

UDC 332

## DO CEO CHARACTERISTICS AFFECT R&D INTENSITY? EVIDENCE FROM MANUFACTURING COMPANIES IN INDONESIA

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### ABSTRACT

Research and Development (R&D) in a company is regarded a high-risk agenda. Latest research shows that personal characteristics of a CEO can affect the policies made by a company. The characteristics of CEO referred to in this research are derived from the upper-echelon theory that categorizes major observable characteristics of CEO including gender, age, and education background. This research analyzed the influence of CEO characteristics on R&D intensity. Research samples were manufacturing companies listed in Indonesia Stock Exchange during 2013-2014. In this research, regression analysis was administered which results showed that CEO's age significantly influenced R&D intensity. Differently, CEO's gender and education background were not found to have significant influence on R&D intensity.

### KEY WORDS

CEO gender, CEO age, CEO education level, R&D intensity.

Innovation is quite important to the sustainability and the growth of a company. Innovation helps create proper values, make an organization more efficient, form strong intellectual resources, achieve great competitiveness, and so on. Moreover, within the economic challenges nowadays, innovation holds the key to the success of a company. However, creating a new innovation takes a great amount of cost. The high cost might be considered as a risk for a company and it often receives strong considerations from shareholders. A manager has to be able to provide shareholders high return. On the other side, the business competition that gets tighter urge a company to create innovations to make the company have competitive advantage to stay sustainable.

Issues related to innovation are regarded interesting, As stated by Schumpeter's (1934), continuous innovation activities are the key to the company's success in the long run (Rosenbush et al., 2011). Kotler (2000) stated that companies will be at greater risk if they fail to engage in innovation. In situations where the level of competition is high and the product life cycle of the company is short, the company's ability to produce innovation is getting more important as it enables companies to improve their business performance and maintain their competitive advantage (Artz et al., 2010). Within this increasingly fierce business competition, companies are urged to create innovations (Lipit, 2006). Current products owned by a company are vulnerable to be forgotten as customers' needs and preferences keep changing, and the technology also changes. Therefore, companies must be able to make innovations to compete in the market.

Companies or countries that keep making innovations are able to give significant contributions to the economic development. Based on the 2017 Global Innovation Index (GII), Indonesia ranked 87th (out of a total of 127 countries worldwide). This data shows that Indonesia lags behind other ASEAN members except Cambodia in terms of innovation. Singapore ranked 7th, Malaysia 37th, Vietnam ranked 47th, Thailand ranked 51st, and Brunei and the Philippines ranked 71st and 73rd.

GII has conducted research on innovations viewed from various dimensions in various countries. GII stated that Indonesia had difficulties in facing several classic problems including government regulation, low education level, inadequate development of R&D and lack of awareness in utilizing patents. According to GII, private companies in Indonesia have

relatively weak ability in making innovations (ranked 130th). Based on three subcomponents - the political climate, regulation and business - Indonesia ranked below 80 for all those three aspects. In terms of regulations that drive innovation, Indonesia ranks 126<sup>th</sup>. Those conditions reflect the difficulties faced by Indonesia in creating conducive and supportive environment for innovations. In addition, those difficulties are also related to local culture.

How good a company makes innovations can be described by the intensity of Research and Development (R&D). R&D intensity refers to the amount of fund incurred by a company to carry out product development and costs to improve the efficiency of a company such as the utilization of technology better production processes. Decisions related to the fund for R&D will definitely involve management and shareholders within the company. Furthermore, R&D activities are included in company's expenditures that requires large costs. The amount of R&D cost often concerns shareholders as they usually question whether or not the R&D activities fail or successful in increasing sales, improving process efficiency, enhance the performance and add to the value of the company.

