# Earnings information of Thai listed firms investing in information technology

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**Received:** 2023-06-14; **Revised:** 2023-09-29; **Accepted:** 2023-09-30

**บทคัดย่อ**

การศึกษาวิจัยครั้งนี้มีวัตถุประสงค์เพื่อศึกษาข้อมูลกำไรในบริษัทไทยที่มีการลงทุนในเทคโนโลยีสารสนเทศ ซึ่งผลวิจัยในอดีตมีความแตกต่างกันสำหรับเรื่องความเกี่ยวข้องกับการตัดสินใจเมื่อมีการนำเทคโนโลยีสารสนเทศมาใช้ในกิจการ โดยศึกษาจากเสถียรภาพกำไรบริษัทไทยที่มีการลงทุนในเทคโนโลยีสารสนเทศ งานวิจัยนี้ศึกษาข้อมูลระหว่างปี พ.ศ. 2560-2564 ในการวิเคราะห์หลังจากที่มีการควบคุมตัวแปรเกี่ยวกับเวลาและอุตสาหกรรมพบว่า ความเกี่ยวข้องของข้อมูลกำไรเพื่อการตัดสินใจในบริษัทที่มีการลงทุนในเทคโนโลยีสารสนเทศมีค่าต่ำกว่าในบริษัทที่ไม่มีการลงทุนเทคโนโลยีสารสนเทศ และเสถียรภาพกำไรระหว่างบริษัทที่มีการลงทุนในเทคโนโลยีสารสนเทศเทียบกับบริษัทที่ไม่มีการลงทุนในเทคโนโลยีสารสนเทศไม่มีความแตกต่างกันอย่างมีนัยสำคัญ ผลวิจัยสอดคล้องกับงานวิจัยในอดีต ซึ่งงานวิจัยนี้เสนอว่างบการเงินไม่ได้สะท้อนการลงทุนในเทคโนโลยีสารสนเทศของกิจการ อีกทั้งตลาดทุนไม่ตอบสนองต่อมูลค่าของการลงทุนในเทคโนโลยีสารสนเทศ

**คำสำคัญ:** กำไร, เทคโนโลยีสารสนเทศ, เสถียรภาพกำไร

**Abstract**

The purposes of this research study were to Earnings information of Thai listed firms investing in information technology (IT firms) in Thai settings. Findings from prior work are varied for the value relevance of information technology information. We also consider earnings information quality for IT firms through earnings persistence. We investigate sample data during 2017 – 2021 for our analysis. By controlling for time and industry variants, we evidence that the value relevance of earnings for IT firms is lower relative to firms without information technology investment (Non-IT firms), and earnings persistence between IT and

Non-IT firms were not statistically different. Consistent with prior work, this study suggests that financial statements may not reflect information technology and stock price does not value information technology investment.

**Keywords:** Earnings, Information Technology, Persistence

## Introduction

In this study we document that the stock market values information technology investment over traditional financial reporting information for firms listed in Thai stock exchanges. As suggested by prior work (Barth et al., 2018), the value relevance of earnings has declined especially when transitioning to the new economy that is based on service and information technology. Information technology may create competitive advantages for innovative organization. Information technology as one of intangible assets is important for a firm to account it in financial statements. However, financial statements may not fully capture such advantages nor timely report them (Lev and Zarowin, 1999). Thus, the question we address is whether value relevance of earnings between firms investing and not investing in information technology is different.

Since financial statements may not fully account investment of information technology, accounting measures may not reflect the existence of information technology on timely basis. We, then, assume that earnings information does not capture such investment. To corroborate our findings related to the value relevance of earnings information for a firm investing in information technology, the second point we address here is whether earnings quality between firms investing and not investing in information technology is different. Our findings should provide additional evidence for emerging market settings that the implementation of information technology is value relevant for a firm. In addition to the value relevance, our findings reveal earnings information quality between firms with and without information technology investments.

We organize the remainder of this study as follows. Next section 2 is related literature. Section 3 discusses the data and methodology. Section 4 presents empirical evidence on the value relevance of earnings and earnings persistence and section 5 concludes.

