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The Impact of a Company's Management Strategy on Its Profitability, Stability, and Growth: A Focus on the Information Security Industry

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Abstract: This study concentrated on a business report that typically reveals a company's non-financial information, aiming to uncover its strategic direction. Using text-mining techniques, the research extracted and analyzed the report's overview sections, identifying key strategic themes categorized into the financial, customer, learning and growth, and internal process perspectives. The empirical analysis applied a two-stage model to assess how shifts in company strategies affect profitability, stability, and growth. This research provided insights into the management strategies and financial metrics within the information security sector, examining how strategic priorities shape financial health. The findings were as follows. Firstly, companies emphasizing financial strategies in their reports tended to exhibit higher profitability. Secondly, those focusing on customer-oriented strategies also reported greater profitability. Thirdly, companies prioritizing internal processes demonstrated increased organizational stability. Fourthly, an emphasis on learning and growth strategies was associated with lower stability but higher growth potential. This paper contributes to the field by offering a method to quantitatively analyze qualitative textual data, providing a more precise approach to understanding management strategies through direct content analysis of business reports. It also highlights the specific financial and strategic characteristics of information security firms, a relatively under-researched area, thereby offering valuable guidance for these companies in terms of strategic planning.

Keywords: management strategy; profitability; stability; growth; information security industry; business report; BSC frame; text mining

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1. Introduction

The importance of the information security industry is increasing in the information age [1]. Although information security is becoming increasingly important, the information security industry is not as active as its importance suggests. Therefore, this study intends to contribute to the development of the information security industry by presenting the results of research that investigated the relationship between the management strategies and financial conditions of companies in the information security industry. In Korea, the information security sector continues to have numerous small firms. As we advance further into the information security era, the significance of safeguarding information is increasingly underscored, necessitating the ongoing growth of companies in this field. Consequently, this research examines how the management strategies prioritized by these companies impact their financial ratios. Namely, this study aims to identify companies in the information security industry and analyze the relationship with their financial performance.

Information about a company varies, but it can be classified into information that can only be known to corporate insiders and disclosures to outsiders [2]. According to the agency theory, managers, who are company agents, know more important information about the company than shareholders, who are company owners [3]. Conflicts or problems may arise between the insiders and outsiders of a company and between shareholders, owners, managers, and agents [4]. Therefore, managers of companies need to make efforts to mitigate the information asymmetry as much as possible.

There are several ways to communicate important information about a company to the outside world. Financial information is regularly disclosed to the outside through financial statements. Non-financial information is disclosed through business reports, management's discussion and analysis (MDA), audit reports, sustainable management reports, and so on. Transparent communication of important information about a company to stakeholders such as shareholders and creditors outside the company and a clear presentation of the company's vision, strategies, and goals are critical to improving the company's future value [5].

In this study, the company's management strategy is identified by collecting the contents of the business report, which is the most representative report among the reports that disclose non-financial information about the firm. A company's business report contains business details, financial information, cash flow, directors' opinions, audit results, and corporate risk factors. In particular, the business overview part of the business report explains the company's vision, mission, core values, and major business activities. Therefore, this study collects data focusing on the business overview of the business report among the vast contents. Keywords are extracted after crawling the business overview contents of the business report using text-mining techniques. In addition, these keywords are divided into a financial perspective, a customer perspective, a learning and growth perspective, and an internal process perspective by the BSC frame to identify the management strategy emphasized by the company. Finally, among the regression models, the two-stage model suggested by Heckman (1979) is used to investigate how the profitability, stability, and growth ratio change according to the strategy emphasized by the corporation [6].

Namely, this paper examines how the financial condition changes according to the firm's emphasized management strategy for companies in the security industry. Most of the Korean security companies are unlisted companies, are small in size, and are financially poor. The research results of this paper are expected to provide useful information on what management strategies that security firms establish are helpful to the company's financial situation.

This study is judged to be valuable in that it quantifies the qualitative unstructured text data of the business report through the text-mining technique, one of the artificial intelligence techniques, and presents the results of an empirical analysis. As for how to quantify and conduct empirical analysis of company qualitative information, this study is expected to contribute to the expansion of the scope of corporate research by presenting specific guidelines.

In addition, this paper communicates to various stakeholders, such as managers, shareholders, and creditors, in the information security industry that management strategies can be grasped through business reports, and at the same time, it provides useful information that there is some connection with the company's various financial ratios through these management strategies.

2. Theoretical Background and Hypothesis Development

2.1. Text Mining

Text mining is a methodology for extracting and analyzing valuable insights from textual data [7]. It processes and examines large-scale textual data, typically encompassing the following procedural steps. Initially, text data are gathered from various sources, such as the web or social media platforms. Subsequently, text-mining methodologies are employed to distill meaningful information from the data, leveraging Natural Language-Processing

(NLP) technologies [8]. NLP constitutes a field of artificial intelligence that facilitates natural language interactions between humans and computers [9]. Its research and development focus on enabling computers to comprehend and generate human languages, with applications spanning Natural Language Understanding (NLU), Natural Language Generation (NLG), Automatic Summarization, Machine Translation, Sentiment Analysis, Question Answering, and Text Classification [10].

The key technologies within NLP include tokenization, which involves segmenting sentences into smaller units such as words or phrases, and morphological analysis, which decomposes words into morpheme units and assigns parts of speech to each morpheme [11]. Text data preprocessing precedes its utilization in NLP models [12]. This preprocessing step involves refining and structuring the data to enhance the model comprehension. The major preprocessing procedures encompass tokenization, stop-word removal, stemming or lemmatization to extract word base forms, sentence segmentation, and text cleaning to eliminate special characters, HTML tags, and extraneous spaces [13,14].

Subsequently, meaningful insights are extracted from the preprocessed text data. In this research, keywords are identified from the management's discussion and analysis (MDA) sections through the computation of the Term Frequency-Inverse Document Frequency (TF-IDF) values [11]. The TF-IDF serves as a statistical technique for assessing the significance of words within text data, aiding in determining a word's importance within a document [15]. The Term Frequency (TF) denotes the frequency of a word's occurrence within a document. In contrast, the Inverse Document Frequency (IDF) measures the uniqueness of a word across a document set, assigning a higher weight to rare words [16]. The TF-IDF facilitates the computation of a word's importance, as utilized across various NLP applications, including text classification, information retrieval, and document clustering [17]. Words repeated significantly within a document are assigned higher TF-IDF values, potentially serving as keywords indicative of the document's content.

2.2. BSC Frame

This study extracts keywords by collecting the contents of the business purpose part of the business report disclosed by companies using the text-mining technique, with companies in the security industry as a sample target. Then, the keywords of the business report are divided into the finance, customers, internal processes, and learning and growth perspectives by the Balanced Scorecard (BSC) framework to understand what management strategies companies in the security industry emphasize.

