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The Effect of Board Characteristics towards the R&D Intensity among Malaysian Public Listed Companies

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Abstract
Purpose: The aim of this study is to examine the outcome of board characteristics towards R&D intensity in Malaysian context.
Design/methodology/approach: Based on samples of 45 active Malaysian listed companies in R&D for the period 2017 to 2019, this study employs linear regression to analyse the relationship between board characteristics and R&D intensity.
Findings: The outcome of board characteristics towards the R&D intensity are significant.
Research limitations/implications: This study does not represent the broad population of companies in Malaysia. This is because, the population in this study is limited to only 45 active Malaysian listed companies in R&D. Hence, the findings from the study could not be generalised to other companies in Malaysia.
Practical implications: This study contributes by highlighting the importance of corporate governance towards the R&D intensity of active Malaysian listed companies in R&D.
Originality/value: This study represents the first attempt to explore the impact of board characteristics towards R&D intensity based on active Malaysia listed companies in R&D.
Paper type: Research paper

Keywords: Board characteristics, Corporate governance, R&D intensity, Malaysia

Introduction

Corporate governance has been one of the most investigated research in the social science realm for more than three decades (Bawaneh, 2020). Previous scholars have explored the effect of corporate governance on R&D Intensity (Kuo, Wang, & Yeh, 2018; Almor, Bazel-Shoham, & Lee, 2019; Chou & Johennesse, 2021). Hence, what is corporate governance and why is it important?

Given the increasing magnitude of boards in research, it is crucial to identify the board characteristics which makes a board more functional from another (Mohammed, 2018). Hence, the characteristics of the board of directors are used in this study to examine their influence towards the R&D intensity. In this study, the board characteristics comprise of education of

board, board size, board meetings, age of board members and board gender are used to examine their relationship towards the R&D intensity.

Literature Review

Critical Analysis of Past Scholars

Previous scholars have investigated the relationship between board characteristics and financial performance. For example, Guldiken and Darendeli (2016) applied both agency theory and resource dependence theory in examining board monitoring and R&D investment. Using 467 samples of large public listed companies from high-tech industries such as pharmaceutical and information technology industries from a period of 2005 to 2010, Guldiken and Darendeli (2016) noted that there is an inverted U-shaped relationship between board monitoring and R&D investment. Besides, Francis and Samuel (2016) have investigated the correlation between the board composition and R&D investment based on 68 companies extracted from listed companies of Stockholm Stock Market. However, from their study, it is noted that amongst the board composition only board interlock has both significantly and negatively correlated at 5% level with the R&D investment while the other variables are noted to possess lower negatives correlation towards R&D investment with no significant correlation being found. Moreover, Zona (2016) studies on how the R&D investment is affected by governance devices such as CEO duality, CEO tenure and independence outside directors using 2170 observations from United States for a period of 2001 to 2007. Zona (2016) concluded that board independence on R&D investment is time dependent and is contingent upon CEO tenure, further inferring board dependence can serve shareholder's interest which is totally agreeable with agency theory, thus reducing agency cost.

Furthermore, Kuo, Wang and Yeh (2018) examine the role of education of directors in affecting the organisations R&D investment with samples of 437 Taiwanese listed firms between 2006 and 2012. Kuo et al. (2018) revealed that higher education of directors influences the organisation to invest massively in R&D. In other words, Kuo et al. (2018) concluded that there is an overall positive correlation between the education of directors and R&D investment with internal corporate governance playing a crucial role as moderator in this relationship. In addition, Almor, Bazel-Shoham and Lee (2019) investigate the effect of gender diversity towards investment in R&D. Using approximately 18,881 companies from 44 countries, Almor et al. (2019) deduce that higher gender diversity (more women on the board) will generate negative relationship with R&D investment in which implies increased gender diverse board reduces the decision making in R&D investment. Employing a sample of 434 technological listed companies on the Taiwanese Stock Exchange from financial year 2014 and 2017, Chou and Johennesse (2021) explored the effect of board characteristics and ownership structure towards strategic decision taken for R&D investment. From this study, Chou and Johennesse (2021) concluded that the board independence has a positive and strong significant relationship towards the R&D intensity while the CEO duality exerts negative and significant relationship towards the R&D intensity. Similarly, board size in big companies has negative and significant correlation towards the R&D intensity.