**Related Literature**

A large literature documents the value relevance of accounting information. Prior studies employ several proxies to explain the value relevance of earnings information. Among those measures, intangible asset is one of researchers' interests. Intangible assets are mostly accounted as advanced technology or intellectual property. Intangible assets can be arisen from the investment in technology base and should generate economic benefits to a firm. However, prior studies documented that the value relevance of earnings information has declined for the firm investing in high intangible assets (Barth et al., 2018).

Information technology is not only the foundation of information technology components such as hardware, software, or networks but also shared service, data, information and technology applications. Technology capacity is an important part for a firm to achieve their business process. The infrastructure of technology, thus, is important for a firm performance (Razali, 2017). However, the impact of information technology investment in firm's financial performance has not been conclusive (Bogarin, 2022). In the agriculture business, Oyelami, L. O., Sofoluwe, N. A. & Ajeigbe, O. M. (2022) suggest that information technology must be increased with care. The investment in information technology alone may not help a firm to improve a firm's output (Razali, 2017) but it can observe a positive impact of information technology on firm performance in the long run. Arslan and Ozturan (2011) find that information technology with supports including complementary assets, capability, and organization competencies is positively related to firm performance in Turkey. This suggests that only information technology may not drive the firm to achieve desired performance. Faisol, Suhardi, Puji Astuti, Subagyo (2022) find that information technology adoption is important factor to improve business performance for small enterprises. Rajgopal et al., 2003 evideced that the stock market values information technology over accounting information measures in a firm implementing network system. In terms of earnings quality estimated through earnings persistence, Kim and Nikolaev (2022) evidence that earnings information is more informative for future prediction when it is come with context information around earnings disclosure. Baginski et al. (2001) suggest that earnings persistence has declined over 35-year period in US firms regardless of how much spending for information technology investment through time. Yu, Wang and Chang (2009) evidence the value relevance of intellectual capital in information technology firms but they do not observe earnings persistence through intellectual capital spending.

According to the prior work, the findings about value relevance and earnings persistence on information technology spending are mixed. However, financial statements have not timely reflected information technology investment. We argue that the value relevance of earnings and earnings persistence among firms should not be different regardless of how large amount they have spent for information technology.

**Research Objectives**

Study Earnings information of Thai listed firms investing in information technology

**Data and methodology**

The sample firms consist of all the firms listed on the Thai stock exchanges during 2017-2021. Data and share prices employed for this study are obtained from the SET market analysis and reporting tool (SETSMART), officially provided by Stock Exchange of Thailand. After dropping missing data, the initially testable sample consists of 1,639 firm- year observations from eight industries grouped by the stock exchange. To avoid fiscal year difference, we employ only firms with 31 December year-end.

This study focuses on the firms that appointed information technology function as one of top executive functions in their organization structure, i.e. Chief Technology Officer (CTO) or the managing director (MD) of information technology. Some firms have not accounted information technology as one of the top management functions but they have only the manager or director in information technology. For this research, we establish two groups of sample firms. The first group includes information technology firms (IT firms) if they have top executive functions in information technology and the second group is non-information technology firms (Non-IT firms) if the firm's organize structure does not show information technology at the top executive position, i.e. division manager or director and below. We obtain the information technology executive position by hand collection from the firm's annual report every tested year.

To investigate data in our settings, this study performs value relevance by using a price and share return models (Ohlson, 1995) with variables deflated by scale factor to avoid biases to research results because of the scale effect. We also control for time and a firm's industry effects in our models to avoid possible biases. We use the indicator variable to differentiate between IT firms and Non-IT firms the top executive function in information technology.