The Balanced Scorecard (BSC), a managerial accounting tool, has evolved into a widely adopted management practice [18]. As a comprehensive management framework, the BSC maintains continuous and interactive engagements across dimensions such as learning and growth, customer relations, internal processes, and financial performance [19]. In particular, the BSC frame can be useful for identifying management strategies [18,20].

The BSC elucidates the causal relationships among objectives within these dimensions, shedding light on the interactions not solely from a financial standpoint but also encompassing non-financial aspects like customer satisfaction, process efficiency, and learning and growth initiatives [21]. It operates as a value-creating system by effectively integrating the financial performance, customer relations, internal processes, and learning and growth perspectives, leveraging key indicators to enhance core business performance [22]. Ultimately, the BSC facilitates the consideration of non-financial strategic success factors that significantly impact sustainable business practices, thereby supporting the management of all the corporate activities aligned with strategic objectives.

2.3. Hypothesis Development

There are still many small companies in the information security industry in Korea. In the age of information security, the importance of information security is gradually being emphasized, and the continuous development of information security companies is necessary. Therefore, this study studies the effect of the management strategies

emphasized by companies based on the financial ratios for companies in the information security industry.

A company's business report contains information on the company's vision, goals, and major business details. In other words, the business report contains a lot of content that can help you understand the company's management strategy [23]. Therefore, in this study, the contents of the business reports of information security companies are investigated to identify the management strategies that each company emphasizes and pursues. Next, an empirical analysis is conducted on how the company's financial ratios differ according to the management strategy emphasized by the company. Depending on what management strategies a company emphasizes, a company is expected to differ in its various financial ratios (profitability, stability, growth potential). Specific hypotheses about the relationship between a company's management strategy and financial ratio are presented below.

This study extracts the management strategies emphasized in business reports by text-mining techniques and BSC frames. The BSC frame is divided into four perspectives: finance, customer, internal process, and learning and growth [19]. If a company emphasizes its financial perspective as a management strategy, it is expected to focus on and manage profits in terms of profitability rather than the stability or growth of the company [19]. In other words, if a company emphasizes the financial part as a management strategy, the company's management performance is, of course, expected to increase considerably because it pays attention to the financial part [24,25]. In addition, according to the theory of the life cycle of a company, if a company cares financially, it may be in an introductory period or a period of growth that has not yet grown sufficiently, or rather a period of decline [26]. Companies in the information security industry are likely to be introduced or mature because there are still many unlisted companies, and the profitability ratio may be high as they pay attention to financial aspects, but stability or growth is unlikely to be high because it is interpreted as investing less [26]. Therefore, the following hypothesis is derived.

Hypothesis 1. *A company emphasizing a financial perspective in a business report will be highly profitable.*

If the management strategy emphasized in the business report values customers, the company will put the policy for customers first [18]. Such a customer-centered policy will naturally lead to customer satisfaction, which is expected to be directly connected to the improvement of the company's profitability. In other words, the security level of customers is likely to improve due to the customer-first policy of information security companies, which is expected to improve the profitability in terms of business through thorough customer management [27]. According to the corporate life cycle theory, companies often strive to attract active customers when they are in the growth stage and improve profitability through steady customer management [28]. Thus, the following hypothesis is suggested.

Hypothesis 2. *Companies that emphasize customer perspectives in business reports will be highly profitable.*

A company that emphasizes internal processes as a company's management strategy is highly likely to be a company that has achieved some growth [21]. Therefore, there is a high probability of trying to stabilize the company to ensure its sustainability. Companies in this situation are more likely to pay attention to relative stability than to pursue profitability. Namely, companies that have established management strategies emphasizing internal processes are expected to strive to have a capital structure that lowers the debt ratio of the company and increases the equity ratio to improve stability [29]. From the perspective of the corporate life cycle theory, if the internal process is strengthened to strengthen the substance rather than to focus on external growth, the company is likely to be in maturity, and accordingly, it will try to lower the debt ratio to stabilize the company [30]. Therefore, the following hypothesis is drawn.

Hypothesis 3. *A company emphasizing an internal process perspective in a business report will have high corporate stability.*

It can be said that companies that emphasize learning and growth perspectives in their management strategies have a strong future-oriented tendency [27,29]. In other words, companies that emphasize learning and growth are expected to take many active actions for growth and pay a lot of attention to employee training as a bold investment for the future [30]. The theory of a company's life cycle also explains that companies that want to grow invest in the learning and education of their employees from a long-term perspective [28]. Therefore, companies that emphasize learning and growth may have low financial stability due to high employee training and training expenditures, but their potential growth potential is expected to be high. Hence, the following hypothesis is derived.

Hypothesis 4. *A company emphasizing a learning and growth perspective in a business report will have low corporate stability but high growth potential.*

3. Methods

3.1. Samples

This study sampled Korean information security companies, and the sample period was from 2018 to 2022. Due to the nature of the study, there were time and cost limitations to sample the entire company because it was necessary to collect the contents of the company's business report directly. In the information age, the interest in and importance of the information security industry are growing, and the information security industry tends not to diversify its business compared to other industries, so it was determined that it would be easier to understand the management strategies of companies, so it was selected as a sample target for this study.

The financial data of information security companies were obtained from the Value Search of Nice Credit Ratings. From 2018 to 2022, the number of samples was 405, of which 48 companies for which financial data were unavailable were excluded. In addition, 11 companies that eroded capital were excluded from the sample to derive objective results. Therefore, this paper's final number of samples used for the empirical analysis is 346. Table 1 summarizes the information on the sample composition of this study.

Table 1. Sample selection.

Contents	Number of Samples
Full information security firms	405
Companies that do not have access to financial data	−48
Capital erosion companies	−11
Final sample firms	346

This paper used variables, as shown in Table 2 below, to analyze the impact of management strategies on the corporate profitability, stability, and growth in business reports. This study used the ROA and ROE as corporate profitability proxy variables, the LEV and CUR as stability proxy variables, and the GRW_Sales and GRW_Asset were used as growth proxies.

Descriptive statistics concerning the variables used in the empirical analysis in this paper are presented in Table 3 below. The average value of the ROA, a measure of profitability, was 0.063, the standard deviation was 0.099, and the median was 0.061. The average value of the ROE, another measure of profitability, was 0.180, the standard deviation was 0.460, and the median was 0.119. The average profitability of the information security industry is relatively higher than that of other industries.

Table 2. Variables' definitions.