Analysis from the previous studies on the relationships between board characteristics (in various forms) and firm performance from many countries, the authors discovered some limitations from the previous studies. The limitations are summarised in Table 1

Table 1: Limitations of Previous Scholars

Authors	Limitations
Guldiken & Darendeli (2016); Zona (2016); Kuo et al.(2018)	The conclusion arising from previous scholars is outdated as it compiles samples before financial year 2016.
Kuo et al. (2018); Almor et al. (2019)	Past researchers only measure one independent variable in investigating its impact towards the R&D intensity.
Almor et al. (2019)	Conducting research using samples from more than one country. Since corporate governance may differs in different countries, the conclusion arrive from the research may not be accurate.

Hypotheses Development

This study aims to investigate the impact or relationship of board characteristics in aggregate as well as to explore the individual board characteristics with R&D intensity. Thus, the study comes up with one main hypothesis (aggregated board characteristics) and 5 sub hypotheses (individual board characteristics).

The main (aggregated) hypothesis developed in this study is:
H1*: There is significant relationship between board characteristics and R&D intensity*.

The other five sub-hypotheses which consists of the individual board characteristics are discussed below:

a. Relationship between Education of Directors and R&D Intensity

Bantel (1993) discovered that board members with various background and experience are tremendously vital for the organisations pertaining to decision making purpose. Besides, Chen (2014) via his research of "Board capital, CEO power and R&D investment in electronic firms" concluded that board capital such as studies that directors' educational level and directors' industry-specific experience has a positive correlation with R&D investment as the CEO power moderates this relationship. In addition, Gottesman and Morey (2015) established that the education of board of directors represents the crucial identity of intellectual capital. Kuo et al. (2018) in researching the relationship of the role of education of directors and the organisations R&D investment using samples of 437 Taiwanese listed firms, concluded that higher education of directors influences the organisation to invest massively in R&D. Hence, this study proposes the following hypothesis:
H1 (a): *There is significant relationship between education of director and R&D intensity.*

b. Relationship between Board Size and R&D Intensity

It is noted that several studies have explored the correlation between board size and R&D intensity. For instance, Elmagrhi, Ntim, Crossley, Malagila, Fosu and Vu (2017) stated that board size has an influence towards the company's strategy. In addition, other previous scholar concluded that board size influenced negatively on the firm strategy such as disclosure and risk taking (Alnabsha, Abdou, Ntim & Elamer, 2018; Alshbili, Elamer & Beddewela, 2019). In addition, Chou and Johennesse (2021) concluded that board size in big companies has negative and significant correlation towards the R&D intensity in Taiwan business perspective. Therefore, this study proposes the following hypothesis:

H1 (b): *There is significant relationship between board size and R&D intensity.*

c. Relationship between Board Meetings and R&D Intensity

As per Wang (2019), it is deduced that board meeting has significant relationship towards the R&D Intensity. This indicates that board meeting frequency enables to strengthen the communication between the directors and enhance the governance efficiency and aids in technical innovation which subsequently increases the investment in R&D. This is consistent with previous scholars who inferred that higher board meetings frequency resulted more monitoring of managers which lead to improved performance especially on R&D intensity (Bravo & Reguera-Alvarado, 2017). This is because higher board meeting frequency can benefit by reducing the agency conflicts via contributing the information to management (Elmagrhi et al., 2017). Hence, this study proposes the following hypothesis:
H1 (c): *There is significant relationship between board meetings and R&D intensity.*

d. Relationship between Age of Board Member and R&D Intensity

Age is a crucial component because the cognitive ability such as learning and memory will disappear as the age grows. This explains why the young directors are open minded in engaging in innovative activities while the older directors possess risk avoidance behaviour. Platt and Platt (2012) noted that younger board of directors possess higher confidence in facing risk compared to the older directors whom are irrepressible in forming new ideas and innovations. Therefore, this study proposes the following hypothesis:
H1 (d): *There is significant relationship between age of board member and R&D intensity.*

e. Relationship between Board Gender and R&D Intensity

Burke (2003) stated that the involvement of women in the board have created positive strategic input and enhancing organisation's reputation. Moreover, Adams and Ferreira (2009) notice that the female directors are more concerned towards than the male directors in which they will take higher responsibility to lead the firm and guide the managers to oversee project which increases the company's value. In addition, Bear, Rahman and Post (2010) indicated that the female directors are more concerned, responsible and consistent than the male counterparts. Furthermore, Johnson, Schnatterly and Hill (2013) further supported the hypothesis by stating that board with gender diversity has significant effect towards the board decisions. Hence, this study proposes the following hypothesis:
H1 (e): *There is significant relationship between board gender and R&D intensity.*

