

Disclosure of Research and Development information of Thai' s MAI listed Companies during the application of the Thailand 4.0 model.

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Abstract

This work aims to examine relationship and effect of R&D Disclosure along with firm characteristics on financial performance (Return on Asset – ROA) of SME in Thailand Market for Alternative Investment (MAI) in the early phase of Thailand 4.0 model implementation. Descriptive statistical analysis and text unit counting are used to collect R&D Disclosure data from 128 sample companies' annual reports between 2016 and 2018. MRA is used to test effect and relationship. The study shows that first, R&D Disclosure has been on the rise in the past three years but there is no conclusive evidence of R&D Disclosure's direct effect on financial performance. Second, development closure has negative effect from development disclosure, firm age, leverage (debt to equity ratio: DER), and growth rate on financial performance. Third, there is positive effect from Development Disclosure, along with CEO Age, and business sector (S-Curve group). Fourth, effect of research disclosure on financial performance cannot be concluded. Finally, the TAS No. 38: Intangible Asset contributes to R&D Disclosure in the 56-1 report.

Keywords: Research Disclosure, Development Disclosure, MAI Listed Companies, Financial Performance

Background

Innovation and technology are accepted as keys to benefit and competitive edge for the organization and country in the current era. It is also accepted that source of such innovation and technology is R&D efforts [1, 2], which receives much expectation as a gateway to success [3] and good financial performance for the organization and country [4], with a strategy to manage existing resources to fulfill the expectation of better reward [5]. Nevertheless, the Bloomberg Global Innovation Index (GII), which reports ranking of national innovative drive and operation, is usually used to measure overall innovative success at the national level [6]. In 2016, Thailand was grouped in Efficiency-driven Economies, resulting in subsequent announcement of Thailand 4.0 model to adjust the national course, targeting S-curve industries such as innovative industry-cultural capital and high-value service, public health-health and medical technology, food processing and biotechnology, advanced and digital industries, and basic and support industries. The concept is to transform the economy into high value, or high productivity economics, and eventually the country to innovative-based country [7], especially the high-potential, high-growth SMEs in MAI in the Stock Exchange of Thailand as they have support factors that stimulate R&D investment such as tax benefit, and guideline of Thai Accounting Standards (TAS) No. 38: Intangible Assets

which turns the voluntary R&D disclosure into a semi-compulsory affair through accounting standards. Still, information disclosure still varies, depending on characteristics and dynamism of the organization [8] as it tries to build capabilities for continuous operation and build investor confidence, along with positive and negative effect of information disclosure on organizational operation [9]. Information disclosure has methodical freedom as the management can follow Agency Theory and Signaling Theory in presentation of information and guideline for business administration [10, 11]. Nevertheless, R&D report that might affect future operation is limited to SET-registered companies [3], as they are required to disclose R&D information in the annual report (if any). Thailand is also required to report R&D from 2017 onwards. As information disclosure can affect competitiveness, the guideline for disclosure thus is allowed to be part of Management Discussion and Analysis (MD&A) that can better reflect potential and value of the registered firm [12]. Nevertheless, issues from information disclosure are found. In addition to support factors such as increased promotion, stimulation and investment in R&D due to tax measures and TAS No.38, conflicting factors from positive and negative effect of R&D disclosure are found, especially size and performance [12] in terms of financial data and disclosure of information that can attract investors, or affect their decision to invest. [13] found that disclosure has positive effect on investment value and can generate income that can increase return. [14] found positive relationship between investment and R&D disclosure as firm performance has to be disclosed to stakeholders. [15] found that firm size has positive relationship with R&D efforts and disclosure. [16] presented that better resources readiness led to better information disclosure, and R&D disclosure might have negative effect if such R&D was against environment conservation or sustainability development, or investment in unsuccessful or long-term R&D that had yet to bear fruit. [12] found that expenses related with R&D were high, and it would take time before the investment bore fruit. The study also found conflicting effect from protection of rights to the innovation that affected information disclosure. Therefore, it supported that the investment was riskier or more likely to fail rather than successful. [17] found additional factors in SME's R&D investment such as business type, R&D efforts, the stock market's information disclosure guideline and tax that had complex and diverse effect on performance and financial result, which in turn affected the business, resulting in improvement of performance report and disclosure of information related with the business [2]. This work aims to apply data synthesis technique to examine and survey R&D disclosure from complexity and concealment inside the annual report, with the goals to (1) determine effect of R&D disclosure on financial indicator of MAI companies, and 2) joint effect of R&D disclosure and firm characteristics on financial operations.