Variables		Definition
Dependent variables	*ROA*	Total return on assets = net income/total assets [31]
	ROE	Return on equity = net income/total capital [32]
	LEV	Debt ratio = total liabilities/total assets [33]
	CUR	Current ratio = current liabilities/current assets [34]
	GRW_Sales	Sales growth rate = (current year's sales − lagged year's sales)/lagged year's sales [35]
	GRW_Asset	Total asset growth rate = (current year's total assets − lagged year's total assets)/lagged year's total assets [36]
Independent variables	*Financial*	A dummy variable that means 1 is the most related to financial content among the keywords extracted from the business report, and 0 otherwise
	Customer	A dummy variable that means 1 is the most related to customers among the keywords extracted from the business report, and 0 otherwise
	Internal	A dummy variable that means 1 is the most related to the internal process among the keywords extracted from the business report, and 0 otherwise
	Learning and Growth	A dummy variable that means 1 is the most related to learning and growth among the keywords extracted from the business report, and 0 otherwise
Control variables	*SIZE*	Natural logarithmic value of total assets [37]
	CFO	Operating cash flow/total assets [38]
	PPE	Depreciable tangible assets/total assets [39]
	INVREC	(Inventory assets + accounts receivable)/total assets [40]
	AGE	Natural logarithmic value of corporate age [41]
	LOSS	A dummy variable that means 1 if the company reported a loss in the previous year and 0 otherwise [42]
	BIG4	A dummy variable that means 1 if the accounting firm audited the enterprise is BIG4 and 0 otherwise [43]

Table 3. Descriptive statistics of the variables.

Variables		N	Mean	Std	Min	Q1	Median	Q3	Max
Dependent variables	*ROA*	346	0.063	0.099	−0.377	0.015	0.061	0.116	0.375
	ROE	346	0.180	0.460	−1.436	0.033	0.119	0.245	2.635
	LEV	346	0.550	0.239	0.063	0.385	0.550	0.703	1.795
	CUR	346	0.628	0.340	0.063	0.431	0.579	0.773	1.888
	GRW_Sales	346	0.090	0.211	−0.497	−0.010	0.074	0.159	1.195
	GRW_Asset	346	0.151	0.264	−0.378	0.016	0.099	0.222	1.513
Independent variables	*Financial*	346	0.361	0.481	0.000	0.000	0.000	1.000	1.000
	Customer	346	0.358	0.480	0.000	0.000	0.000	1.000	1.000
	Internal	346	0.350	0.478	0.000	0.000	0.000	1.000	1.000
	Learning and Growth	346	0.355	0.479	0.000	0.000	0.000	1.000	1.000
Control variables	*SIZE*	346	22.801	1.212	21.078	22.032	22.540	23.375	28.129
	CFO	346	0.079	0.120	−0.194	0.000	0.064	0.146	0.525
	PPE	346	0.081	0.103	0.000	0.013	0.036	0.112	0.480
	INVREC	346	0.056	0.085	0.000	0.010	0.026	0.063	0.505
	AGE	346	3.263	1.371	0.693	2.639	2.996	3.332	7.612
	LOSS	346	0.124	0.330	0.000	0.000	0.000	0.000	1.000
	BIG4	346	0.058	0.234	0.000	0.000	0.000	0.000	1.000

The mean value of the LEV, a measure of stability, was 0.550, the standard deviation was 0.239, and the median was 0.550. The mean value of another measure of profitability, the CUR, was 0.628, the standard deviation was 0.340, and the median was 0.579. The

stability average of the information security industry is found to be relatively low compared to other industries.

The average value of the GRW_Sales, a measure of growth potential, was 0.090, the standard deviation was 0.211, and the median was 0.074. The average value of the GRW_Asset, another measure of profitability, was 0.151, the standard deviation was 0.264, and the median was 0.099. The average growth potential of the information security industry is relatively higher than that of other industries.

Table 4 shows the results of the Pearson correlation analysis. The correlation coefficient between the ROA and ROE, which are profitability indicators, was 0.51 and was found to be significant at the 1% level. The correlation coefficient between the LEV and CUR, which are stability indicators, was 0.50 and was found to be significant at the 1% level. The correlation coefficient between the GRW_Sales and GRW_Sales, which are growth indicators, was 0.42, which was found to be significant at the 1% level.

3.2. Extracting the Company's Management Strategy from the Contents of the Business Report

This study quantified the keywords extracted from the corporate business reports by text-mining techniques and then divided them into four variables: financial, customer, internal, learning and growth by BSC frame.

Text mining employs techniques to draw valuable insights from texts that are either unstructured or semi-structured by leveraging natural language processing (NLP) [12]. This method facilitates the extraction of significant data from extensive text corpora, identifies connections to additional data, and helps categorize themes or topics within the documents [13,14]. Automated systems, often incorporating Java, gather text data from which irrelevant words are eliminated during keyword collection [14].

The bag-of-words (BoW) approach highlights the most common words in a business report [41]. Subsequently, the Term Frequency-Inverse Document Frequency (TF-IDF) matrix, which maps the repetition rates of words within the report, is constructed using the BoW model [15,16]. Text mining often uses the TF-IDF technique for vectorization purposes [17].

The Balanced Scorecard (BSC) is extensively applied in business settings [21]. It recognizes the relationships among learning, customer interactions, internal processes, and financial outcomes. These four aspects are interconnected through cause-and-effect relationships [20]. The BSC model assists in pinpointing critical success factors from these dimensions, thereby supporting an organization's strategic objectives [22].

In this study, only words derived from a value with a TF-ID value of 2.0 or more were selected and designated as keywords. These keywords were classified into the financial, customer, internal, learning and growth perspectives on the management strategies emphasized by the company according to the BSC frame. The specific classification method was as follows. First, the keywords extracted from the company's business report were reviewed and classified into the financial, customer, internal, and learning and growth perspectives. Then, one viewpoint, which was the most concentrated among these four viewpoints by company, could be grasped. Therefore, a dummy variable was created by assigning 1 to the strategic viewpoint that each company emphasizes the most: financial, customer, internal, and learning and growth viewpoints. In other words, through the text-mining technique, a variable that means the company's most emphasized management strategy is quantified as a dummy variable.