Regarding the cost and risk that follow, R&D activities depend on the characteristics of the company and the characteristics of the CEO. In recent years, research has shown that CEO personal characteristics might affect company policy and company performance. Cronqvists et al. (2012) show that corporate behavior goes consistently with how CEOs behave and act personally. Funding decisions and attitudes toward risk can be affected by CEO characteristics including life experiences and overconfidence (Malmendier et al., 2011). Other research show that compensation (Armstrong, 2013), gender (Faccio et al., 2013), attributes (Yu and Luu, 2014) of a company CEO have an influence on corporate risk taking. Bertrand and Schoar (2003) and Malmendier and Tate (2008) also show how managerial traits have an influence on company performance.

A number of researches have been carried out to find out about the factors that influence the intensity of R&D in a company. However, researches that examine whether CEO characteristics can influence R&D activities have never been conducted in most companies in developing countries such as Indonesia. CEO characteristics including age, gender, and education level were analyzed in this research in order to examine their influences on of R&D intensity. Based on the background of this research, this research was carried out to analyze the effect of CEO characteristics on R&D intensity in Indonesian manufacturing companies.

## LITERATURE REVIEW

The concept of CEO characteristics relates to the aspects of values, behavior, and skills related to intellectual abilities. James (2010) stated the characteristics of company managers influence organizational change such as age, education, experience, work experience, and functional background. CEO characteristics that include gender, age and education level can be observed and can be quantitatively measured.

Gender is defined as the differentiation of roles, positions, responsibilities, and division of labor between men and women determined by the community based on the characteristics of women and men according to the norms, customs, beliefs or habits of the community ([www.bps.go.id](http://www.bps.go.id), 2016). Gender diversity plays an important role in corporate decisions. Some previous research suggests that gender difference can influence the tendency to take risks. Female CEOs tend to avoid investment and riskier funding opportunities (Faccio et al., 2013). Weber and Zulehner (2010) stated that start-up companies led by female CEOs tend to sustain. However, prior research also mentioned that banks with more female board members would take more risks than banks with fewer number of female council members (Adams and Ragunathan, 2013; Berger et al., 2013).

CEO's age is a basic characteristic that is easily observed and it has been known to have an influence on risk-taking behaviors. Ryan and Wiggings (2001) stated that there is a significant relationship between manager's age decisions making. Barker and Muller (2002) also presented similar results that young CEOs prefer to invest more in Research and Development. In line with these researches, Bertrand and Schoar (2003) found that older

CEOs are likely more conservative and they tend to maintain low financial leverage. Previous research also mention that young CEOs are dare to take risks in order to obtain large earnings.

Previous research suggests that manager's style in making decisions and interests in risk are related to educational background. Managers with proper education background tend to be more aggressive to take risk, leading the company to spare large capital expenditures and obligations (Bertrand and Schoar, 2003). A research carried out by Karagiannidis (2012) concluded that managers who work in a mutual fund company with a business education background have better performance and are dare to take risks. Based on Human Capital Theory, education is an investment (Zhou and Yonghai, 2014). A CEO will be more rational as their education background enhances from the result of the investment they make in education, from which they expect greater returns.

The Financial Accounting Standards (PSAK) no. 19 revised in 2015 mentions that original research and planned research are carried out to expect enhancement of technical knowledge and to obtain new knowledge. Development is the application of research findings or other knowledge to plan or design newer raw materials, tools, products, processes, systems or services or have been substantially improved before the commencement of commercial production or use. Financial Accounting Standard no. 2 in Wilson and Campbell (1992) states that research is the planning or critical investigation aimed at discovering knowledge in the hope that knowledge will be useful in developing new products, services or processes, new techniques or improving the already existing processes or products. Development is also the translation of research findings or other knowledge in the forms of plans or designs of a new product or new process for a significant improvement in an existing product or process, whether the plan or design will be intended for sale or use. Thus, R&D can be essentially interpreted as the research of ideas, methods, products or services in order to create new products or processes, improve existing products, and discover new knowledge that can be useful in the future.

Adequate investment on R&D investment allows a company to achieve competitive advantage that can be used as a mechanism for product differentiation. Many companies spend little amount of fund on research and development to create new products or processes, improve existing products, and discover new knowledge that can be useful in the future. R&D in this case covers a broader meaning, beyond development and discovery of new products, but R&D can be done in other sectors that require innovation or improvement.

