Revitalizing IT-Based Enterprises: Uncovering Innovative Strategies for Performance Enhancement via Partial Adjustment Valuation

(A Case Study of Indonesian Banking Industry)

Kessya Azzahra Rismadewi[1], Lukman Abdurahman[2], Muharman Lubis[3], and Muhammad Fakhrul Safitra[4]

[1,2,3,4] Telkom University, Jl. Telekomunikasi, 40257, Indonesia
[1]kecaaaa@student.telkomuniversity.ac.id

Abstract. In general, many banks have not fully optimized their IT-based investment efforts, particularly when anticipating gradual changes or adjustments in specific financial variables over time. This approach is primarily employed to assess the valuation of assets, securities, or companies. The primary data source for this study comprised Annual Reports from three prominent Indonesian banking institutions: BNI, Mandiri, and BRI, spanning the period from 2006 to 2021. The percentage values obtained for these banks are as follows: BNI at 30%, Mandiri at 25%, and BRI at 21%. Combining the percentages for these three banks, the overall percentages are 25% for BNI, 21% for BRI, and 30% for Mandiri. Conversely, the average percentages for these institutions are as follows: BNI at 75%, BRI at 63%, and Mandiri at 90%. Based on these findings, companies can enhance their performance by evaluating their IT investments and aligning their expectations with the future value of IT. Essentially, the improvement in performance for banking institutions can continue to rise without the need for additional capital expenditures, although income may increase without necessarily reaching the expected levels. Consequently, businesses must optimize the value of IT in accordance with their strategic plans, considering factors such as equity liquidity, minimum wages, labor costs, capital expenditure, and income.

Keywords: Business positioning, IT-based enterprises, partial adjustment valuation, performance enhancement, systems engineering, valuation methodologies, information technology.

1 Introduction

Indonesia, as a leading nation with a substantial population of internet users, is committed to safeguarding public interests through comprehensive legislation [1]. The integration of information technology (IT) into business operations holds paramount significance in enhancing the efficiency and effectiveness of a company's processes. The contemporary IT landscape plays a pivotal role in mitigating challenges and

M. D. Sulistiyo and R. A. Nugraha (eds.), *Proceedings of the International Conference on Enterprise and Industrial Systems (ICOEINS 2023)*, Advances in Economics, Business and Management Research 270,
https://doi.org/10.2991/978-94-6463-340-5_8

predicaments faced by businesses striving to harness the full potential of IT adoption [2]. The rapid evolution of technology has left an indelible imprint on various facets of life, reshaping the dissemination of precise, efficient, and effective information by individuals, organizations, and governments [2].

The transformative power of IT extends to a company's competitive edge and its capacity to streamline business processes in pursuit of strategic objectives [1]. Virtually every enterprise invests in information systems (IS) and IT to realize their business objectives, aiming to cultivate a resourceful reservoir of swift, accurate, and comprehensive information, both internally and externally [1]. Nevertheless, such investments necessitate substantial resources and entail inherent risks and drawbacks, emblematic of the IT landscape [3]. In today's digital milieu, the Java library Log4j has emerged as a ubiquitous tool for error message logging within applications [4]. Cyberattacks targeting these systems can exert tangible consequences, especially in the control of physical processes [5].

Presently, IT wields a formidable influence over a company's operational workflows, offering novel opportunities for addressing critical imperatives, as supported by recent research findings [6]:

1. Digitization capability can augment operational efficiency through the automation of manual tasks and the seamless integration of business processes.
2. Digitization capability can drive revenue growth by expanding market reach, fostering innovation in product development and services, and elevating customer satisfaction.
3. Digitization capability can bolster competitiveness by affording access to a broader spectrum of information and resources, thereby catalyzing faster innovation.

Economic interdependence manifests in both production and consumption markets, with changes in one country's economy reverberating across borders. The pinnacle of integration in international financial economics materializes in the formation of a single currency, a currency union [7].

Companies harness the intrinsic value of information technology to streamline their operations, infusing technology into their workflows to heighten efficiency and effectiveness, thereby striving to achieve optimal outcomes [8]. In this context, IT value assumes critical importance, defined as follows: a quantifiable increment in currency units or an index ratio representing the benefits derived from judiciously allocating IT resources to enhance company performance [9].

Company performance assessment serves as a compass for management to identify weaknesses and assess the financial health of the organization, enabling informed decision-making aimed at bolstering profitability [1, 4]. Such assessments are contingent upon several variables, including the impact of IT on company performance [1, 4]. Consequently, investors can ascertain whether a company is generating or depleting wealth. SPSS, a user-friendly and precise software package, stands as a reliable tool for conducting quantitative analyses.

2 Literature Review

2.1 Related Work

In the realm of related literature, previous studies have introduced a framework for business positioning based on extensive research, laying the groundwork for future inquiries aimed at determining the optimal business positioning aligned with desired company performance [5]. Furthermore, inspiration has been drawn from the Balanced Scorecard (BSC) framework [10], which has guided this study in constructing a comprehensive company framework designed to enhance performance across four critical perspectives: financial, customer-centric, internal business processes, and learning and growth. It is imperative to note that this article predominantly caters to corporate environments heavily reliant on Information Technology (IT) as an integral production tool [6]. In specific domains such as telecommunications organizations, the parameters essential for engineering processes are inherently IT-centric.