Table 4. The results of the Pearson correlation analysis.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) ROA	1.00																
(2) ROE	0.51 ***	1.00															
	(0.00)																
(3) LEV	−0.01	0.15 ***	1.00														
	(0.82)	(0.00)															
(4) CUR	−0.07	0.10 **	0.50 ***	1.00													
	(0.16)	(0.04)	(0.00)														
(5) GRW_Sales	0.21 ***	0.13 ***	−0.09 *	−0.20 ***	1.00												
	(0.00)	(0.01)	(0.07)	(0.00)													
(6) GRW_Asset	0.24 ***	0.16 ***	−0.02	−0.07	0.42 ***	1.00											
	(0.00)	(0.00)	(0.63)	(0.14)	(0.00)												
(7) Financial	0.61 ***	0.49 ***	−0.01	−0.03	0.15 ***	0.21 ***	1.00										
	(0.00)	(0.00)	(0.80)	(0.49)	(0.00)	(0.00)											
(8) Customer	0.58 ***	0.53 ***	0.08 *	0.03	0.20 ***	0.22 ***	0.68 ***	1.00									
	(0.00)	(0.00)	(0.10)	(0.51)	(0.00)	(0.00)	(0.00)										
(9) Internal	0.01	−0.12 ***	−0.67 ***	−0.60 ***	0.13 ***	0.06	−0.04	−0.09 *	1.00								
	(0.76)	(0.01)	(0.00)	(0.00)	(0.01)	(0.24)	(0.38)	(0.08)									
(10) Learning and Growth	0.24 ***	0.21 ***	0.01	−0.16 ***	0.52 ***	0.52 ***	0.20 ***	0.22 ***	0.00	1.00							
	(0.00)	(0.00)	(0.76)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.99)								
(11) SIZE	0.03	0.04	−0.04	0.27 ***	−0.13 ***	−0.13 ***	0.01	0.04	−0.07	−0.07	1.00						
	(0.51)	(0.38)	(0.44)	(0.00)	(0.01)	(0.01)	(0.77)	(0.38)	(0.17)	(0.18)							
(12) CFO	0.39 ***	0.29 ***	−0.06	−0.01	0.13 ***	0.36 ***	0.39 ***	0.36 ***	0.01	0.26 ***	0.12 ***	1.00					
	(0.00)	(0.00)	(0.24)	(0.83)	(0.00)	(0.00)	(0.00)	(0.00)	(0.74)	(0.00)	(0.01)						
(13) PPE	−0.04	−0.07	−0.09 *	0.35 ***	−0.04	0.13 ***	−0.06	−0.11 **	−0.03	−0.05	0.33 ***	0.11 **	1.00				
	(0.36)	(0.14)	(0.07)	(0.00)	(0.40)	(0.01)	(0.21)	(0.03)	(0.53)	(0.27)	(0.00)	(0.04)					
(14) INVREC	−0.01	0.05	0.11 **	0.14 ***	0.07	0.13 ***	−0.04	−0.04	−0.08	0.14 ***	0.06	0.00	0.06	1.00			
	(0.78)	(0.27)	(0.04)	(0.00)	(0.19)	(0.01)	(0.41)	(0.43)	(0.13)	(0.00)	(0.20)	(0.88)	(0.24)				
(15) AGE	−0.02	−0.09 *	−0.02	0.05	−0.25 ***	−0.15 ***	−0.08 *	−0.09 *	0.03	−0.19 ***	0.10 **	−0.08 *	0.03	−0.12 **	1.00		
	(0.69)	(0.09)	(0.64)	(0.33)	(0.00)	(0.00)	(0.09)	(0.06)	(0.48)	(0.00)	(0.05)	(0.10)	(0.56)	(0.02)			
(16) LOSS	−0.13 ***	−0.11 **	0.25 ***	0.06	−0.08	−0.05	−0.11 **	−0.11 **	−0.12 ***	−0.09 *	−0.13 ***	−0.16 ***	0.00	0.06	0.00	1.00	
	(0.01)	(0.04)	(0.00)	(0.19)	(0.11)	(0.33)	(0.02)	(0.02)	(0.01)	(0.07)	(0.01)	(0.00)	(0.90)	(0.24)	(0.93)		
(17) BIG4	0.05	0.09 *	0.01	0.16 ***	0.00	−0.02	0.07	0.09 *	−0.05	−0.05	0.59 ***	0.17 ***	0.26 ***	0.03	−0.06	−0.05	1.00
	(0.34)	(0.08)	(0.76)	(0.00)	(0.98)	(0.65)	(0.18)	(0.06)	(0.33)	(0.31)	(0.00)	(0.00)	(0.00)	(0.48)	(0.23)	(0.30)	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

3.3. Research Model

This study aims to investigate the effect of a company's management strategy on the financial ratio (profitability, stability, and growth performance). In this case, there may be endogeneity in which the management strategy can be affected by the financial ratio. Therefore, to eliminate this endogenous problem, our researchers use Heckman's two-stage model for the empirical analysis [6]. In step 1, a logit model is designed in which the mention of the business report (BSC) is the dependent variable, and the financial ratio that can affect the business report is set as the independent variable. The Inverse Mill's Ratio for the business report of the sample company is derived in the first step. It can be defined as the probability that the mention of the BSC in the business report is not randomly determined.

In step 2, the analysis is performed by adding the Inverse Mill's Ratio derived from the previously established first-stage logit model as a control variable for the regression model. In other words, it is possible to analyze the change due to the BSC mention itself in a pure business report in which the selection bias of the variable is controlled by controlling the probability that the BSC reference in the business report is selected. The first-stage logit model for endogenous control is shown in Equation (1).

$$BSC\ (Financial, Customer, Internal, Learning\ and\ Growth) = \beta_0 + \beta_1\ SIZE + \beta_2\ CFO + \beta_3\ PPE + \beta_4\ AGE + \beta_5\ LOSS + \varepsilon \quad (1)$$

See Table 2 for the definitions of the variables.

In this study, in the first-stage model of the two-stage model, the company size (SIZE) [34], operating cash flow ratio (CFO) [37], and ratio of depreciable tangible assets (PPE) were used as determinants of the BSC references in the business reports [38]. The company age (AGE) was used as a determinant to explain the corporate characteristics [40]. Since there may be incentives to hide past poor performance, whether the company reported a loss last year (LOSS) was used [41]. In the first-stage model, the Inverse Mill's Ratio is derived. The Inverse Mill's Ratio derived from the first-stage model is added as a control variable to the second-stage regression model, which is presented in (2), (3), and (4). This study presented the objective and reliable empirical analysis results using two measures of profitability, stability, and growth, respectively.

$$Profitability\ (ROA, ROE) = \beta0 + \beta1\ BSC\ (Financial, Customer, Internal, Learning\ \&\ Growth) + \beta2\ SIZE + \beta3\ CFO + \beta4\ PPE + \beta5\ INVREC + \beta6\ AGE + \beta7\ LOSS + \beta8\ BIG4 + Year\ Effect + \varepsilon \quad (2)$$

See Table 2 for the definitions of the variables.

$$Stability\ (LEV, CUR) = \beta0 + \beta1\ BSC\ (Financial, Customer, Internal, Learning\ \&\ Growth) + \beta2\ SIZE + \beta3\ CFO + \beta4\ PPE + \beta5\ INVREC + \beta6\ AGE + \beta7\ LOSS + \beta8\ BIG4 + Year\ Effect + \varepsilon \quad (3)$$

See Table 2 for the definitions of the variables.

$$Growth\ potential\ (GRW\_Sales, GRW\_Asset) = \beta0 + \beta1\ BSC\ (Financial, Customer, Internal, Learning\ \&\ Growth) + \beta2\ SIZE + \beta3\ CFO + \beta4\ PPE + \beta5\ INVREC + \beta6\ AGE + \beta7\ LOSS + \beta8\ BIG4 + Year\ Effect + \varepsilon \quad (4)$$

See Table 2 for the definitions of the variables.