Literature Reviews

Firm Performance and R&D Disclosure

Stock market-registered companies' information report is based on the concept of "Code of Commerce" and "General Accounting Plan" [3] that require presentation of performance, financial status and future plan of the firm to stakeholders [14], while the report must comply with legal and accounting principles The Stock Exchange of Thailand. Despite the fact that R&D disclosure is still unregulated and voluntary-based [9] the Security and Exchange Commission requires the companies to provide R&D information if it might have effect on future financial status or performance [18], because R&D could affect performance, and sensitivity toward asset value in the market [19], and investor decision. It is found that better-performing companies are more likely to disclose more information [20]. It is also found that the more profit, the more R&D investment will be done. However, some conflicting findings are found, as

R&D investment is expensive which could reflect the accounting expense. In addition, as R&D investment would take time to bear fruit, it affects amount and style of disclosure [13]. Firm performance usually uses indicators such as Return on Equity (ROE) or Return on Asset (ROA) [3].

Firm Characteristics and R&D Disclosure
Many studies explain firm characteristics and effect on performance and information disclosure. Characteristics used for measurement include asset's structure, Leverage, Firm's size, Growth rate, Firm's age, CEO Age, Business Sector, and Return on assets, which are found that they have different effect on R&D performance and information disclosure [3, 14].

Growth rate and R&D Disclosure
Building growth rate varies depending on context and characteristics of the firm [21]. Innovative information disclosure has both positive and negative effect on growth rate. [22] found that R&D disclosure has positive effect on growth rate, because it increased surplus cash, resulting in constant investment and positive effect on R&D operation and disclosure. Nevertheless, some conflicting studies found that innovation does not have positive relationship with the economy. Growth rate usually is measured from changes in revenue or sale in a period of time, to compare continuity and increase of revenue [23].

Firm AGE and R&D Disclosure

Many studies found that age of the firm has positive effect on investment and presentation of R&D information in listed firms, as older firms have high marketing experience, good customer base, good operational experience and R&D disclosure [15, 24-26]. However, later studies also found that experience led to firms not disclosing some information. [27-29] found that new firms can generate value based on a hypothesis of positive relationship between innovation and young firm age. Disclosure and operation by young firms is more likely to stimulate more growth.

Leverage and R&D Disclosure

Leverage is used to explain financial liquidity of the form based on the conservative approach of working capital, that focuses on long-term investment by finding rotating asset and debt. Debt to Asset ratio (DAR) is used as an indicator [30]. R&D investment is found to have relationship with leverage of listed firms [31]. Nevertheless, [14] found positive relationship between investment and R&D disclosure because the need to report performance to stakeholders. [29, 32, 33]; and [16] that found negative relationship added that R&D investment from fundraising or creating debt increased leverage, which is considered a risk and thus affect disclosure, especially if the investment is a failed one or has not borne fruit.

CEO age and R&D Disclosure

CEO age has positive relationship with R&D disclosure due to their wisdom, experience, management skills and abilities to direct the firm [15]. Studies that compare CEO age shows that younger CEOs had limitations in experience that might affect CEO disclosure, or they might choose to avoid disclosing the R&D altogether if performance was poor as they were concerned with performance and investors' decisions during their terms [3]. However, some studies found that younger CEOs could generate faster growth and withstand more fluctuation in profit making compared to the industrial norm [34]. Some studies could not draw relationship between CEO age and R&D disclosure [15].

Sector and R&D Disclosure

[1] found that revenue generation from firm asset, operation and investment in R&D vary from firm to firm, and unique to their sector. [12, 32] found that disclosure within the same sector is largely similar because of their business context. However, some

sectors are required by law to disclose specific information [35]. R&D disclosure does not automatically translate into positive effect in all sectors [33];

Market for Alternative Investment (MAI)

The Market for Alternative Investment (MAI) is founded as a long-term fundraising source for SMEs in the Stock Exchange of Thailand, that have Paid-up capital after IPO of at least 50 million baht. The MAI focuses on firms with high-growth and good growth trend. Practice is largely the same as the SET The Stock Exchange of Thailand, 2020. Relationship and effect of R&D disclosure and firm characteristics on firm performance is also an interesting topic for study [15] along with compliance and support of Thailand 4.0 model and TAS No.38. And hypotheses developed for this study are:

- H1: R&D disclosure has effect on financial performance of MAI listed firms
- H2: Research disclosure and firm characteristics have relationship and effect on financial performance of MAI listed firms
- H3: Development disclosure and firm characteristics have relationship and effect on financial performance of MAI listed firms

Research method

Population and sample: The sampled group is selected by purposive sampling, consisting of 128 firms out of 164 firms which are the entire population of MAI listed firms in the SET [36]. The sample is again filtered based on completeness of reports between 2016 and 2018 (three accounting years), at the early phase of Thailand 4.0 policy, before being used for R&D disclosure study.

Research data collection: Primary data from annual reports is Return on Asset (Y), firm age (X3), business risk (X4, using Debt to Equity Ratio: DER), CEO age (X6), type of S-curve industry (X7). Secondary data is Growth Rate (X5), Research disclosure (X1), and Development disclosure (X2). Research disclosure (X1) and Development disclosure (X2) data collection use text unit counting from sentences in the report. Including word groups that have a complete meaning [37]. Rating and number of data disclosure are collected to explain firm information disclosure based on research method of [38]. Research Disclosure (X1) uses terms such as "R&D into new products", "Human resources used in R&D", "Investment in a new research center", "Disclosure of R&D success", "R&D project estimation", "Finance and content of R&D", "Funding source of R&D", "Accounting/financial data for R&D", and "Accounting policies related with R&D". Develop Disclosure (X2) uses the following terms: "Innovation", "Design", "Knowledge", "Market Analysis", "Innovative development", "Creating new thing", "Develop technological advancement", "Assessment", "Searching" and "Creativity".

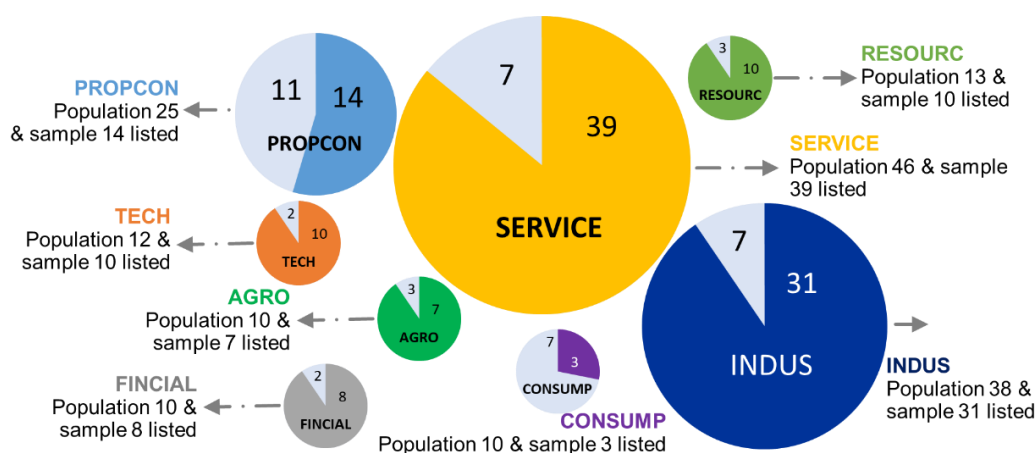
Data analysis: The researcher uses descriptive statistics, panel correlation matrix test and multiple regression analysis (MRA) to make assessment of Return on Asset (ROA; Y). The equation is as follows:

$$\text{First equation: } Y = b_0 + b_1X_1 + b_2X_2 + e$$

$$\text{Second equation: } Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + e$$

Result and Discussion

1) Details of sample group: The sampled MAI-listed firms that passed the selection as firms with complete annual report throughout the research period. 128 firms (78.05% of the population) are selected as shown in Figure 1.



The Stock Exchange of Thailand MAI N = 164, n = 128 (78.05%)

Figure 1: Harvey ball of MAI population and sample selections

Proportion of the sample group is: 30.47% are in service, 24.22% are in industrial product, 10.94% are in property and construction, 7.81% are in resources, 7.81% are in technology, 7.03% are in consumption, 6.25% are in finance, and 5.47% are in agricultural and food.

2) Result of R&D disclosure study

Table 1

Result of study of return on asset ratio, research disclosure and development disclosure.