This study also closely aligns with research focused on the evaluation and enhancement of IT governance through the prism of the Balanced Scorecard framework [7]. The primary focus of this paper centers on the domain of information management and governance [7].

2.2 IT Value

Information technology (IT) serves as a powerful tool in the business realm, creating value through the systems it establishes, resulting in tangible benefits such as increased profitability from ongoing business operations. This value proposition often manifests as improved business processes, leading to reduced process durations and heightened competitiveness [1, 2]. IT value often arises from the intricate interplay of multiple subsystems, components, subcomponents, and even smaller elements. A notable example of technological innovation that has garnered significant attention is FinTech, which has been pioneered by financial institutions to facilitate financial transactions, particularly within commercial contexts. FinTech's relevance extends across various financial service domains, including cooperative financial institutions, banking, and insurance [3].

2.3 Partial Adjustment Valuation

Partial Adjustment Valuation (PAV) elucidates that changes in output during a manufacturing process do not always precisely align with anticipated changes. For instance, it involves comparing the current change at time t to the preceding period's change, denoted as $t-1$ [1, 2]. Importantly, a coefficient linking these changes across different time intervals is indispensable and is commonly referred to as a constant speed of adjustment. This leads to the following equation:

$$y_t = \left(\gamma_1 \alpha K_t^{\beta_1} L_t^{\beta_2} I_t^{\beta_3}\right) + \left(\gamma_2 S_t \alpha K_t^{\beta_1} L_t^{\beta_2} I_t^{\beta_3}\right) - (\gamma_1 + y_{t-1}) - (\gamma_2 S_t y_{t-1})\epsilon_t \quad (1)$$

Notes:

y_t: real output of a production process (at time t)
y_{t-1}: previous year's income
K_t: equity
L_t: Labor costs
I_t: IT spending costs / IT capex
α, β: parameters whose values are unknown
$\gamma_1 + \gamma_2$: unknown parameters
μ: speed of adjustment constant coefficient
ϵ_t: conventional error
S_t: vector of variables that affect SoA (ROA/ROE)

$$y_t = \mu y_t^* + (1 - \mu) y_{t-1} + \epsilon_t, \qquad (t = 1,2,\dots,s) \tag{2}$$

This equation represents the PAV model with a three-factor production function (K_t, L_t, and I_t) and introduces the concept of the speed of adjustment μ_t.

$$y_t = \mu_t f(X_t; \beta) + (1 - \mu) y_{t-1} + \epsilon_t, \qquad (t = 1,2,\dots,s) \tag{3}$$

$$\mu_t = g(S_t; \gamma), \qquad 0 \le \mu_t \le 1, \qquad (t = 1,2,\dots,s) \tag{4}$$

$f(X_t; \beta)$ is the alternative function of the preferred yield (y_t^*), which is revealed as a fabrication function. Consequently, X_t could comprise a vector of production such as the normal capital (K_t), the normal labor expense (L_t), and the technology investment, in this research related to IT investment (I_t). The advantage of flexible assessment of the fabrication function is that it may involve two configurations. The first is that K, L, and I blend to provide accommodations for the elements of capital, labor, and IT investment approximately. Then, the second is that K and L blend that has the capacity for the factors of capital and labor. Therefore, there are two models: $X_t = (K_t, L_t, I_t)$ and $X_t = (K_t, L_t)$ whereas β is the unidentified parameter.

$$y_t - y_{t-1} = \mu_t f(X_t; \beta) - \mu_t y_{t-1} + \epsilon_t, \quad (t = 1,2,\dots,s) \tag{5}$$

$$f(X_t; \beta) = \alpha K_t^{\beta_1} L_t^{\beta_2} I_t^{\beta_3} e^{v_t - u_t}, \qquad (t = 1,2,\dots,s) \tag{6}$$

$$\mu_t = \gamma_1 + \gamma_2 S_t, \qquad \text{with } 0 \le \mu_t \le 1 \tag{7}$$

At this point, μ_t is the dynamic speed of adjustment, and S_t is the dynamic factor that can employ the dynamics of μ_t fit to the time-varying. Similarly, it may disclose disparities between the tangible and the estimable variables of the firm. Additionally, researchers deliver many degrees to fulfill these elements with several variables S_t, for instance, return on equity, return on asset, Tobin q, market-to-book value, economic value-added, and market value-added, in which γ_1 and γ_2 are the unknown parameters. Additionally, if the Equations (6) and (7) substitute components of the Equation (5), it produces an Equation (8) as follows:

$$y_t = (\gamma_1 + \gamma_2 S_t)\left(\alpha K_t^{\beta_1} L_t^{\beta_2} I_t^{\beta_3} e^{v_t - u_t}\right) - (\gamma_1 + \gamma_2 S_t - 1) y_{t-1} + \epsilon_t, \quad (t = 1, 2, \ldots, s) \tag{8}$$

2.4 Speed of Adjustment

The Speed of Adjustment concept in Partial Adjustment Valuation (PAV) theory consists of two approaches: static and dynamic. In the context of Partial Adjustment Valuation, the static Speed of Adjustment approach remains constant throughout the estimated time period t, while the dynamic Speed of Adjustment approach introduces a multitude of unknown factors. Dynamic Speed of Adjustment is particularly valuable for assessing the projected value of IT within a corporation, enabling the measurement of changes in corporate performance resulting from IT expenditures.