The control variables used in the above research model were based on previous studies. SIZE, which means the company size, can profoundly impact a company's profitability, stability, and growth [33]. In particular, the companies in the information security industry in the study's sample are relatively small, so controlling the effect of the company size is necessary.

CFO, which means operating cash flow ratio, is expected to significantly impact profitability, stability, and growth [37]. A company's profitability, stability, and growth can depend on how abundant its cash flow is. PPE refers to the ratio of a company's tangible assets to its proportion of depreciable assets. This is an important factor in determining a company's depreciation cost, which can affect the company's profitability, stability, and growth [38]. INVREC, a variable representing the proportion of a company's

inventory assets and accounts receivable, was also set as a control variable for the research model. The proportion of inventory assets and accounts receivable represents the size of a company's business and is naturally highly related to the company's profitability, stability, and growth [39].

AGE, another control variable, refers to the age of a company, which is added as a control variable because the profitability, stability, and growth fluctuate according to the company's age according to the life cycle theory [40]. LOSS is a dummy variable that means a company's loss. If a company reported a loss, it was naturally used as a control variable in the research model because it greatly impacted the profitability, stability, and growth [41]. BIG4 is a dummy variable about whether a major accounting firm has audited a company. Since the audit quality differs depending on the type and size of the accounting firm, it was determined that it could significantly affect the profitability, stability, and growth of the company, so it was added as a control variable [42].

Finally, since this study only analyzes the information security industry, the industrial effect does not need to be controlled, and the sample period is five years. The year dummy was used as a control variable to eliminate the effect of year-to-year differences.

4. Results

4.1. Hypothesis Test Results

Based on the business reports of companies in the information security industry, this paper conducted an empirical analysis of how the BSC frame affects profitability, stability, and growth according to the management strategy emphasized by the company.

Tables 5 and 6 show the verification results for Hypotheses 1 and 2. In Table 5, the independent variable, Financial, had a β1 of 0.883 and a t-value of 1.815, which were statistically significant at the 10% level. These results support Hypothesis 1, meaning that if a company's management strategy emphasizes the financial part, the company's profitability is high. As expected, it can be seen that companies that pay attention to financial aspects are highly likely to achieve good profitability by managing their financial performance well.

Table 5. Results for Hypotheses 1 and 2 (ROA).

Variable	ROA							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	−0.415	−1.594	−0.302	−1.475	−0.091	−0.228	−0.182	−0.890
Financial	0.883	1.815 *						
Customer			0.620	1.868 *				
Internal					0.059	0.185		
Learning and Growth							0.157	1.131
SIZE	0.002	0.390	0.001	0.253	0.004	0.327	0.006	0.871
CFO	0.166	4.171 ***	0.193	4.836 ***	0.339	7.810 ***	0.176	1.201
PPE	0.195	1.280	0.260	1.439	−0.098	−1.906 *	−0.055	−0.873
INVREC	0.021	0.428	0.022	0.438	−0.003	−0.053	−0.024	−0.417
AGE	0.027	1.772 *	0.021	1.816 *	0.000	0.046	0.010	1.164
LOSS	−0.010	−0.788	−0.011	−0.819	−0.008	−0.115	−0.005	−0.267
Big4	−0.015	−0.644	−0.023	−0.968	−0.005	−0.188	0.001	0.047
Λ	−0.475	−1.588	−0.316	−1.555	−0.039	−0.198	−0.079	−0.938
Fixed Effect	Included		Included		Included		Included	
F-value	18.565 ***		17.034 ***		15.846 ***		16.456 ***	
Adj_Rsq	0.3983		0.3766		0.3054		0.2705	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

Table 6. Results for Hypotheses 1 and 2 (ROE).

Variable	ROE							
	β	**t-Value**	**β**	**t-Value**	**β**	**t-Value**	**β**	**t-Value**
Intercept	1.851	2.968 ***	−0.759	−1.330	0.593	0.312	0.753	0.763
Financial	2.517	4.707 ***						
Customer			3.144	2.902 ***				
Internal					−0.432	−0.284		
Learning and Growth							−0.419	−0.626
SIZE	0.086	3.019 ***	0.121	2.758 ***	−0.013	−0.197	−0.015	−0.466
CFO	0.424	2.149 **	0.391	2.007 **	1.137	5.183 ***	1.511	2.134 **
PPE	−3.434	−5.217 ***	−2.617	−3.474 ***	−0.618	−2.502 **	−0.697	−2.304 **
INVREC	−1.314	−3.076 ***	0.423	1.725 *	0.287	1.026	0.223	0.789
AGE	−0.016	−1.004	−0.137	−3.235 ***	−0.009	−0.295	−0.041	−0.973
LOSS	−1.536	−5.038 ***	−0.615	−3.434 ***	−0.176	−0.554	−0.133	−1.366
Big4	0.189	1.658 *	0.117	1.021	0.127	0.981	0.163	1.252
Λ	−1.277	−4.955 ***	−2.209	−3.334 ***	0.180	0.194	0.335	0.827
Fixed Effect	Included		Included		Included		Included	
F-value	12.923 ***		12.805 ***		9.028 ***		8.965 ***	
Adj_Rsq	0.3100		0.3079		0.2781		0.3005	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

In addition, in Table 5, the independent variable, Customer's β1, was 0.620, and the t-value was 1.868, which were statistically significant at the 10% level. These results support Hypothesis 2, suggesting that if a company's management strategy emphasizes customers, it will ultimately help improve its profitability because it will pay a lot of attention to the business side through thorough customer management.

In Table 6, the independent variable, Financial, had a β1 of 2.517 and a t-value of 4.707, which were statistically significant at the 1% level. Hypothesis 1 was consistently supported, even when the profitability measure of the dependent variable was taken as the ROE. In other words, if a company's management strategy emphasizes the financial part, its profitability is high.

In Table 6, the independent variable, Customer's β1, was 3.144, and the t-value was 2.902, which were statistically significant at the 1% level. These results consistently support Hypothesis 2, even when the profitability measure of the dependent variable is taken as the ROE, suggesting that when a company's management strategy emphasizes customers, the company tends to be highly profitable. Combining these empirical analysis results, it can be confirmed that Hypotheses 1 and 2 of this paper are established by consistent results when both the ROA and ROE are analyzed for corporate profitability proxy variables.

Tables 7 and 8 confirm the verification results for Hypotheses 3 and 4. In Table 7, the independent variable Internal's β1 was −4.105 and the t-value was −1.941, which were statistically significant at the 10% level. These results support Hypothesis 3, meaning that if a company's management strategy emphasizes internal processes, the company's stability is high. It is inferred that, as expected, a company that has established a management strategy emphasizing internal processes first focuses on lowering the company's debt ratio and stabilizing the company.

Table 7. Results for Hypotheses 3 and 4 (LEV).