Year	Return on Asset ratio (ROA, %, Y)		Research disclosure (word, X1)		Development disclosure (word, X2)	
	Mean	SD	Mean	SD	Mean	SD
2016	3.61	15.34	247.98	210.40	161.82	177.39
2017	2.13	15.05	277.44	230.50	164.38	199.22
2018	1.80	15.91	304.28	257.34	177.98	202.41
2016-2018 Average	2.51	13.38	276.57	203.42	168.06	165.38

According to Table 1, between 2016 and 2018 the mean ROA (Y) is 2.51 % (SD = 13.38). The mean of research Disclosure (X1) is 276.57 words (SD 203.42). The mean of development Disclosure (X2) is 168.06 words (SD 165.38). Mean annual ROA is 3.61 % (SD 15.34), 2.13 % (SD 15.05), and 1.80% (SD 15.91) respectively. Annual research disclosure has 247.98 words (SD 210.40), 277.44 words (SD 230.50), and 304.28 words (SD 257.34) respectively. Annual development disclosure has 161.82 words (SD 177.39), 164.38 words (SD 199.22), and 177.98 words (SD 202.41).

3) Result of MRA descriptive statistic & correlation analysis is shown in Table 2.

Table 2

Descriptive Statistic & Correlation analysis

Variable	Descriptive Statistic	Correlation analysis.
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	MEAN	SD	X1	X2	X3	X4	X5	X6
Research disclosure (X1)	276.57	203.42						
Development disclosure (X2)	168.06	165.38	.132**					
Firm Age (yrs.) X3	24.67	10.54	-.021	-.052				
Leverage (DAR) (time) X4	1.47	2.82	.036	-.058	.027			
Growth Rate (%) X5	-17.36	37.89	.000	.077	.062	-.263**		
CEO Age (yrs.) X6	64.51	37.29	.063	-.118*	.089	-.106*	.016	
Type of S-Curve SECTOR (%) X7	.461	0.50	-.042	-.058	-.092	-.024	.020	.002

*, ** are P-value = .05, .01 respectively. Pearson' Correlation <0.7. All variable inflation factor (VIF) of independent variables were lower than threshold 10.0 indicating that multicollinearity is not a major concern [39]

According to Table 2, mean research disclosure (X1) is 276.57 words (SD = 203.42), while the mean of development disclosure (X2) is 168.06 words (SD = 165.38). Regarding firm characteristics, mean firm age is 24.67 years (SD = 10.54), leverage (DAR) is 1.47 time (SD = 2.82). Mean growth rate is -17.36% (SD = 37.89). Mean CEO age is 64.51 years (SD = 37.29). SECTOR is 46.1%.

4) Result of Multiple Regression Analysis (MRA) using Pearson's Correlation, along with multicollinearity test, and relationship test are shown in Table 3.

Table 3

Result of Multiple Regression Analysis (MRA)

Variable	Un-stand. Coefficients		Stand. Coefficients Beta	t	sig
	B	Std. Error			
Constant (Model 1)	3.627	1.349		2.689	.007**
Research disclosure (X1)	.000	.003	.004	.069	.945
Development disclosure (X2)	-.007	.004	-.087	-1.696	.091
R2					.008
Adjusted R2					.002
F-Value (Sig)				1.541 (.236)	
Constant (Model 2)	-.786	5.297		-.148	.882
Research disclosure (X1)	.001	.003	.011	.220	.826
Development disclosure (X2)	-.008	.004	-.096	-1.987	.048*
Firm Age (yrs.) X3	-.211	.070	-.144	-3.015	.003**
Leverage (DAR) (time) X4	-1.250	.189	-.327	-6.629	.000**
Growth Rate (%) X5	-.005	.013	-.017	-.346	.729
CEO Age (yrs.) X6	.151	.074	.098	2.042	.042*
Type of S-Curve sector - SECTOR (%) X7	3.602	1.465	.117	2.459	.014*

R2				.167
Adjusted R2				.151
F-Value (Sig)				10.762 (.000**)

4.1) test of direct relationship between ROA (Y) and Research disclosure (X1) and Development disclosure (X2) shows that despite the positive relationship with Research disclosure (X1) and negative relationship with development disclosure (X2), there is no conclusive evidence to prove statistical significance and the first equation.