2.5 ROE, ROA and MVA

The dynamics of Return on Assets (ROA) can be explained by considering the nonlinear dynamics of total asset value and the dynamics of net profit after taxes. Monitoring fluctuations in ROA over a specific historical period serves as a valuable metric for evaluating the efficient management of a bank.

The second component of Return on Equity (ROE), known as asset turnover, can be influenced by inflation, potentially leading to improvements even when asset utilization remains unchanged. This phenomenon is attributed to the immediate reflection of inflationary effects in sales figures, in contrast to the slower adjustment of the book value of assets, which comprises a combination of new and older assets. Market Value Added (MVA) serves as an essential measure for evaluating a company's success in maximizing investor wealth, aligning company value with stock prices as a core objective. Market Value Added (MVA) serves as an essential measure for evaluating a company's success in maximizing investor wealth, aligning company value with stock prices as a core objective.

3 Proposed Methodology

3.1 Problem Statement Definition

The objective of this research is to formulate an innovative framework designed to comprehensively assess a firm's current ("as-is") business position. This framework serves as the foundation for enhancing future ("to-be") positions, thereby ensuring and augmenting the firm's competitive edge and long-term sustainability [7].

3.2 Selection of Company Entities

The acquisition of high-quality data is imperative for rigorous research. Consequently, we have chosen three prominent Indonesian banking institutions to constitute our study sample. These organizations collectively command a substantial 84.1% share of the Indonesian banking customer market [9-12]. Specifically, BNI, BRI, and Mandiri have generously provided data encompassing three key dynamic parameters of adjustment speed spanning from 2006 to 2021. Among these parameters are ROE (Return on Equity), ROA (Return on Assets), and MVA (Market Value Added) [13-15]. These dynamic components collectively form the basis of a three-parameter company classification [4], which encompasses financial metrics (ROA and ROE) and strategic indicators (MVA). In this context, ROE represents the ratio of net profit to shareholder equity, while ROA measures a company's profitability relative to its total assets [16]. MVA, on the other hand, signifies the difference between a company's market value and its investor capital [17].

3.3 Selection and Application of a Dynamic Speed of Adjustment Valuation Method to Illuminate IT Value

A model is indispensable for assessing how IT expenditure impacts a company's performance. To this end, Equation (8) represents the mathematical framework for determining the value of an IT-driven company, employing the Partial Adjustment Valuation (PAV) approach [6, 8, 9, 20]. The PAV Equation facilitates the computation of model performance metrics, performance values, and performance ratios [6, 9]. In our study, PAV incorporates dynamic speed adjustment, including three dynamic factors: ROE, ROA, and MVA. Data for these dynamic elements is directly sourced from the company's annual reports. In cases where such data is not available, reasonable estimates are incorporated into the model.

3.4 Adjustment of Targeted Performance Metrics and Ratios

The resolution of Equation (8) requires the application of Equation (6). In essence, the CD function featuring X_t, comprising production components K_t, L_t, and I_t (representing IT investment), is essential for estimating the valuation method. Consequently, the presence of the variable I_t has a positive impact on the model, as indicated by the coefficient β_3 for the dynamic speed of adjustment. This implies that the production elasticity (β_3) of IT investment stands at β_3%, meaning that a 1% increase in IT investment can potentially enhance production by β_3%, assuming all other factors remain constant [13, 14]. Notably, these elasticities closely align with empirical findings [15-17].

3.5 Adjustment of Targeted Performance Metrics and Ratios

Understanding the interplay between yield and IT production elasticity (β_3) empowers the enhancement of performance metrics and ratios [refer to Equation (10, 11)]. By increasing the value of β_3 [refer to Equation (6)], performance metrics and ratios can be elevated in a directly proportional manner. It's crucial to note that the targeted increase in performance metrics and ratios is facilitated through an engineering process. This involves the adjustment of the IT production elasticity (β_3) parameter, raising it when the determinant coefficient (R^2) exceeds 90% [18, 19]. Consequently, even with constant IT investment (I), the margin of error remains within acceptable limits. This adjustment is performed utilizing the SPSS application and a non-linear regression procedure [13, 14].

3.6 Development of an IT-Based Business Positioning Framework

The three dynamic components are subsequently mapped onto the three company categories [20-24], culminating in the establishment of a framework. This framework furnishes a company with an accurate assessment of its current business position, serving as a strategic compass for enhancing its competitive advantage. This is achieved through a continuous improvement process addressing six dynamic facets. Additionally, it's essential to acknowledge that IT investments have contributed to heightened organizational revenue [25-29].

4 Case Study and Results

4.1 Case Study

In addressing the estimation of Equation, the initial step involves prioritizing the three dynamic factors. Data utilized in this analysis is sourced from the annual reports of the three companies spanning the period from 2006 to 2021. The data for the variables K, L, and I for each company undergo classification for estimation purposes, utilizing a non-linear regression method facilitated by the SPSS software, as detailed in Equation. Furthermore, Equations are employed to calculate the performance values (PV) and performance ratios (PR) for the three respective firms, leading to the results presented in Tables corresponding to BNI, BRI, and Mandiri [6-8].