Variable	LEV							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	1.006	1.088	0.978	2.981	2.421	2.550	0.259	0.520
Financial	−0.174	−0.079						
Customer			0.310	0.497				
Internal					−4.105	−1.941 *		
Learning and Growth							0.599	1.773 *
SIZE	−0.014	−1.097	−0.023	−0.931	−0.023	−2.312 **	0.002	0.144
CFO	−0.125	−1.095	−0.172	−1.534	−0.036	−0.461	−0.685	−1.916 *
PPE	−0.254	−0.376	0.008	0.019	−0.844	−1.826 *	−0.046	−0.302
INVREC	0.206	0.397	0.263	1.864 *	0.156	1.459	0.199	1.389
AGE	−0.001	−0.107	0.009	0.360	0.054	1.407	0.032	1.523
LOSS	0.168	4.505 ***	0.208	2.017 **	0.108	3.829 ***	0.222	4.531 ***
Big4	0.106	1.565	0.094	1.440	0.100	2.010 **	0.118	1.800 *
λ	0.128	0.095	−0.146	−0.383	2.329	1.348	−0.332	−1.624
Fixed Effect	Included		Included		Included		Included	
F-value	5.188 ***		5.702 ***		4.193 ***		5.626 ***	
Adj_Rsq	0.1363		0.1505		0.1841		0.1484	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

Table 8. Results for Hypotheses 3 and 4 (CUR).

Variable	CUR							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	−2.479	−1.939 *	−0.693	−1.522	−2.008	−1.912 *	−1.619	−2.348 **
Financial	4.995	1.247						
Customer			−0.723	−0.835				
Internal					−1.137	−1.651 *		
Learning and Growth							0.884	1.891 *
SIZE	0.046	2.551 **	0.073	2.097 **	0.096	2.729 ***	0.076	3.296 ***
CFO	−0.246	−1.553	−0.323	−2.074 **	−0.217	−1.795 *	−1.063	−2.149 **
PPE	2.539	2.716 ***	0.549	0.913	1.021	7.49 ***	1.241	5.876 ***
INVREC	1.562	2.179 **	0.445	2.273 **	0.291	1.886 *	0.480	2.427 **
AGE	0.009	0.686	−0.020	−0.591	−0.013	−0.750	0.058	1.981 **
LOSS	0.077	1.498	−0.042	−0.291	0.318	1.813 *	0.162	2.393 **
Big4	−0.040	−0.426	−0.004	−0.048	−0.018	−0.254	−0.019	−0.206
λ	−3.049	−1.634	0.497	0.940	0.944	1.839 *	−0.583	−2.061 **
Fixed Effect	Included		Included		Included		Included	
F-value	7.142 ***		7.416 ***		7.595 ***		7.582 ***	
Adj_Rsq	0.1880		0.1947		0.2071		0.1987	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

In Table 7, the independent variable Learning and Growth's β1 was 0.599 and the t-value was 1.773, which were statistically significant at the 10% level. These results support Hypothesis 4, indicating that companies that emphasize learning and growth are also active in their management strategies and pay a lot of attention to investment and employee training for the future, so these companies may have low stability due to high expenditures on employee training and training.

In Table 8, the independent variable, Internal, had a β1 of −1.137, and the t-value was −1.651, which were statistically significant at the 10% level. These results support Hypothesis 3, even when the stability measure of the dependent variable was set to the

CUR. In other words, it suggests that when a company's management strategy emphasizes internal processes, its stability tends to be high.

In Table 8, the independent variable Learning and Growth's β1 was 0.884 and the t-value was 1.891, which were statistically significant at the 10% level. This result supports Hypothesis 4, even when the growth measure of the dependent variable is set to the CUR, meaning that companies that emphasize learning and growth may have low stability because the company's management strategies are also active. It spends a lot of money on investments and employee training for the future. In conclusion, it can be confirmed that Hypotheses 3 and 4 of this paper are established by deriving consistent results when analyzing the company's stability proxy variables in both the LEV and CUR.

Tables 9 and 10 show the verification results for Hypothesis 4. In Table 9, the independent variable Learning and Growth's β1 was 0.486 and the t-value was 1.807, which were statistically significant at the 10% level. These results support Hypothesis 4, and if a company's management strategy emphasizes learning and growth, it is judged that a company with strong future-oriented tendencies will pay a lot of attention to investment and employee training for the future. Therefore, it was confirmed through the empirical analysis results that the growth potential of these companies tends to be high.

Table 9. Results for Hypothesis 4 (GRW_Sales).

Variable	GRW_Sales							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	−0.217	−0.264	0.941	3.223 ***	1.390	1.616	0.393	0.992
Financial	2.528	1.295						
Customer			0.756	1.363				
Internal					−0.493	−0.717		
Learning and Growth							0.486	1.807 *
SIZE	−0.027	−2.310 **	−0.052	−2.312 **	−0.047	−1.619	−0.019	−1.445
CFO	0.201	1.970 **	0.163	1.637	0.272	2.745 ***	−0.275	−0.965
PPE	0.708	1.176	0.448	1.163	−0.075	−0.673	0.086	0.707
INVREC	0.742	1.607	0.185	1.471	0.186	1.471	−0.005	−0.047
AGE	−0.032	−3.959 ***	−0.006	−0.272	−0.024	−1.671 *	−0.006	−0.346
LOSS	−0.044	−1.332	0.066	0.720	−0.147	−1.019	−0.001	−0.029
Big4	0.031	0.511	0.035	0.593	0.051	0.881	0.098	1.875 *
λ	−1.536	−1.278	−0.422	−1.244	0.330	0.785	−0.168	−1.028
Fixed Effect	Included		Included		Included		Included	
F-value	4.820 ***		5.347 ***		4.957 ***		5.982 ***	
Adj_Rsq	0.1258		0.1408		0.1298		0.1611	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

In Table 10, the β1 of Learning and Growth, an independent variable, was 0.792, while the t-value was 1.753, which were statistically significant at the 10% level. These results were still found to support Hypothesis 4, even when the stability measure of the dependent variable was set to the GRW_Asset. In other words, it can be seen that if a company's management strategy emphasizes learning and growth, it is highly likely to be a company with high growth potential. These research results confirm that Hypothesis 4 of this paper is established by deriving consistent results when analyzing the company's stability proxy variables in the GRW_Sales and GRW_Asset.

4.2. Additional Test Results

The sample period for this study is from 2018 to 2022. Since 2020 and 2021, which are the periods of COVID-19, are included in the sample period, additional analysis was performed to present the results of an empirical analysis that controlled the COVID-19 period. *COVID19*, a dummy variable meaning 1 in the COVID-19 period and 0 in the non-

COVID-19 period, was set as the control variable of the research model, and the analysis results are presented here.

Table 10. Results for Hypothesis 4 (GRW_Asset).