In this regard, the specification to test our hypothesis that the value relevance of earnings in IT firms differs from that of Non-IT firms is the following:

Price model: $P_{it} = \alpha_0 + \alpha_1 EPS_{it} + \alpha_2 EPS*IT_{it} + \alpha_3 SIZE_{it}$ + time and industry effects + $\varepsilon_{it}$ (1)

Return model: $R_{it} = \lambda_0 + \lambda_1 \Delta EPS_{it} + \lambda_2 \Delta EPS*IT_{it} + \lambda_3 SIZE_{it}$ + time and industry effects + $\varepsilon_{it}$ (2)

where:

$P_{it}$ is share price three months after fiscal year-end scaled by share price three months after fiscal year-end last year;

$R_{it}$ is share return;

$EPS_{it}$ is earnings per shared scaled by the previous year share price;

$\Delta EPS_{it}$ is the change in earnings per share;

$SIZE_{it}$ is the natural logarithm of market capitalization;

$IT_{it}$ is indicator variable for information technology. The dummy equals 1 if the information technology function in sample firms is one of the top executive functions presented on the firm's organization structure and 0 otherwise;

$\varepsilon_{it}$ is the error term;

subscripts *i* and *t* are the firms and the years in the estimation.

As in previous studies, we examine accounting information's value relevance by estimating the statistically significant coefficient.The statistically significant coefficient suggests the value relevance of the corresponding variables. $\alpha_2$ and $\lambda_2$ are the coefficients of interest and they should capture the presence of incremental value relevance of IT firms compared to that of Non-IT firms.

In addition to value relevance of accounting information, we investigate the firm's earnings quality based on the estimation of earnings persistence. We compare earnings persistence between IT firms and Non-IT firms. The regression model is operationalized as follows.

$NP_{it} = \beta_0 + \beta_1 ACC_{it-1} + \beta_2 ACC_{it-1}*IT_{it} + \beta_3 CF_{it-1} + \beta_4 CF_{it-1}*IT_{it}$ + time and industry effects + $\varepsilon_{it}$ (3)

where:

$NP_{it}$ is net profit scaled by total asset for firm *i* at year *t*;

$ACC_{it-1}$ is accrual scaled by total asset for firm *i* at year *t-1*;

$CF_{it-1}$ is operating cash flow scaled by total asset for firm *i* at year *t-1*;

$IT_{it}$ is indicator variable for information technology. The dummy equals 1 if the information technology function in sample firms is one of the top executive functions presented on the firm's organization structure and 0 otherwise;

$\varepsilon_{it}$ is the error term.

The statistically significant coefficients of interest- $\beta_2$ and $\beta_4$, represent the higher earnings persistence in IT firms comparing to that of Non-IT firms. The expected sign of $\beta_1$ and $\beta_3$ is positive, suggesting that earnings information of firms is persistent.

## Results

**Table 1** Descriptive Statistics

| Variable | Mean | Median | Std. Dev. | Minimum | Maximum | N |
|---|---|---|---|---|---|---|
| $P_{it}$ | 1.157 | 0.936 | 1.182 | 0.042 | 30.625 | 1,639 |
| $EPS_{it}$ | 0.009 | 0.048 | 0.236 | -4.032 | 0.725 | 1,639 |
| $IT_{it}$ | 0.587 | 1 | 0.493 | 0 | 1 | 1,639 |
| $SIZE_{it}$ | 22.368 | 22.064 | 1.700 | 17.853 | 27.901 | 1,639 |
| $R_{it}$ | 0.214 | -0.047 | 1.281 | -0.958 | 29.625 | 1,270 |
| $\Delta EPS_{it}$ | -0.007 | 0.003 | 0.272 | -4.200 | 4.040 | 1,270 |
| $NP_{it}$ | 0.029 | 0.031 | 0.092 | -1.499 | 0.558 | 1,237 |
| $ACC_{it-1}$ | -0.036 | -0.032 | 0.156 | -4.383 | 0.377 | 1,237 |
| $CF_{it-1}$ | 0.066 | 0.063 | 0.127 | -0.470 | 2.883 | 1,237 |

$P_{it}$ is share price three months after fiscal year-end scaled by share price three months after fiscal year-end last year; $R_{it}$ is share return; $EPS_{it}$ is earnings per shared scaled by the previous year share price; $\Delta EPS_{it}$ is the change in EPS scaled by the previous year share price; $SIZE_{it}$ is the natural logarithm of market capitalization; $IT_{it}$ is indicator variable for information technology. The dummy equals 1 if the information technology function in sample firms is one of the top executive functions presented on the firm' s organization structure; $NP_{it}$ is net profit scaled by total asset; $ACC_{it-1}$ is accrual scaled by total asset; $CF_{it-1}$ is operating cash flow scaled by total asset; N is firm-year observations.