4.2 Engineering Results

Following steps 4 and 5 outlined in the proposed methodology, the elasticity parameter of IT production (β_3) is adjusted to match the initial IT investment. This adjustment is achieved through a non-linear regression process conducted using the SPSS application. It is essential to note that a prerequisite for this adjustment is that the determinant coefficient R^2 must exceed 0.90 (90%). Tables 1, 2, 3, 4, 5 and 6 present the engineering results for BNI, BRI, and Mandiri, respectively.

Tables 1 and 2 provide insight into the variation in BNI's PV and PR associated with the increase in variable 3 (notably observed in the second-to-last row of each table), as well as columns 2, 3, and 4. For instance, consider the dynamic factor ROE, which had an initial value of 0.395 in 2006. It subsequently increased by 5% and averaged 0.559

from 2006 to 2021 (refer to Table 1, column 2). Table 1 reveals that when 3 increased by 0.009 compared to its initial value, resulting in an average increase of 11%. Similar patterns are observed for the other dynamic factors, such as ROA and MVA, which exhibited an average increase of 5% and 22%, respectively, between 2006 and 2021. This trend is consistent across the board.

Table 1. BNI's PV of three dynamic factors on IT investment

Year	ROE	ROA	MVA
2006	0.395	0.406	0.214
2007	0.579	0.307	0.360
2008	0.667	0.124	0.345
2009	0.709	0.135	0.309
2010	0.902	0.513	0.275
2011	0.005	0.581	0.306
2012	0.177	0.673	0.155
2013	0.387	0.784	0.536
2014	0.620	0.862	0.353
2015	0.849	0.096	0.487
2016	0.381	0.308	0.385
2017	0.904	0.614	0.436
2018	0.786	0.231	0.307
2019	0.546	0.568	0.510
2020	0.566	0.981	0.537
2021	0.473	0.338	0.467
Average	0.559	0.470	0.374
β_3	0.031	0.003	0.221
R^2	0.992	0.992	0.992

Table 2. BNI's PR of three dynamic factors on IT investment

Year	ROE	ROA	MVA
2006	0.425	0.448	0.399
2007	0.624	0.339	0.716
2008	0.719	0.137	0.631
2009	0.765	0.149	0.515
2010	0.974	0.569	0.477
2011	0.005	0.645	0.532
2012	0.192	0.748	0.252
2013	0.420	0.874	0.853
2014	0.673	0.962	0.578
2015	0.917	0.107	0.710
2016	0.412	0.342	0.552
2017	0.978	0.682	0.604
2018	0.851	0.257	0.442
2019	0.591	0.632	0.756
2020	0.613	1.090	0.843
2021	0.513	0.376	0.695
Average	0.605	0.522	0.597
β_3	0.040	0.015	0.225
R^2	0.981	0.962	0.995

Tables 3 and 4 illustrate the variation in Mandiri's PV and PR associated with the increase in variable 3 (as observed in the second-to-last row of each table), alongside columns 2, 3, and 4. For instance, consider the dynamic factor ROE, which had an initial value of 0.766 in 2006. It subsequently increased by 8% and averaged 0.715 from 2006 to 2021 (refer to Table 3, column 2). Table 3 reveals that when 3 increased by 0.006 compared to its initial value, resulting in a total increase of 0.06%. Similar patterns are observed for the other dynamic factors, such as ROA and MVA, which exhibited an average increase of 8% and 2%, respectively, between 2006 and 2021. This trend is consistent across the board.

Table 3. Mandiri's PV of three dynamic factors on IT investment

Year	ROE	ROA	MVA
2006	0.766	0.224	0.674
2007	0.953	0.400	0.377
2008	0.669	0.005	0.516
2009	0.377	0.633	0.932
2010	0.747	0.012	0.684
2011	0.928	0.108	0.675
2012	0.668	0.303	0.629
2013	0.759	0.293	0.485
2014	0.156	0.274	0.616
2015	0.800	0.332	0.688
2016	0.565	0.437	0.731
2017	0.882	0.409	0.644
2018	0.873	0.382	0.477
2019	0.691	0.378	0.459
2020	0.610	0.547	0.400
2021	0.988	0.571	0.313
Average	0.715	0.332	0.581
β_3	0.040	0.015	0.225
R^2	0.993	0.943	0.982

Table 4. Mandiri's PR of three dynamic factors on IT investment

Year	ROE	ROA	MVA
2006	0.804	0.229	0.677
2007	1.010	0.410	0.379
2008	0.715	0.005	0.518
2009	0.403	0.651	0.937
2010	0.802	0.013	0.688
2011	1.020	0.113	0.679
2012	0.744	0.318	0.633
2013	0.852	0.308	0.489
2014	0.176	0.289	0.620
2015	0.903	0.351	0.694
2016	0.641	0.461	0.738
2017	1.006	0.433	0.649
2018	0.999	0.405	0.481
2019	0.792	0.401	0.463
2020	0.701	0.581	0.404

Year	ROE	ROA	MVA
2021	1.140	0.608	0.316
Average	0.794	0.349	0.585
β_3	0.700	0.895	0.225
R^2	0.989	0.986	0.994