Prior research also mentions that innovation is one of the keys to the success of a company (Jimenez and Sanz-Valle, 2011) in obtaining sustainable competitive advantage. (Artz et al., 2010) believe that R&D activities are activities that are important in the search of innovations. Innovations made by a company can be described by the intensity of its R&D. R&D intensity is a measure of a company's R&D spending on activities aimed at expanding products, production processes and technology. R&D intensity is generally calculated dividing the total R&D costs by the total sales of the company (Meyer, 2005).

Regarding the large amount of found a company should pay for R&D activities and the high risks of R&D activities, in this context, CEOs play important roles in decision making process regarding the decisions to make investment in R&D. The hypotheses of this research were developed regarding to the background of this research and the results of previous research as follows.

- H1: CEO's gender influences the R&D intensity;
- H2: CEO's age influences the R&D intensity;
- H3: CEO's education level influences the R&D intensity.

## **METHODS OF RESEARCH**

This explanatory research analyzed the influence and the correlation between one variable and another variable. The samples of this research were manufacturing companies listed in Indonesian Stock Exchange of 2013-2017 periods. The data regarding CEO characteristics were retrieved from company annual report from [www.idx.co.id](http://www.idx.co.id), corporate

website and [www.bloomberg.com](http://www.bloomberg.com). Meanwhile, the data to measure R&D intensity were obtained from annual report retrieved from [www.idx.co.id](http://www.idx.co.id). The data taken in this research were the data from companies that provided information related to the variables in this research. Out of 143 manufacturing companies, only 19 companies provided proper information that matched the research variables to be further analyzed.

In this research, 4 variables were analyzed including gender, age, education level and R&D intensity. Those four variables had passed the classical assumption tests including multicollinearity test, autocorrelation test, heteroscedasticity test and normality test. After that, regression test was performed to find out the influence of CEO characteristics on R&D intensity as presented in this following regression equation.

$$INRD_{i,t} = \alpha_{i,t} + \beta_1 JKCEO_{i,t} + \beta_2 UMCEO_{i,t} + \beta_3 PDKCEO_{i,t} + e_{i,t} (1)$$

$INRD_{i,t}$  is the dependent variable which is the R&D intensity calculated by dividing the R&D cost by total sales. CEO characteristics are classified as follows.  $JKCEO_{i,t}$  is a dummy variable, in which if score 1 shows if CEO is a male and 0 for female CEO (Abor, 2007).  $UMCEO_{i,t}$  is numerical score showing the age of CEO (Wei et al., 2011).  $PDKCEO_{i,t}$  is the range of scales that define CEO education level, in which 1 (high school, vocational school or below); 2 (undergraduate); 3 (graduate); 4 (post-graduate); 5 (others) (Zhou and Wang, 2014).

## RESULTS AND DISCUSSION

This section discusses empirical results obtained in this research. First, this research presents the results of descriptive statistics regarding CEO characteristics. This section also presents the results of multiple regression analysis that indicates correlation between CEO characteristics and R&D intensity.

Table 1 – Descriptive Statistics of CEO Characteristics and R&D Intensity

CEO Characteristics	Minimum	Maximum	Mean
CEO Gender	0	1	,94
CEO Age	37	77	52,72
CEO Education Level	1	3	2,15
R&D Intensity	,0000001	,1109000	,005698959

Table 1 shows that CEO gender is regarded a dummy variable, in which score 1 show that the CEO is male and 0 if the CEO is female. Out of 86 units of analysis, there are more male CEOs than female ones. The age of CEOs ranges from 37 years to 77 years with an average age of 52 years. The lowest level of CEO education is high school/vocational school and the highest is S2. Of the 86 units of analysis, the highest education level among them was graduate school. Table 1 also shows the intensity of research and development intensity (IRD) at an average of 0.0569895 with a minimum value of 0.0000001 and a maximum value of 0.1109000. This shows that some companies spent very little fund for research and development.