Table 1 presents descriptive statistics for variables. Table 1 reveal mean price (P) is 1.157 and mean earnings per share (EPS) is 0.009. The table shows mean share return, R (changes in earnings, $\Delta$EPS) is 0.214 (-0.007). Spearman and Pearson correlations presented in

Table 2 reveal the correlation between share price (return) and earnings information. These are consistent with prior studies (Tungsriwong, 2022).

**Table 2** Correlation: Spearman (Pearson) correlation is presented in above (below) diagonal.

| Variable | $P_{it}$ | $EPS_{it}$ | $R_{it}$ | $\Delta EPS_{it}$ | $NP_{it}$ | $ACC_{it-1}$ | $CF_{it-1}$ |
|---|---|---|---|---|---|---|---|
| $P_{it}$ | 1 | 0.020 | | | | | |
| $EPS_{it}$ | 0.055** | 1 | | | | | |
| $R_{it}$ | | | 1 | -0.017 | | | |
| $\Delta EPS_{it}$ | | | 0.153*** | 1 | | | |
| $NP_{it}$ | | | | | 1 | 0.095*** | 0.410*** |
| $ACC_{it-1}$ | | | | | 0.180*** | 1 | - |
| $CF_{it-1}$ | | | | | 0.181*** | -0.818*** | 1 |

$P_{it}$ is share price three months after fiscal year-end scaled by share price three months after fiscal year-end last year; $R_{it}$ is share return; $EPS_{it}$ is earnings per shared scaled by the previous year share price; $\Delta EPS_{it}$ is the change in EPS scaled by the previous year share price; $NP_{it}$ is net profit scaled by total asset; $ACC_{it-1}$ is accrual scaled by total asset; $CF_{it-1}$ is operating cash flow scaled by total asset. *** and ** denote correlation coefficient statistically significant at 1% and 5% level, respectively.

**Table 3** Main results

Panel A

$$P_{it} = \alpha_0 + \alpha_1 EPS_{it} + \alpha_2 EPS*IT_{it} + \alpha_3 SIZE_{it} + \text{time and industry effects} + \varepsilon_{it}$$

| Variable | Coefficient Estimate | *t-statistic* |
|---|---|---|
| Constant | 1.057 | 2.72*** |
| $EPS_{it}$ | 0.519 | 4.79*** |
| $EPS*IT_{it}$ | -0.278 | -2.00** |
| $SIZE_{it}$ | -0.003 | -0.200 |
| Adjusted $R^2$ | | 17.50% |
| N | | 1,639 |
| | | The year dummies and industry dummies variables are included. |

$P_{it}$ is share price three months after fiscal year-end scaled by share price three months after fiscal year-end last year; $EPS_{it}$ is earnings per shared scaled by the previous year share price; $EPS*IT_{it}$ is the multiplication of the dummy variable IT with EPS; $SIZE_{it}$ is the natural logarithm of market capitalization; N is firm-year observations. **** and ** denote correlation coefficient estimate significant at 1% and 5% level, respectively*.

Panel B

$R_{it} = \lambda_0 + \lambda_1 \Delta EPS_{it} + \lambda_2 \Delta EPS^{*}IT_{it} + \lambda_3 SIZE_{it}$ + time and industry effects + $\varepsilon_{it}$

| Variable | Coefficient Estimate | *t-statistic* |
|---|---|---|
| Constant | -0.482 | -1.23 |
| $\Delta EPS_{it}$ | 0.028 | 3.03*** |
| $\Delta EPS_{it}$ *$IT_{it}$ | -0.016 | -1.34 |
| $SIZE_{it}$ | 0.005 | 0.27 |
| Adjusted $R^2$ | | 18.30% |
| N | | 1,270 |
| | The year dummies and industry dummies variables are included. | |

$R_{it}$ is share return; $\Delta EPS_{it}$ is the change in EPS scaled by the previous year share price; $\Delta EPS_{it}$ *$IT_{it}$ is the multiplication of the dummy variable IT with $\Delta EPS_{it}$; $SIZE_{it}$ is the natural logarithm of market capitalization; N is firm-year observations. **** denotes coefficient estimate statistically significant at 1% level.*