Table 5. BRI's PV of three dynamic factors on IT investment

Year	ROE	ROA	MVA
2006	0.800	0.482	0.895
2007	0.681	1.078	0.788
2008	0.375	0.454	0.816
2009	0.894	0.614	0.952
2010	0.905	0.664	0.796
2011	0.237	0.721	0.833
2012	0.355	0.950	0.917
2013	0.518	0.018	0.803
2014	0.049	0.206	0.819
2015	0.714	0.441	0.154
2016	0.494	0.601	0.398
2017	0.467	0.358	0.439
2018	0.197	0.920	0.518
2019	0.636	0.407	0.589
2020	1.210	0.459	0.433
2021	0.819	0.663	0.960
Average	0.584	0.565	0.694
β_3	0.487	0.441	0.221
R^2	0.987	0.973	0.954

Table 6. BRI's PR of three dynamic factors on IT investment

Year	ROE	ROA	MVA
2006	0.819	0.538	0.924
2007	0.698	1.210	0.815
2008	0.384	0.509	0.843
2009	0.916	0.691	0.985
2010	0.929	0.751	0.824
2011	0.243	0.815	0.862
2012	0.365	1.075	0.950
2013	0.532	0.020	0.833
2014	0.050	0.234	0.849
2015	0.733	0.501	0.160
2016	0.508	0.684	0.413
2017	0.480	0.407	0.455
2018	0.202	1.049	0.538
2019	0.654	0.464	0.611
2020	1.245	0.524	0.450
2021	0.842	0.757	0.997
Average	0.600	0.639	0.719
β_3	0.819	0.538	0.924
R^2	0.998	0.956	0.976

Tables 5 and 6 outline the variation in BRI's PV and PR associated with the increase in variable 3 (as observed in the second-to-last row of each table), alongside columns 2, 3, and 4. For instance, consider the dynamic factor ROE, which had an initial value of 0.800 in 2006. It subsequently increased by 8% and averaged 0.584 from 2006 to 2021 (refer to Table 5, column 2). Table 5 reveals that when 3 increased by 0.003 compared to its initial value, resulting in an average increase of 3%. Similar patterns are observed for the other dynamic factors, such as ROA and MVA, which exhibited an average increase of 7% and 3%, respectively, between 2006 and 2021. This trend is consistent across the board, as mirrored in the PR estimates for dynamic factors showcasing corresponding increases in 3 and PV estimates (as evident in Table 6).

5 Discussion

As a result, the three dynamic factors can be classified into two distinct categories: finance and strategy [4, 5]. These categories encapsulate the dynamic aspects of PV (Present Value) and PR (Public Relations). An increase in the third factor (referred to as '3') leads to a corresponding increase in both PV and PR, thereby naturally enhancing firm performance, as elucidated in Equation (3). Figures 1 to 6 illustrate the fluctuations in PR in graphical format.

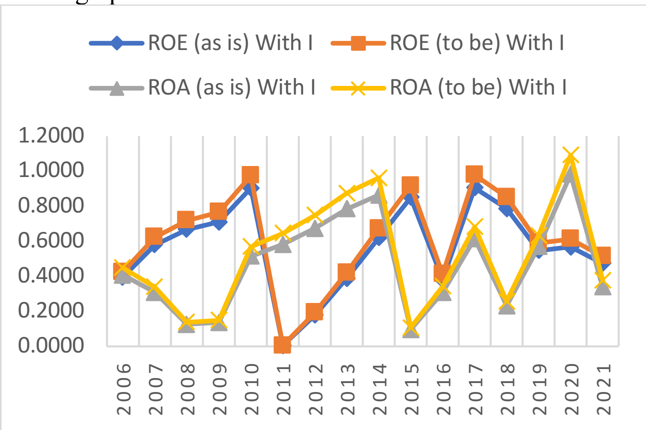

Fig. 1. BNI Financial Performance Ratio: ROE and ROA

Consequently, this discussion presents numerical data from Tables 1 and 6, alongside graphical representations in Figure 1, showcasing PR fluctuations in the financial domain concerning BNI's ROE and ROA. The application of the third factor (3) in the engineering process results in an average 5% increment in ROE and a corresponding 5% increase in ROA. Examining BNI's Public Relations, Figures 2 and 3 exhibit similar trends within the business and strategic categories, which are further substantiated numerically in Tables 2 and 6. The average growth induced by the third factor (3) within the strategic category is represented as MVA = 22%.

