with independent variables (Ghozali, 2018). Multicollinearity test results in Table 2 show that the data have a tolerance value > 0.10 and VIF < 10, meaning there was no multicollinearity in the regression model.

Thirdly, a heteroscedasticity test was performed. The heteroscedasticity test aims to detect the presence of variable variance difference from one residual observation to another in the regression model (Ghozali, 2018). This research detects the presence or absence of heteroscedasticity by looking at the pattern on the scatterplot graph. Based on Figure 2, it can be concluded that there was no heteroscedasticity in the research model because the points were spread above and below the number 0 on the Y-axis. Lastly, an autocorrelation test was performed. The autocorrelation test aims to detect a correlation between confounding errors at period t and the year prior (Ghozali, 2018). Autocorrelation test results in Table 3 show that the value of dU < d < 4-dU is 1.7383 < 1.974 < 2.2617. Hence, it can be concluded that there was no autocorrelation in this research model.

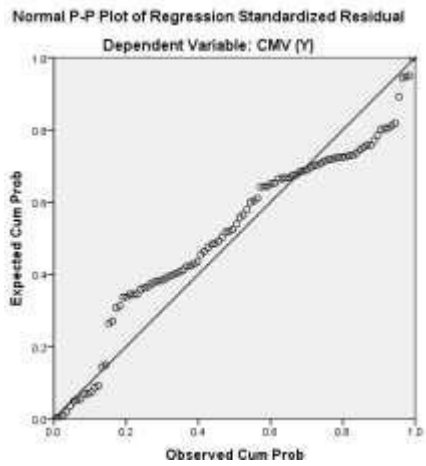

Figure 1 Normality Test

Table 2 Multicollinearity Test

Variable	Tolerance	VIF	Result
Intangible Asset	0,858	1,166	No multicollinearity
R & D	0,858	1,166	No multicollinearity

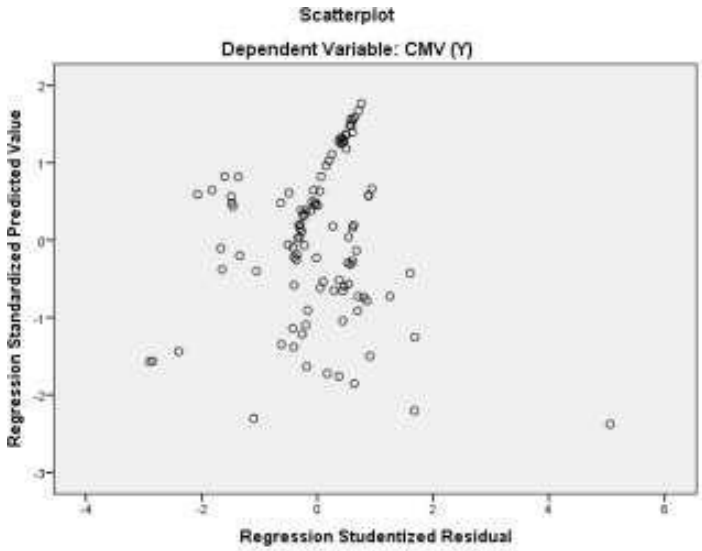

Figure 2 Heteroscedasticity Test

Table 3 Autocorrelation Test

Model	dU	dW	4 – dU	Result
Regression (Dependent: firm value)	1,7383	1,974	2,2617	No autocorrelation

Multiple Linear Regression

Based on the multiple linear regression method that has been shown in Table 4, the multiple linear regression equation in this study can be arranged as follows:

$$CMV = 2{,}399 + 0{,}737\ INTAV + 0{,}299\ RnD$$

Table 4 Multiple Linear Regression

Regression Variable	B
Constant	2.399
Intangible Asset	0,737
R & D	0,299

Model Feasibility Test

The result of the F-statistic test shows a significance value of 0.000 which is less than 0.05. It shows that independent variables in this study have a simultaneous effect on firm value; therefore the research model is feasible to be continued further. Meanwhile, the result of the Coefficient of Determination test (Adjusted) resulted in a value of 0.806. This result means that the independent variables used in this study can explain the dependent variable by 80.6%. In comparison, the remaining 19.4% is explained by other variables not explained in this study.

Hypothesis Testing

In Table 5, both intangible assets and research and development have a higher value of t-value than their t-table. Those results show that intangible assets and research and development significantly affect firm value, which means both hypotheses one and two of this study were accepted.