Table 3 presents findings relating to value relevance. In the regression model, we add time dummies and industry dummies to control for any unmodeled variation in connection with year and industry. We use scaled factors for the testable specification and Huber-White sandwich estimators for adjusted standard errors to address potential heteroskedasticity in error terms of equation. The research interest is value relevance of earnings in IT firms and Non-IT firms. We would expect the coefficient on EPS*$IT_{it}$, $\alpha_{2,}$ to be negative and statistically significant. As shown in panel A, findings from estimating equation (1) reveal that the coefficient on earnings is positive and statistically significant (coefficient = 0.519, t-statistic = 4.79). Consistent with prior work (Lev and Zarowin, 1999, Barth et al., 2018), coefficient of EPS*$IT_{it}$ is reliably negative (coefficient = -0.278, t-statistic = -2.00). The financial variables explain 17.5% on the cross-sectional variable in market values of firms. An important implementation behind this basic value-relevance analysis is that the change in business operation by implementing information system and technology may not be sufficiently reflected on current financial reporting system (Lev and Zarowin, 1999)

To further analyzing if the value relevance analysis shown previously is valid, we estimate the share return model as presented in panel B. Note that the coefficient on earnings changes ($\Delta EPS_{it}$) is positive and statistically significant (coefficient = 0.028, t-statistic

= 3.03), whereas the coefficient on $\Delta EPS_{it}$ * $IT_{it}$, $\lambda_2$, is insignificant. The explanatory power of the regression of share return on financial reporting information as $R^2$ jumps to 18.30%. Thus, the value relevance of IT firms has not been differed from that of Non-IT firms but the IT firm value relevant is more likely to be declined relative to the counterpart.

To determine earnings performance through earnings persistence, table 4 reveals that cash (coefficient = 0.631, t-statistic = 8.10) is more persistent than accrual (coefficient = 0.494, t-statistic 4.75). A F-test shows that the significant coefficients of accrual component and cash component are not equal (F-test = 8.66). Consistent with prior work (Sloan, 1996), the magnitude of accrual component is smaller than that of cash component in earnings persistence.

**Table 4** Earnings persistence

$NP_{it} = \beta_0 + \beta_1 ACC_{it-1} + \beta_2 ACC_{it-1}*IT_{it} + \beta_3 CF_{it-1} + \beta_4 CF_{it-1}*IT_{it} + \beta_5 SIZE_{it} + \varepsilon_{it}$

| Variable | Coefficient Estimate | *t-statistic* |
|---|---|---|
| Constant | -0.146 | -4.64*** |
| $ACC_{it-1}$ | 0.494 | 4.75*** |
| $ACC_{it-1}*IT_{it}$ | 0.083 | 0.73 |
| $CF_{it-1}$ | 0.631 | 8.10*** |
| $CF_{it-1}*IT_{it}$ | 0.071 | 0.80 |
| $SIZE_{it}$ | 0.007 | 5.31*** |
| Adjusted $R^2$ | | 0.375 |
| N | | 1,237 |
| F-test of $\beta_1 = \beta_3$: 8.66*** | | |
| The year and industry dummy variables are included. | | |

$NP_{it}$ is net profit scaled by total asset; $ACC_{it-1}$ is accrual scaled by total asset; $CF_{it-1}$ is operating cash flow scaled by total asset; $ACC_{it-1}*IT_{it}$ is the multiplication of the dummy variable IT with $ACC_{it-1}$; $CF_{it-1}*IT_{it}$ is the multiplication of the dummy variable IT with $CF_{it-1}$; $SIZE_{it}$ is the natural logarithm of market capitalization; N is firm-year observations. *** denotes coefficient estimate statistically significant at 1% level.

Following Dechow (1994), a firm is more likely to manage accrual attributes to level the potential for wide variability in cash flows. In addition, a firm tends to employ accrual components to achieve the desired performance. In our analysis, we add the multiplication of the indicator variable IT with accrual and cash components to capture the differential

persistence of accrual and cash components between IT firms and Non-IT firms. As expected, the coefficients on $\beta_2$ and $\beta_4$ are insignificant suggesting that earnings persistence attributable to the accrual and cash components of earnings is not different between IT firms and Non-IT firms.