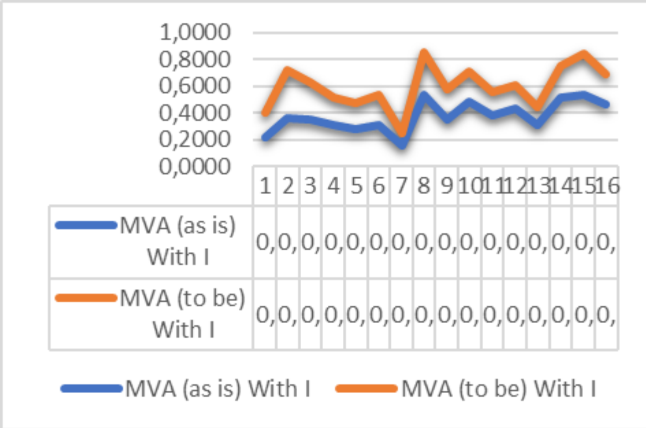

Fig. 2. BNI Strategic Performance Ratio: MVA

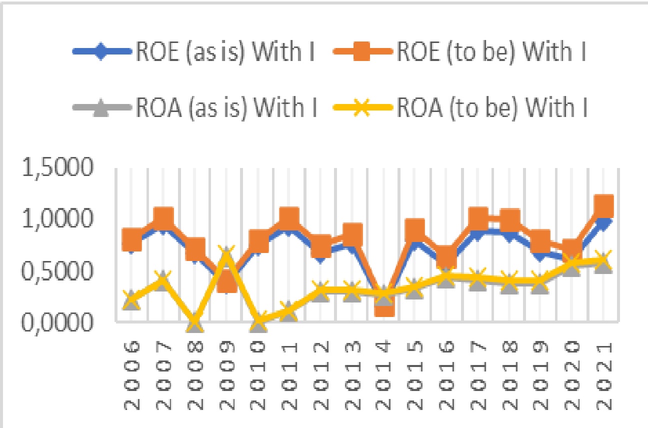

Fig. 3. Mandiri Financial Performance Ratio: ROE and ROA

Figure 4 graphically portrays the fluctuations in PR in the financial realm regarding Mandiri's ROE and ROA, complemented by numerical data from Tables 2 and 6. Through the application of the engineering process employing β_3, an average increase of 8% in ROE is observed, while β_3 in ROA experiences an average increase of 2%. Notably, Figures 2 and 3 reveal analogous patterns in the business and strategic categories, corroborated numerically in Tables 2 and 6, in the context of Mandiri's Public Relations. Similarly, the strategic category exhibits an average increase in β_3, denoted as MVA = 2%.

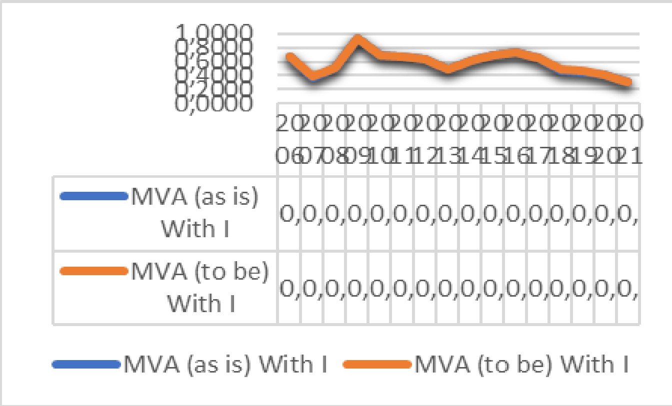

Fig. 4. Mandiri Strategic Performance Ratio: MVA

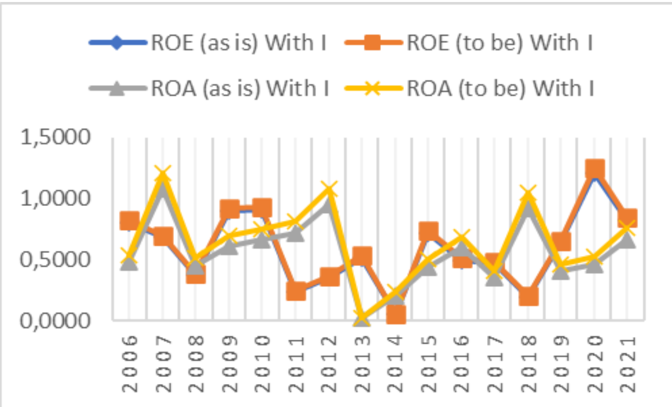

Fig. 5. BRI Financial Performance Ratio: ROE and ROA

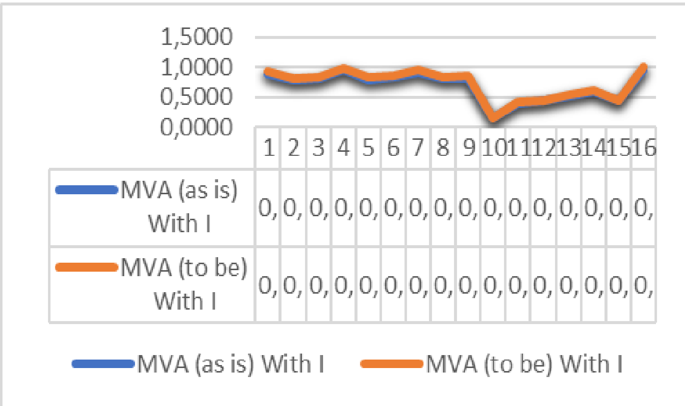

Fig. 6. BRI Strategic Performance Ratio: MVA

Consequently, Tables 2 and 6, in conjunction with Figure 4, provide both numerical and graphical depictions of PR fluctuations within the financial domain, focusing on BRI's ROE and ROA. Utilizing the third value (referred to as '3') in the context of ROE typically results in a 2% increase through the engineering process, while the corresponding increase in ROA amounts to 7%. Numerical parallels in BRI's Public Relations can be observed in Tables 2 and 6, as well as in Figures 2 and 3, pertaining to both business and strategic categories. Similarly, the average increase in '3' within the strategic category is denoted as MVA = 3%.