Table 5 T-test

Model	t-value	t-table
Intangible asset (X1)	17,633	1,6593
R & D (X2)	3,051	1,693

DISCUSSION

The data analysis results show that both INTAV and RnD significantly positively affect CMV. These results illustrate that investors consider intangible assets owned by the company and research and development done by the company positively. This result is in line with several previous studies that show similar research results (Susanti et al., 2017; Safari et al., 2018; Yuhelmi, 2018; Fauzy et al., 2019; Safitri & Gamayuni, 2019; Bahuwa et al., 2020). Rhenald Kasali stated that valuing companies using their tangible assets is no longer relevant, especially for companies heavily engaged in the technology industry such as e-commerce. It is not just their tangible assets that tend to be small the products offered by this industry result from brain images, skills, and knowledge

that are part of intangible assets (Setiawan, 2019). Director of Listing Indonesia Stock Exchange Samsul Hidayat also stated that digital companies' valuation is in the ecosystem they have. It uses different techniques from conventional company valuation based on tangible assets (Reily, 2017). This proves that most of the composition of e-commerce companies are intangible assets. Investors have realized this and presume the number of intangible assets in an e-commerce company as a positive signal. The higher the intangible assets, the higher the company's potential to develop. Besides, the number of intangible assets can be interpreted as its ability to manage tangible assets (Susanti et al., 2017). In August 2018, the Chinese government announced new regulations that will be enforced starting in early 2019. Regulations were enacted to clean up China's reputation as a source of fake products and commerce and improve data protection and cybersecurity (Soo, 2019). This includes licensing requirements and registrations of e-commerce operators for intellectual property protection. Here the importance of intangible assets for the company took place. The company's total intangible assets can indicate that the company owns the resources and knowledge needed to comply with new government regulations.

From the investor's perspective, the value of intangible assets tends to have more value, such as brand. Investors' trust and loyalty will increase if a company has a well-known brand. Investors will be more likely to invest in companies they know because the risk is lower than those they do not recognize (Dewi & Badjra, 2017). Therefore, in today's modern economic era, investors prefer to use intangible assets, rather than revenue, to assess a company, especially in a technology-based industry such as e-commerce (Aulia et al., 2020). Overall, investors consider intangible assets as a positive signal because they show that the company will continue to grow through product innovation and maintain its competitive advantage.

In this 21st century, the quality and speed of innovation are used to maintain a company's competitive advantage (Safitri & Gamayuni, 2019). The existence of research and development activities implies that the company will produce essential assets that can also reduce expenses in the future. This shows that the company is trying to improve performance in products produced and effective company operations (Buchdadi et al., 2018). From the investor's perspective, this activity can be profitable.

As a company engaged in technology-based industries, research and development are inevitable. Continuous development of information technology encourages companies to keep up with existing developments. Including research and development costs in the report shows that the company is progressing with technological developments. Investors received this as a positive signal because the company intends to develop and adapt. On the other hand, the absence of research and development costs in the report can send a negative signal and make investors skeptical of its intention to keep up with technological developments. Overall, most Chinese e-commerce companies have included research and development costs. The company also displays research and development costs as 0, but they provide a reason behind the costs so investors understand their current conditions. This matter shows that the company understands well that research and development play a vital role in investors' eyes.

Over the years, China's e-commerce industry has experienced rapid growth, but 2019 has been a very challenging year. This has started with increasingly fierce competition, slowing internet industry growth, changes in online shopping trends, and new regulations by the Chinese government related to the e-commerce industry (Clark, 2019). In this period, many companies experienced a decrease in revenue or even closed their platform because of significant losses. One of the biggest factors is sales-based live-streaming, which increased in popularity that year. An example is Tmall Global, which has increased product views by up to 309% and increased income by up to 430% (Zheng, 2019). These changes made some e-commerce companies experience a decline in stock prices quite drastically that year. Companies must respond to this situation by adapting to compete again; this can only be done if they carry out research and development activities. To ensure investors know the company's intention to adopt, companies need to send a positive signal, including research and development costs, as with most e-commerce companies from China. This, in turn, increases investor confidence in companies and is reflected in the increasing firm value.

Conclusion

This study concludes that intangible assets and research and development positively affect the firm value of Chinese e-commerce companies listed on

NASDAQ, NYSE, and NYSE American in the 2014–2019 period. Investors see the increased amount of intangible assets and the inclusion of research and development costs as a positive signal and can increase firm value.

Limitations and Suggestions

This study has several limitations, which are explained as follows:

1. The wide variation in sector characteristics and size among Chinese e-commerce affects the processed data results.
2. The number of companies that can be categorized as the e-commerce sector is limited; hence the result does not reflect the actual condition of the e-commerce industry.
3. Regulations and policies regarding e-commerce are still ongoing and developing.

Researchers also provide some suggestions that can be implemented, such as:

1. Future studies can examine the e-commerce sector using specific subsectors to describe the condition of e-commerce companies specifically.
2. Future studies can add control variables such as firm size and firm age to be better and more specific.

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