The results of the regression analysis examining the influence of CEO characteristics on the R&D intensity are presented in Table 2. Table 2 shows that the CEO gender significance value is 0.33 exceeding the required significance level of 0.05. Based on these results, CEO gender does not significantly influence the intensity of R&D. Therefore, Hypothesis 1 is rejected. This insignificant result might be due to the existence of 19 companies (90%) that were led by male CEOs. Thus, the effect of CEO gender on the amount of R&D cost could not be revealed. In addition, research and development activities require large costs that cannot separated from the risk of failure. Research and development activities require trials and errors before finding the best product or process for the development of the company. This uncertainty of R&D activities definitely affects a company in spending spend R&D costs aside from CEO characteristics, namely gender. Although

gender is not found to have a significant effect on the intensity of R&D, seen from the beta coefficient, the positive value indicates that male CEOs tend to spend more funds on research and development than female CEOs.

Different results were obtained regarding CEO age. As presented in Table 2, CEO age shows a significance value of 0.008 that is smaller than the required level of 0.05. This indicates that Hypothesis 2 in this study is accepted. According to the descriptive data, the youngest age of CEO is 37 years old and the oldest is 77 years old with an average age of 52 years. In terms of age, it can be said that most CEOs have adequate work experience which makes them understand that research and development activities are very important for the sustainability of the company. The positive beta coefficient indicates that older CEOs tend to spend higher cost for research and development activities. In the current era of globalization and industry 4.0, a company must continue to innovate through adequate research and development. In addition, based on the research data, CEOs of companies involved in this research are mostly business owners who understand that R&D activities must be carried out to maintain the sustainability of the company for next successors. The results of this study support the results of a research conducted by Ryan and Wiggins (2002) stating that R&D costs can increase with the increasing age of the CEO. However, at a certain age point, the CEO can reduce R&D costs for various reasons such as when CEOs are about to retire that they believe R&D activities do not have an impact on the compensation they receive.

Table 2 – The Impact of CEO Characteristics on R&D Intensity

	Beta	Sig
CEO Gender	,104	,333
CEO Age	,293	,008**
CEO Education Level	,076	,480

\*\* : statistically significant at 5%.

Regarding the influence of CEO education level on R&D intensity, Table 2 shows that the significance value is 0.480 greater than the required significance level of 0.05. This means that Hypothesis 3 is rejected. Descriptive data shows that the CEO education level of the sampled companies include high school/vocational school, undergraduate level, and graduate level. The average education of research samples is at undergraduate level, where they have similar views about the importance of R&D activities for a company.

The making of decisions related to research and development activities is not affected by the education level of CEO because research and development activities are definitely important activities that must be carried out by any company, especially manufacturing companies. Manufacturing industry in Indonesia is one of industries with high growth and tight competition. Thus, in order to sustain and produce products that meet consumers' expectations, companies must continue to innovate through adequate research and development activities. The results of this study are consistent with Barker and George (2002) who stated that the spending on R&D is not influenced by the level of education of a CEO.

## CONCLUSION

Innovations made by a company can be reflected in the intensity of Research and Development (R&D). R&D intensity refers to the cost incurred by the company for product development and costs to improve the efficiency of a company such as technology utilization for the development of the production process. The making of decisions regarding the budget for R&D involves corporate management and shareholders since R&D activities require large costs. The amount of R&D costs often concerns company shareholders if previous R&D activities failed or did not have any significant effect on product sales, process efficiency, and the performance and corporate value.

Regarding to the cost and risk, R&D activities are influenced by the company characteristics and CEO characteristics. In recent years, research have shown that CEO personal characteristics can affect company policy and company performance. In this research, the influence of CEO characteristics on R&D intensity in manufacturing companies listed in the Indonesia Stock Exchange (IDX) from 2013 to 2017 was examined. Based on the regression analysis carried out in this research, it was found that CEO age had a significant influence on R&D intensity. Whereas, gender and education of CEO did not have significant influence on the intensity of company R&D.

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