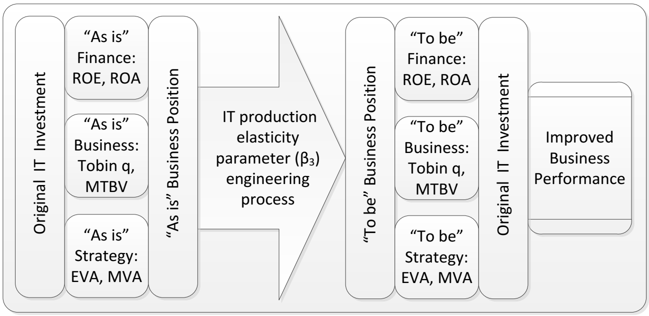

Fig. 7. IT-Based Business Positioning System's Framework

Considering these findings, this rationale lends support to the notion that both business categories, enabled by IT investments driven by each dynamic factor, possess the potential to enhance business performance by adapting the elasticity of IT production ('3') to accommodate changes while maintaining a reasonable level of confidence [30]. Consequently, the framework illustrated in Figure 7 offers valuable insights into the creation of a cost-effective IT-based business within specified budget constraints. Figure 7 delineates the current state of IT-based business [31], often referred to as the "as-is" position, while engineering efforts are instrumental in elevating this positioning to the "to-be" position.

6 Conclusion

In conclusion, the Partial Adjustment Valuation (PAV) method has proven to be a valuable tool for comprehending the inherent IT value within an IT-based enterprise. Moreover, PAV incorporates a production function, specifically the Cobb-Douglas model, where IT variables undergo engineering processes, governed by IT product elasticity parameters. As a result, this research convincingly demonstrates that the technical manipulation of these parameters in alignment with a company's dynamic factors can lead to significant improvements in company performance.

Furthermore, the study categorizes these dynamic factors into two distinct categories: finance and strategy [32]. To facilitate the practical application of these findings, integration into an IT-based business positioning system framework becomes imperative [33]. Consequently, the technical endeavors at this level necessitate a seamless translation into tactical and managerial actions within the real-world context.

References

1. Safitra, M. F., Lubis, M., & Fakhrurroja, H. (2023). Counterattacking Cyber Threats: A Framework for the Future of Cybersecurity. Sustainability, 15(18), 13369. https://doi.org/10.3390/su151813369.
2. Safitra, M. F., & Abdurrahman, L. (2023). Open-up International Market Opportunities: Using the OSINT Crawling and Analyzing Method. SEIKO: Journal of Management & Business, 6(1), 923–931. https://doi.org/10.37531/sejaman.vxix.346.
3. Firdaus, T. M., Lubis, F. S., & Lubis, M. (2022, September). Financial Technology Risk Analysis for Peer to Peer Lending Process: A Case Study of Sharia Aggregator Financial Technology. In 2022 10th International Conference on Cyber and IT Service Management (CITSM) (pp. 1-4). IEEE. https://doi.org/10.1109/CITSM56380.2022.9935926.
4. Safitra, M. F., Lubis, M., & Widjajarto, A. (2023). Security Vulnerability Analysis using Penetration Testing Execution Standard (PTES): Case Study of Government's Website. Proceedings of the 2023 6th International Conference on Electronics, Communications and Control Engineering, 139–145. https://doi.org/10.1145/3592307.3592329.
5. Lubis, F. S., Lubis, M., Hakim, L., & Fakhrurroja, H. (2023). The Text Mining Analysis Approach for Electronic Information and Transaction (ITE) Implementation Based on Sentiment in the Social Media. In Intelligent Sustainable Systems: Selected Papers of WorldS4 2022, Volume 1 (pp. 263-271). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-19-7660-5_23.
6. Safitra, M. F., Lubis, M., & Kurniawan, M. T. (2023). Cyber Resilience: Research Opportunities. Proceedings of the 2023 6th International Conference on Electronics, Communications and Control Engineering, 99–104. https://doi.org/10.1145/3592307.3592323.
7. Lubis, F. S., Lubis, M., & Hakim, L. (2022, December). Investigation of Netizen Sentiment Analysis Toward The Controversy of Information and Electronic Transaction Law. In 2022 Seventh International Conference on Informatics and Computing (ICIC) (pp. 1-7). https://doi.org/IEEE.10.1109/ICIC56845.2022.10006918.
8. F. Maulana, H. Fajri, M. F. Safitra and M. Lubis, Unmasking log4j's Vulnerability: Protecting Systems against Exploitation through Ethical Hacking and Cyberlaw Perspectives, 2023 9th International Conference on Computer and Communication Engineering (ICCCE), Kuala Lumpur, Malaysia, 2023, pp. 311-316, https://doi.org/10.1109/ICCCE58854.2023.10246082.
9. Abdurrahman, L., Suhardi, & Langi, A. Z. R. (2014). Information Technology (TI) value model using variance-based structural equation modeling: Towards TI value engineering. 2014 2nd International Conference on Information and Communication Technology, ICoICT 2014.
10. Agustina, H. (2017). Penggunaan Teknologi Informasi, Kemudahan, dan FTIur Layanan Terhadap Minat Nasabah Dalam Menggunakan Internet Banking (Studi Pada Bank Syariah Mandiri). Jurnal Manajemen Kinerja, 3(1), 24– 29.
11. Alkarimah, I. N. (2017). Analisis Evaluasi Investasi Dan ProduktivTIas Sistem Informasi Ellipse Pada Direktorat Keuangan Dan Direktorat Sdm & Administrasi Pt. Pjb Services Sidoarjo Menggunakan Metode Information Economics Dan Cobb Douglas. 1–252.
12. Denziana, I., & Fatah, F. (2014). Corporate Financial Performance Effects of Macro Economic Factors Against Stock return. Pontificia Universidad Catolica Del Peru, 8(33), 44.
13. Dewi, A., & Ananda, R. (2020). Pengembangan Aplikasi Gui Matlab Untuk Menaksir Koefisien Parameter Model Regresi Non Linier Menggunakan AlgorTIma Levenberg