Methods

Populations & Samples

The research method applied in this study is deductive approach and quantitative data. The hypotheses are derived first while the data are collected later in confirming the propositions whether the board characteristics have an influential role in deciding the R&D intensity of Malaysian listed companies. The population of this research comprise of 45 active Malaysian listed companies in R&D which are collected from financial year 2017 to 2019. These data of active Malaysian listed companies in R&D is extracted from Bloomberg Professional software. Based on Krejcie and Morgan (1970) table, if the number of data for population is 45 (N), then 40 (n) samples should be selected. Similarly, using Sekaran and Bougie (2016) table as a basis of determining the number of samples, for a given population of 45 (N), approximately samples of 40 (n) should be employed. However, in this research, all the 45 companies are tested. As a result, these 45 companies selected will not only represents 100% of the population selection but also will generate better results. In this study, the samples are gathered from financial year

2017 to 2019, hereby creating 135 observations. However, it is noted that there 21 missing data on the key variables. Hence after excluding companies with the missing data on the key variables, the final data consist of 114 observations. Meanwhile, the financial year 2017 to 2019 is selected because 2017 has lowest effect from the 2008 global financial crisis in which providing added value and reliable findings (Alqatan, Chbib & Hussainey, 2019). Table 2 provides the summary of the population and samples used for this study.

Table 2: Summary of the Population and Samples

Populations	45 active Malaysian listed companies in R&D
Sampling	100%
Samples	45 active Malaysian listed companies in R&D
Year	From financial year 2017 to financial year 2019
Observations	114 observations

Variables

This study examines the impact of board characteristics towards R&D intensity. The dependent variable in this study is company's R&D intensity. The R&D intensity which is the critical source for innovation is also used by other researchers (Lee, 2018; Erdogan & Yamaltdinova, 2019; Harymawan, Nasih, Agustia, Ratri & Nowland, 2020; Liu, Zhang & Gao, 2020; AlHares, Elamer, Alshbili & Moustafa, 2020). Cho, Halford, Hsu and Ng (2016) stated that R&D intensity is the measurement of company's long-term competitiveness. This study measures R&D intensity as R&D expenditure per total sale of the firm (Lee, 2018; Erdogan & Yamaltdinova, 2019; Liu et al., 2020). The ratio of R&D intensity is computed by dividing the R&D expenditure with the total sales, which is then converted into percentage. R&D expenditure data for each company was collected from Bloomberg Professional software.

The characteristics of board of directors were used as the independent variables in this study. The followings are the selected board characteristics, hence independent variables, employed in this research:

a) Education of directors
b) Board Size
c) Board Meetings
d) Age of board members
e) Board Gender

One of the independent variable in this study is the education of directors. According to Chen, Ho and Hsu (2013), the education is measured by averaging the education of directors in a firm. Firstly, the education of directors is divided into four ranks whereby rank 1 for high-school or below, 2 for bachelor's degree, 3 for professional certificate and 4 for postgraduate. Then, the total value of education of directors for every firm is accumulated based on the ranking that has been categorised for each financial year.

Furthermore, board size is the second variable selected in this study. The board size is the number of directors on the board. Referring to previous researchers such as Khan et al. (2019), Alqatan et al., (2019), it is noted that board size is measured using the number of directors in the organisation.

In addition, the third independent variable for this study is board meetings. Board meetings are calculated via the total number of board meeting of the company held during the current financial year. This is extracted from previous researchers (Ting, Kweh & Hoanh, 2018; Baweneh, 2020).

Moreover, the board members age is the other independent variable in this study. Wiersema and Bantel (1992) has used the measurement of age of board members previously The age of

all the directors collected will be accumulated and divide it with the total number of the directors for the financial year 2018.

Besides, the other independent variable in this study is board gender. According to Pathan, Haq and Gray (2013), the women directors is measured by the percentage of female directors in the board. This study attains the total number of women directors and dividing it by the total number of the directors during the financial year.

In this study, two control variables, namely leverage and firm value, were used. Based on research by Erdogan and Yamaltdinova (2019), leverage refers to the division of total debt from total equity while the firm size is the natural log of total assets of the company. Table 3 provides the summary of the measurements of variables adopted by this study.