Variable	GRW_Asset							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	1.574	1.608	1.007	2.894 ***	1.188	1.155	1.736	4.398
Financial	−0.988	−0.426						
Customer			−0.576	−0.872				
Internal					−0.011	−0.013		
Learning and Growth							0.792	1.753 *
SIZE	−0.048	−3.421 ***	−0.026	−0.971	−0.048	−1.394	−0.049	−3.956 ***
CFO	0.774	6.383 ***	0.743	6.249 ***	0.854	7.202 ***	0.560	5.382 ***
PPE	0.113	0.158	0.027	0.060	0.400	2.997 ***	0.234	1.447
INVREC	0.174	0.317	0.414	2.765 ***	0.406	2.685 ***	0.221	1.626
AGE	−0.016	−1.678 *	−0.039	−1.501	−0.017	−0.971	−0.073	−2.335 **
LOSS	−0.013	−0.319	−0.112	−1.022	−0.020	−0.114	0.007	0.186
Big4	−0.012	−0.169	−0.019	−0.274	−0.017	−0.237	0.043	0.696
λ	0.639	0.448	0.396	0.981	0.021	0.041	−0.634	−2.292 **
Fixed Effect	Included		Included		Included		Included	
F-value	8.130 ***		8.531 ***		7.886 ***		6.941 ***	
Adj_Rsq	0.2118		0.2211		0.2060		0.1780	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

Table 11 presents the additional test results for Hypotheses 1 and 2 when the dependent variable is the ROA. As a result of the further analysis, the independent variable, Financial, had a β1 of 0.680 and a t-value of 1.697, which were statically signaled at the 10% level, as shown in Table 5. In addition, another independent variable, the Customer's β1, was 0.266 and the t-value was 2.133, which were statistically significant at the 5% level.

Table 11. Additional test results for Hypotheses 1 and 2 (ROA).

Variable	ROA							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	−0.473	−1.519	−0.317	−1.667 *	−0.030	−0.282	−0.122	−0.607
Financial	0.680	1.697 *						
Customer			0.266	2.133 **				
Internal					0.090	0.829		
Learning and Growth							0.145	1.050
SIZE	0.008	1.460	0.011	1.653 *	0.001	0.197	0.004	0.623
CFO	0.215	5.341 ***	−0.056	−0.300	0.208	1.296	0.182	1.239
PPE	−0.026	−0.574	0.082	0.879	−0.023	−0.242	−0.052	−0.838
INVREC	−0.023	−0.457	0.031	0.572	0.022	0.438	−0.031	−0.531
AGE	0.023	1.446	0.008	1.743 *	0.003	0.815	0.009	1.080
LOSS	0.022	0.640	−0.030	−2.053 **	−0.014	−0.876	−0.007	−0.371
Big4	−0.024	−1.024	−0.013	−0.523	−0.018	−0.752	0.006	0.241
COVID19	0.004	0.337	0.002	0.164	0.014	1.070	0.000	−0.023
λ	−0.359	−1.285	−0.113	−1.511	0.009	0.131	−0.069	−0.830
Fixed Effect	Included		Included		Included		Included	
F-value	15.359 ***		14.156 ***		16.728 ***		8.097 ***	
Adj_Rsq	0.3511		0.2761		0.3721		0.2706	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

Table 12 shows the additional test results for Hypotheses 1 and 2 when the dependent variable is the ROE. As a result of the additional analysis, the independent variable, Financial, had a β1 of 5.232 and a t-value of 2.417, which were statically signaled at the 5% level, as shown in Table 6. Also, the independent variable, Customer's β1, was 3.395, while the t-value was 2.068, which were statistically significant at the 10% level. Hence, Hypotheses 1 and 2 are robustly supported through control of the COVID-19 period.

Table 12. Additional test results for Hypotheses 1 and 2 (ROE).

Variable	ROE							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	3.422	2.307 **	4.883	2.078 **	0.007	0.013	0.700	0.723
Financial	5.232	2.417 **						
Customer			3.395	2.068 **				
Internal					−0.271	−0.507		
Learning and Growth							−0.442	−0.665
SIZE	0.027	1.005	0.131	1.895 *	0.013	0.489	−0.013	−0.414
CFO	0.446	2.329 **	0.680	3.202 ***	1.494	1.886 *	1.506	2.133 **
PPE	−0.258	−1.196	−0.339	−1.419	−0.800	−1.668 *	−0.702	−2.329 **
INVREC	0.217	0.891	0.437	1.625	0.399	1.596	0.228	0.809
AGE	−0.205	−2.688 ***	−0.153	−2.300 **	−0.024	−1.156	−0.042	−1.022
LOSS	−0.489	−2.953 ***	−0.312	−2.685 ***	−0.112	−1.472	−0.136	−1.403
Big4	0.071	0.623	0.132	1.056	0.077	0.666	0.155	1.205
COVID19	−0.014	−0.219	0.046	0.669	0.037	0.576	0.035	0.723
λ	−3.509	−2.637 ***	−2.262	−2.247 **	0.442	1.380	0.347	0.864
Fixed Effect	Included		Included		Included		Included	
F-value	13.246 ***		11.775 ***		11.775 ***		5.057 ***	
Adj_Rsq	0.3157		0.2888		0.2888		0.2052	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

Table 13 presents the additional test results for Hypotheses 3 and 4 when the dependent variable is the LEV. As a result of the further analysis, the independent variable, Internal, had a β1 of −0.445 and t-value of −1.753, which were statically signaled at the 10% level, as shown in Table 7. In addition, another independent variable, Learning and Growth, had a β1 of 0.599, and its t-value was 1.773, which were statistically significant at the 10% level.

Table 14 shows the additional test results for Hypotheses 3 and 4 when the dependent variable is the CUR. As a result of the additional analysis, the independent variable, Internal, had a β1 of 5.232 and a t-value of 2.417, which were statically signaled at the 5% level, as shown in Table 8. Also, the independent variable, Customer's β1, was 3.395, while the t-value was 2.068, which were statistically significant at the 10% level. Therefore, Hypotheses 3 and 4 are consistently supported under the control of the COVID-19 period.

Table 15 presents the additional test results for Hypothesis 4 when the dependent variable is the GRW_Sales. As a result of the further analysis, the independent variable, Learning and Growth, had a β1 of −0.465 and a t-value of 1.733, which were statically signaled at the 10% level, as shown in Table 9.

Table 16 shows the additional test results for Hypothesis 4 when the dependent variable is the GRW_Asset. As a result of the additional analysis, the independent variable, the GRW_Asset, had a β1 of 0.125 and a t-value of 1.690, which were statically signaled at the 110% level, as shown in Table 10. Thus, Hypothesis 4 is robustly supported through control of the COVID-19 period.

Table 13. Additional test results for Hypotheses 3 and 4 (LEV).