Marquardt. Wahana Matematika Dan Sains: Jurnal Matematika, Sains, Dan Pembelajarannya, 14(1), 1858–0629. https://ejournal.undiksha.ac.id/index.php/JPM/article/view/20901.
14. Kusuma, B. H., & Bangun, N. (2011). Analisis Pemahaman Mahasiswa Akuntansi Terhadap Konsep Aset, Kewajiban, Dan EkuTIas. Jurnal Bisnis Dan Akuntansi, 13(3), 183–194.
15. Mardiatmoko, G.-. (2020). Pentingnya Uji Asumsi Klasik Pada Analisis Regresi Linier Berganda. BAREKENG: Jurnal Ilmu Matematika Dan Terapan, 14(3), 333–342. https://doi.org/10.30598/barekengvol14iss3pp333-342.
16. Nurdany, A. (2013). Analisis Pengaruh Rasio Keuangan RentabilTIas Terhadap Pendapatan Margin Murabahan Bank Syariah (Studi Kasus pada PT. Bank Mega Syariah Periode 2005-2012). Khazanah, 5(2), 13–24. https://doi.org/10.20885/khazanah.vol5.iss2.art2.
17. Nurprihatin, F., & Tannady, H. (2017). Pengukuran ProduktivTIas Menggunakan Fungsi Cobb Douglas Berdasarkan Jam Kerja Efektif. JIEMS (Journal of Industrial Engineering and Management Systems), 10(1), 34–45. https://doi.org/10.30813/jiems.v10i1.36.
18. Purwanto, A., Asbari, M., & Santoso, T. I. (2021). Analisis Data PenelTIian Marketing: Perbandingan Hasil antara Amos, SmartPLS, WarpPLS, dan SPSS untuk Jumlah Sampel Besar. Journal of Industrial Engineering & Management Research (JIEMAR), 2(4), 216–227.
19. Putra, R. gilang jodi. (2015). Paradoks ProduktivTIas Teknologi Investasi Sistem Aplikasi Crm (Studi Kasus : ProductivTIy Paradox of Information Technology: Investment Analysis of Crm Application System (Case Study : Pt . Xyz).
20. Razi, M. (2017). Analisis Investasi Sistem Informasi E-Ketenagakerjaan Dengan Menggunakan Metode Information Economics Pada Pt . Mahakam Kencana Intan Padi Investment Analysis of E-Employment Information Systems Using Information Economics Method in Pt . Mahakam.
21. Sabrudin, D., & Suhendra, E. S. (2019). Dampak Akuntabilitas, Transparansi Dan Profesionalisme Paedagogik Terhadap Kinerja Guru Di Smkn 21 Jakarta. Jurnal Nusantara Aplikasi Manajemen Bisnis, 4(1), 38.
22. Susantun, I. (2000). Fungsi Keuntungan Cobb Douglas Dalam Pendugaan Efisiensi Ekonomi Relatif. Jurnal Ekonomi Pembangunan, 5(2), 149–162. journal.uii.ac.id.
23. Tira, ilma prahmalia. (1985). Analisis Faktor-Faktor Produksi Pada Industri Semen di Indonesia. JURNAL EKONOMI PEMBANGUNAN Journal of Economic & Development, 2(31–55), 31–55. production, elasticTIy, return to scale, efficiency, cement industry.
24. Witanti, W., & Falahah. (2007). VAL TI : Kerangka Kerja Evaluasi Investasi Teknologi Informasi. Seminar Nasional Aplikasi Teknologi Informasi 2007, 2007(SNAIl), 31–37.
25. Rosmaini, E., Kusumasari, T. F., Lubis, M., & Lubis, A. R. (2018, March). Study to the current protection of personal data in the educational sector in Indonesia. In Journal of Physics: Conference Series (Vol. 978, No. 1, p. 012037). IOP Publishing.
26. Lubis, M., Kartiwi, M., & Zulhuda, S. (2018). Current state of personal data protection in electronic voting: criteria and indicator for effective implementation. TELKOMNIKA (Telecommunication Computing Electronics and Control), 16(1), 290-301.
27. Lubis, M., Fauzi, R., & Lubis, A. (2018). Enterprise application integration for high school students using blended learning system. In MATEC Web of Conferences (Vol. 218, p. 04016). EDP Sciences.
28. Al-Khowarizmi, A. K., Nasution, I. R., Lubis, M., & Lubis, A. R. (2020). The effect of a SECoS in crude palm oil forecasting to improve business intelligence. Bulletin of Electrical Engineering and Informatics, 9(4), 1604-1611. Widjajarto, A., Lubis, M., & Yunan, U. (2019). Architecture model of information technology infrastructure based on service quality at government institution. Procedia Computer Science, 161, 841-850.