**Additional Tests**

In our analysis, we use all industries to obtain the result. However, the firm in finance, insurance and bank industry may have different accounting information system. Thus, we re-estimate both value relevance equations by excluding those financial firms. Unablated results are qualitatively similar to the main results as explained previously. The prior work also suggests that the loss firm may induce different effect on value relevance results. We, thus, re-estimate by using only profit firms. Unablated results are also qualitatively similar to the main result as above presented. For the earnings persistence analysis, we also exclude financial firms for the additional analysis. Unablated results do not differ from the main result. However, to gain more insight about the difference between IT firms and Non-IT firms for this study, we use logistic regression to investigate the difference of traditional financial information between those two groups of firms. We operationalize the model as follows:

$$IT_{it} = \partial_0 EPS_{it} + \partial_1 ACC_{it} + \partial_2 CF + \partial_3 SIZE_{it} + \varepsilon_{it}$$

**Table 5** Logistic regression

| | All firms | | Exclude financial firms | |
|---|---|---|---|---|
| Variable | Coefficient Estimate | *t-statistic* | Coefficient Estimate | *t-statistic* |
| Constant | -1.149 | -1.61 | -0.419 | -0.55 |
| $EPS_{it}$ | 0.341 | 1.20 | 0.204 | 0.76 |
| $ACC_{it}$ | -1.552 | -2.15** | -1.239 | -1.71 |
| $CF_{it}$ | -2.226 | -2.56** | -1.309 | -1.49 |
| $SIZE_{it}$ | 0.066 | 2.10** | 0.027 | 0.79 |
| Pseudo $R^2$ | | 0.0051 | | 0.0025 |
| N | | 1,710 | | 1,499 |
| | The year dummy is added | | The year dummy is added. | |

$EPS_{it}$ is earnings per shared scaled by the previous year share price; $ACC_{it}$ is accrual scaled by total asset; $CF_{it}$ is operating cash flow scaled by total asset; $SIZE_{it}$ is the natural logarithm of market capitalization; and N is firm-year observations. ** denotes coefficient estimate statistically significant at 5% level.

Both columns in table 5 show that earnings information (EPS) is not significantly different between two sample groups. Based on all testable firms in column one, it shows that accrual components (ACC) and cash components (CF) between IT firms and Non-IT firms are statistically significantly different. Relative to the Non-IT firms, the IT firm has lower accrual components and cash components. In addition, IT firm size (SIZE) is significantly larger than Non-IT firm size. The significant difference may be induced from financial firms included in the analysis. As shown in column 2, when excluding financial firms, all variables including earnings, accrual components, cash components, and firm size are not statistically significant. Thus, we would suggest that the financial firm is more likely to implement information technology for their business process relative to the non-financial firm. However, as suggested by the analysis result, to improve firm performance by implementing information technology is still in doubt whether the use of information technology really improves firm performance. Thus, business operation environment other than information technology is also very important for a firm to improve its performance as suggested by Lev and Zarowin (1999).

## Concluding Remarks

In response to the decline of value relevance of earnings information when moving forward to information technology-based economy, we provide some of first evidence in Thai settings that the information technology implementation is not reasonably valued by the stock market although the information technology should improve business operations leading to the better firm performance. We find that the market values equality for the firm with and without information technology investment. In addition, we do not observe the difference of earnings information quality between the firm with and without information technology investment. However, the magnitude of a firm that invests in information technology is large.

Our work is subject to several limitations. First, there are more than one channel for the investment in information technology. For example, a firm may perform information technology investment through the investment of intangible asset or research and development. Thus, accumulation of evidence about information technology investment would be an interesting avenue for future study. Second, the nonfinancial indicators might be an interesting extension and it should make the future evaluation to be more comprehensive. Third, our inferences are based on relatively short time span. The high investment in information technology may require a longer time to fully achieve its

performance and finally improve a firm's business performance. The longer time span analysis may capture the mismatch between revenues and expenses from investments.

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