Table 3: Measurement of Variables

Variables	Abbreviation	Definition	Measurement	Adopted from
Dependent variable				
R&D intensity	RND	R&D expenditure per net sale of the firm	(R&D expenses ÷ Total Sales) × 100%	Lee (2018), Erdogan & Yamaltdinova (2019), Liu et al. (2020)
Independent variables				
Education of Directors	EDU	Average the education of directors in a firm	(Education of directors ÷ Number of Directors) The education of the every director is ranked according to the education attained : High-school or below = 1 Bachelor's Degree = 2 Professional Certificate = 3 Postgraduate = 4	Chen, Ho & Hsu (2013)
Board Size	BSIZE	Number of Board of Directors	Total number of directors on the board	Khan, Yaseen, Mustafa & Abbasi (2019), Alqatan, Chbib & Hssainey (2019)
Board Meetings	BMGTS	Number of Board of Director meetings per year	Total number of board meetings of the firm in the current year	Ting, Kweh & Hoanh (2018), Baweneh (2020)

Age of Board Member	AGE	Average age of each board of directors	(The total age of directors ÷ Number of Directors)	Wiersema & Bantel (1992)
Board Gender	GEN	Percentage of female directors in the board	(Number of Female Directors ÷ Number of Directors) × 100%	Pathan, Haq & Gray (2013)
Control variables				
Leverage	LEVERAGE	Firm's Debt divided by Equity	Total Debt/Total Assets	Erdogan & Yamaltdinova (2019)
Firm Size	VALUELG	Firms Value which is calculated to natural log of Total Assets	Natural log of Assets	Erdogan & Yamaltdinova (2019)

Model Specification

In order to test the relationship of board characteristics and firm R&D intensity, following multiple regression analysis is employed:

RD = α + β1EDULG + β2BSIZELG + β3BMTGSLG + β4AGE + β5GENLG + β6LEVERAGE + β7VALUELG + ε

where:

RD = Research and Development Expenditure divided Net Sales
EDULG = Education of Director which is transform to natural log
BSIZELG = Board Size which is transform to natural log
BMTGSLG = Board Meetings which is transform to natural log
AGE = Board Age
GENLG = Board Gender which is transform to natural log
LEVERAGE = Firm's Debt divided by Equity
VALUELG = Firms Value which is calculated to natural log of Total Assets

Findings

Descriptive Statistics

Table 4 explicates the descriptive information about each independent variable, dependent variable of Malaysian companies which are highly involved in R&D investment. The data were collected for three (3) years from the period of 2017 to 2019. In addition, the data were collected using secondary sources such as Annual Report and Bloomberg Professional software.

Table 4: Descriptive Statistics of Variables

Variable	Observations	Minimum	Maximum	Mean	Std. Dev
EDU	114	1.33	3.67	2.8294	0.46378
BSIZE	114	4.00	13.00	7.5702	2.07799
BMTGS	114	3.00	21.00	5.8947	3.10685
AGE	114	44.38	70.67	58.9668	5.34474
GEN	114	0.00	50.00	18.2391	13.29188
RD	114	0.02	59.74	3.2511	7.05322
LEVERAGE	114	0.18	42.90	17.6204	12.06719
VALUELG	114	7.17	11.25	9.0048	1.00448

Notes:

EDU = Education of Director
BSIZE = Board Size
BMTGS = Board Meetings
AGE = Board Age
GEN = Board Gender
RD = R&D intensity
LEVERAGE = Firm's Leverage
VALUELG = Firms Value which is calculated to natural log of Total Assets

Table 4 provides descriptive statistics analysis for the variables used in this study. The statistical summary represents the analysed data which were extracted from SPSS in the form of minimum, maximum, mean and standard deviation. This study includes 114 observations of 45 active Malaysian public companies in R&D between 2017 to 2019.

There are five independent variables (education of director, board size, board meetings, age of board member, board gender) being tested in this study. Amongst the sample being tested is education of directors (EDU). Based on Table 4, it is noted that the EDU has both minimum and maximum of 1.33 and 3.67 average ranking respectively. This indicates that there are board of director who possess only high-school education and also attains postgraduate qualification such as Masters and PhD. Meanwhile, the EDU has average of 2.82 indicating that the board of directors do have both Bachelor's Degree and Professional Certificate as their education background.