4.2) test of direct relationship of ROA (Y) in the second equation is able to explain 16.7% (R2 = .167) of the statistically-significant positive relationship between SECTOR (%) X7 and CEO Age (yrs.) X6. Conversely, statistically-significant negative relationship is found between Leverage (X4), Firm Age (X3), and Development Disclosure (X2). There is no conclusive evidence to prove effect of Research Disclosure (X1), Growth Rate (X5) and constant value on ROA. The second equation can be explained that

$$\text{ROA} = -0.008 \text{ Development disclosure (X2)} - .211 \text{ Firm Age (X3)} - 1.250 \text{ Leverage (X4)} + .151 \text{ CEO Age X6} + 3.602 \text{ SECTOR (X7)}$$

Discussion

The first issue is that the ROA in the last three years has been decreasing, while R&D disclosure has been increasing. Nevertheless, this study still cannot confirm direct relationship with statistical significance, which conflicts with [33]. This finding confirms relationship between R&D disclosure and investment as cost, thus affecting current ROA. This confirms that R&D is future expectation of profit rather than immediate. [17] proposed that ROA should be compared within an industrial sector rather than between.

The second issue is result of MRA on R&D disclosure and firm characteristics. 1) Research disclosure in MAI group has positive effect on ROA but cannot explain relationship with statistical significance. Research investment is expensive, which affects ROA. Accounting standard still does not support the report [23], resulting in less disclosure, which concurs with [9] Development Disclosure has statistically-significant negative effect, concurring with [40], which found that R&D investment increased according to accounting and tax conditions.

The third issue is characteristics of joint effect from research disclosure. The study discovers positive relationship with Development Disclosure, CEO Age, Leverage, and Growth Rate. Negative relationship with Sector and firm age is also found. It can be discussed that 1) positive relationship with development disclosure can be attributed to effect of research on development, as one that needs the other. This concurs with [41]; and [31] Positive relationship with CEO age concurs with [15] that currently CEOs have more attention on research and development as they see future benefit on performance, and expression of management vision. 3) research disclosure has positive relationship with DAR, concurring with [17] which found that disclosure of research data as part of performance report to the stakeholders result in better firm leverage. 4) Research disclosure has positive relationship with growth rate, concurring with [13], which explained that research investment can generate future growth rate. 5) being in the sector that R&D disclosure is expected, research disclosure can have either positive or negative effect. [35] proposed that R&D disclosure varies between sectors and studies should be done within each sector rather than all of them together. 6) Research disclosure shows negative relationship with firm age, in agreement with [27-29] which found that younger firms could use information disclosure to generate better growth with research and disclosure to investors. [26] proposed that R&D efforts would have positive effect if they complement the core value of the business in young SMEs.

The final issue is characteristics of effect of development disclosure and positive relationship with growth rate and negative relationship with CEO Age, Firm Age, Leverage and SECTOR on performance. It is proposed that 1) positive relationship with growth rate shows increased revenue, which would attract more investment, concurring with [12] which found that support factors like tax benefit would lead to more disclosure. 2) CEO age (yrs.) has negative relationship with development disclosure which shows investment to solve problems. [15] found that CEO Age shows management ability but solving the problem is perceived as reduced performance. 3) negative relationship with leverage concurs with [30, 31] which found that listed firms usually invest by fundraising. [16] explained that investment in development reflects problems and risks, resulting in reduced R&D disclosure [33] as the latter was a high-risk investment. 4) Relationship between development disclosure and SECTOR across the sectors concurs with [21, 32]. Negative relationship might occur from mixing MAI-listed firms from many sectors for study in an attempt to get an overall image. When mixed with development efforts to solve problems, this might show problems in the sector in disclosure, but such disclosure can support and promote overall image. 5) Negative relationship with firm age concurs with [15, 24, 28], which stated that development disclosure showed inadequate experience and proficiency.

Suggestions and application guideline

Guideline for financial analysis pertaining to R&D disclosure cannot definitively conclude a relationship with financial performance of MAI-listed firms. Conversely, Development disclosure has relationship with financial performance. According to the TAS No. 38 (Update 2018), firms can record development expenses as assets in their budget, which would affect operation, and lead to more R&D disclosure in the report. This work would like to suggest that an effort to develop and drive the economy per Thailand 4.0 model through tax benefit and accounting standard is considered a positive support, but disclosure that might affect investor performance needs more transparency according to the principle of good governance and mutual data disclosure. Theoretically, R&D disclosure through text unit counting may be studied together with financial accounting.

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