Besides, the board size ranges from at least 4 members to at most 13 members sitting on the board with an approximate mean of 8 board members. On the other hand, the results of annual board meetings have minimum, maximum and mean of 3.0, 21.0 and 5.8 times respectively. Referring to Table 4, it can be deduced that board meetings on average amongst the Malaysian listed companies are held about six times annually which is almost consistent with Arora and Bodhanwala (2018) research in which their data finding noted that the board meetings in Indian listed firms are held about five times yearly.

Moreover, the age of board members ranges from at least 44 years old to 71 years old and includes approximate mean of 59 years old. Besides, it is noted that the lowest percentage of GEN (which represent female directors) sitting in the board is none (0%) while the highest percentage of GEN sitting in a board is 50%. However, the average of GEN sitting in board is 18.23% in which is lesser than the stipulation made in MCG 2017 in which targets a minimum of 30% of BOD comprise of women within these companies.

Table 4 also elucidates the results of the descriptive statistics for the R&D intensity. It is observable that the mean of companies spending on R&D activities is 3.25% of their Net Sales indicating the companies in Malaysia has lower level on R&D investment. Besides, the

standard deviation of 7.05% shows that the sample consist relatively many firms that vary more or less on the R&D investment.
Meanwhile, it is noted that based on results displayed in Table 4, the firm value has an average of 9, maximum value of 11.25 and minimum of 7.17 while the leverage has the highest value of 42.90 and lowest value of 0.18.

Regression Analysis
Regression analysis is a statistical method employed in estimating relationships between one or more independent variables towards dependent variable. This research investigates the effect of board characteristics towards the R&D intensity of active Malaysian listed companies with R&D. In this section, the regression analysis is applied to define the relationship of board characteristics towards R&D intensity.
Referring to the regression analysis where **RD = α + β1EDULG + β2BSIZELG + β3BMTGSLG + β4AGE + β5GENLG + β6LEVERAGE + β7VALUELG + ε PERF = α + β1RD + β2LEVERAGE + β3VALUELG + ε** was developed in previous section, following are results being tested:

Table 5: Regression Analysis between Board Characteristics and R&D Intensity

Variables	**R&D**	
	β	**P-value**
Constant	30.10	0.071
Education of Director	-3.13	0.869
Board Size	16.98	0.100*
Board Meeting	-1.92	0.773
Age of Member	0.01	0.960
Board Gender	-10.75	0.045**
Firm Value	-3.29	0.016**
Leverage	0.27	0.069*
R-squared	18.20%	
F-statistic	2.01*	

Referring to Table 5, the model which measures the regression analysis of board characteristics towards R&D intensity has a significance value (p-value) of 0.069 (p-value less than 0.10 level). This infers that combined (aggregated) effect of all the five independent variables (board characteristics) are significant towards the R&D intensity. Hence, Hypothesis 1 is accepted.
Furthermore, based on the Table 5, it is also noted that only 18.20% of the variations in the R&D intensity is explained by the combined (aggregated) effect of the board characteristics. This implies that there are different elements (81.80%) that affects the R&D intensity of the Malaysian listed companies. These elements are not examined in this study.
Amongst the independent variables, it is concluded that only board size and board gender possess a significant relationship towards R&D intensity. The board size has significance value (p-value) of 0.100 while the board gender has p-value (0.045) which is less than 0.05 level. As a result, both Hypothesis 1 (b) and Hypothesis 1 (e) are accepted. Meanwhile, it is deduced that all the other remaining independent variables such as education of director, board meeting and age of member are not significant towards R&D intensity.
Based on results displayed in Table 5, Hypothesis 1 (a) is rejected. It is noted that there is no significant relationship between educations of director towards R&D intensity. The finding from this study opposes the findings derived by Kuo et al. (2018). Hence, this study provides

an implication that the education of directors does not influence the R&D intensity for the Malaysian listed companies which are active in R&D.

Based on results shown in Table 5, it is deduced that there is a positive significant association between board size and R&D intensity. Hence Hypothesis 1 (b) is accepted. The findings from this study is similar to Abebe and Myint (2018) research. However, this study contradicts the findings derived by AlHares et al. (2020) and Chou and Johennesse (2021). Their studies concluded that board size has negative significant correlation towards the R&D intensity. The positive significant correlation between board size towards R&D intensity in this study indicates that bigger board size in active Malaysian listed companies in R&D is not only influence but also increases the R&D intensity.

Hypothesis 1(c) explains the relationship between board meeting and R&D intensity. As shown in Table 5, Hypothesis 1 (c) is rejected. This is because the association between board meeting and R&D intensity has p-value of 0.773 which is greater than 0.10 level. Hence, this study contradicts the results of past scholars (AlHares et al., 2020) which concluded that board meeting has significant association towards R&D intensity. Thus, this study deduced that board meetings does not impact the R&D intensity for the active Malaysian listed companies in R&D.

Furthermore, the results of the regression analysis in Table 5 revealed that there is no significant relationship between age of board member and R&D intensity since the p-value is more than 0.01. Therefore, Hypothesis 1 (d) is rejected.

Moreover, Hypothesis 1 (e) is accepted because there is a negative significant relationship between board gender towards R&D intensity. The board gender has a significance value (p-value) of 0.045 in which the p-value is less than 0.05 level. The finding indicates that it is important to take into account board gender in determining the companies R&D intensity. The negative significant relationship reveals that more women on the board would lead to negative relationship with R&D investment. This study supports the findings of Almor et al., (2019) who also concluded that higher gender diversity generates negative association towards R&D intensity.

Discussion and Conclusion

In this study, as an overall, it is concluded that board characteristics (in aggregate) are significant towards the R&D intensity. However, by investigating the individual independent variables, it is noted that only board size and board gender are significant towards R&D intensity. Meanwhile, it is also noted that the relationship of other remaining board characteristics such as education of director, board meeting and age of board member are not significant towards R&D intensity. Nevertheless, this study manages to provide findings of R&D intensity using active Malaysian listed companies in R&D.

Theoretical Implications

This study would provide some positive impacts by contributing to other literature's body of knowledge as well as to other researchers who want to know the causal effects or outcome between board characteristics and R&D intensity. Basically, the aim of this study is to gauge better understanding on the relationship between board characteristics and R&D intensity using active Malaysian listed companies in R&D since there is lack of research on this topic previously. This research is essentially among the pioneer studies which investigates the effect of board characteristics towards R&D intensity using active Malaysian listed companies in R&D. Moreover, this study also offers effective and improve decision making for R&D investment through corporate governance via board characteristics. Hence, these findings contribute significantly to the corporate governance in the Malaysian settings pertaining to R&D intensity.

Practical and Social Implications

This study signifies the policy maker in Malaysia to emphasise in maximising R&D intensity or investment in their companies. Through this research, the policy makers can understand the relationship between board characteristics and R&D intensity. Therefore, it is important to create positive competition for the companies from enterprise to private and public companies to capitalise on research and development intensity (investment) so that it could maximise better returns.

Limitations and Suggestions for Future Research

Although this research was able to provide contributions by filling the gap in investigating the effect of board characteristics towards firm R&D intensity of active Malaysian listed companies in R&D, this study also displays some limitations and offers many unanswered questions. Among the limitation includes in the study was that the population used is limited to only 45 active Malaysian listed companies in R&D. Therefore, this study's findings may not be generalised as this study did not investigate the board characteristics in non-active R&D listed companies and non-listed companies in Malaysia. Besides, the board characteristics used in this study does not represent a broad definition of corporate governance in determining its effect towards firm performance. This study employs board characteristics such as education of director, board size, board meeting, age of board member and board gender as the independent variable in examining its effect towards R&D intensity. There is limitation in which this study fails to consider other board characteristics such as board interlock, board ethnicity diversity. The corporate governance mechanism can be divided into two groups which are internal and external. The internal corporate governance refers to the board of directors and director's shareholdings while the external corporate governance includes disclosure, legal system and corporate governance codes. Therefore, the R&D intensity can also be examined by considering other predictors other than board characteristics.

The future researcher who aspire to conduct research within this scope could ponder some modification of this study. Future research can consider using large samples in which will enable better statistical research analysis. The future researchers who are interested in taking account Malaysian context may consider using entire listed companies from Malaysia as population in their future research. The entire listed companies in Malaysia represents broad population of companies in Malaysia and future research may consider to increase the size of the population and samples by considering unlisted companies to be included as population and samples in conducting the research. Furthermore, future researchers may take into account other board characteristic variables that could possibly affect the R&D intensity. Since corporate governance comprises of internal and external in which the internal corporate governance refers to the board of directors and director's shareholdings while the external corporate governance includes disclosure, legal system and corporate governance codes, future researcher can consider in investigate the impact other characteristics in corporate governance towards R&D intensity.

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