Variable	LEV							
	β	**t-Value**	**β**	**t-Value**	**β**	**t-Value**	**β**	**t-Value**
Intercept	0.460	0.546	0.951	3.220 ***	0.649	2.186 **	0.259	0.520
Financial	0.696	0.567						
Customer			0.325	1.070				
Internal					−0.445	−1.753 *		
Learning and Growth							0.599	1.773 *
SIZE	−0.008	−0.487	−0.021	−1.419	−0.014	−0.924	0.002	0.144
CFO	−0.219	−2.017 **	−0.539	−1.201	−0.691	−1.511	−0.685	−1.916 *
PPE	−0.124	−1.008	0.051	0.189	0.115	0.416	−0.046	−0.302
INVREC	0.219	1.584	0.274	1.936 *	0.302	2.076 **	0.199	1.389
AGE	0.021	0.475	0.006	0.541	0.009	0.796	0.032	1.523
LOSS	0.208	2.212 **	0.190	4.386 ***	0.203	4.606 ***	0.222	4.531 ***
Big4	0.083	1.290	0.097	1.492	0.066	0.982	0.118	1.800 *
COVID19	−0.028	−0.784	−0.016	−0.440	0.064	2.594 ***	−0.014	−0.396
λ	−0.358	−0.474	−0.152	−0.838	0.228	1.244	−0.332	−1.624
Fixed Effect	Included		Included		Included		Included	
F-value	6.835 ***		5.754 ***		4.863 ***		5.626 ***	
Adj_Rsq	0.1802		0.1519		0.1007		0.1484	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

Table 14. Additional test results for Hypotheses 3 and 4 (CUR).

Variable	CUR							
	β	**t-Value**	**β**	**t-Value**	**β**	**t-Value**	**β**	**t-Value**
Intercept	−0.402	−0.338	−0.523	−1.273	−0.329	−0.761	−1.919	−2.809 ***
Financial	−0.171	−0.099						
Customer			−0.094	−0.223				
Internal					−1.251	−1.813 *		
Learning and Growth							0.928	1.976 **
SIZE	0.047	2.143 **	0.049	2.405 **	0.067	2.604 ***	0.086	3.738 ***
CFO	−0.325	−2.122 **	−0.048	−0.077	−0.320	−2.058 **	−1.083	−2.175 **
PPE	1.094	6.323 ***	0.944	2.496 **	1.078	6.184 ***	1.223	5.754 ***
INVREC	0.402	2.059 **	0.439	2.227 **	0.449	2.294 **	0.513	2.583 **
AGE	0.000	−0.003	0.005	0.316	−0.039	−0.916	0.060	2.051 **
LOSS	0.059	0.444	0.070	1.167	−0.133	−0.706	0.169	2.474 **
Big4	−0.020	−0.223	−0.013	−0.147	−0.004	−0.043	−0.049	−0.538
COVID19	−0.015	−0.295	−0.004	−0.075	−0.003	−0.064	0.023	0.678
λ	0.171	0.160	0.111	0.438	0.823	1.194	−0.624	−2.197 **
Fixed Effect	Included		Included		Included		Included	
F-value	7.591 ***		7.347 ***		7.469 ***		8.962 ***	
Adj_Rsq	0.1990		0.1930		0.1960		0.1875	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

Table 15. Additional test results for Hypothesis 4 (GRW_Sales).

Variable	GRW_Sales							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	−0.497	−0.648	0.822	3.128 ***	0.691	2.491 **	0.435	1.115
Financial	1.980	1.768 *						
Customer			0.444	1.641				
Internal					0.747	1.034		
Learning and Growth							0.465	1.733 *
SIZE	−0.013	−0.891	−0.036	−2.781 ***	−0.039	−2.362 **	−0.020	−1.534
CFO	0.213	2.150 **	−0.388	−0.970	0.158	1.588	−0.269	−0.947
PPE	−0.034	−0.303	0.290	1.199	−0.004	−0.039	0.085	0.698
INVREC	0.159	1.256	0.201	1.589	0.182	1.448	−0.010	−0.091
AGE	0.035	0.895	−0.022	−2.108 **	−0.006	−0.233	−0.007	−0.442
LOSS	0.092	1.078	−0.012	−0.324	0.070	0.575	−0.005	−0.128
Big4	0.036	0.612	0.042	0.731	0.037	0.641	0.099	1.921 *
COVID19	−0.017	−0.522	−0.014	−0.440	−0.015	−0.455	−0.045	−2.310 **
λ	−1.194	−1.735 *	−0.227	−1.402	−0.417	−0.943	−0.153	−0.945
Fixed Effect	Included		Included		Included		Included	
F-value	5.024 ***		5.386 ***		5.286 ***		6.609 ***	
Adj_Rsq	0.1317		0.1418		0.1391		0.1315	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

Table 16. Additional test results for Hypothesis 4 (GRW_Asset).

Variable	GRW_Asset							
	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Intercept	1.347	1.483	1.199	3.828 ***	1.167	3.528 ***	1.484	3.180 ***
Financial	−0.303	−0.229						
Customer			0.415	1.289				
Internal					0.015	0.018		
Learning and Growth							0.125	1.690 *
SIZE	−0.048	−2.889 ***	−0.056	−3.583 ***	−0.047	−2.408 **	−0.058	−3.690 ***
CFO	0.745	6.353 ***	0.256	0.538	0.751	6.314 ***	0.931	2.737 ***
PPE	0.459	3.468 ***	0.733	2.542 **	0.458	3.435 ***	0.392	2.700 ***
INVREC	0.380	2.547 **	0.432	2.871 ***	0.416	2.774 ***	0.211	1.558
AGE	−0.029	−0.613	−0.007	−0.552	−0.017	−0.529	−0.025	−1.244
LOSS	−0.043	−0.425	0.014	0.300	−0.021	−0.143	−0.031	−0.664
Big4	−0.030	−0.440	−0.026	−0.374	−0.026	−0.370	0.032	0.515
COVID19	−0.033	−0.870	−0.025	−0.643	−0.025	−0.647	−0.017	−0.728
λ	0.236	0.290	−0.207	−1.072	0.034	0.065	−0.221	−1.141
Fixed Effect	Included		Included		Included		Included	
F-value	8.130 ***		8.550 ***		8.433 ***		9.316 ***	
Adj_Rsq	0.2118		0.2215		0.2188		0.2140	
N_obs	346		346		346		346	

Note: *, **, and *** mean that the significance levels are significant at 10%, 5%, and 1%, respectively.

5. Discussion

This paper studied how various financial ratios are affected by the management strategies emphasized in business reports, with the information security industry as the sample target. In particular, this study is considered valuable in that the qualitative unstructured text data of the business report were quantified through the text-mining technique, one of the artificial intelligence techniques, and the results of the empirical analysis were presented.

The empirical analysis results of this paper suggest the following points. First, it was found that companies with management strategies that emphasize a financial perspective have a high financial ratio. According to the corporate life cycle theory, these results can appear when the company is still immature, and according to [26,28], the information security industry seems to be valid as most of them have many unlisted companies. Second, the research results showed that companies with management strategies that emphasize the customer perspective have similarly high financial ratios. The theory of the corporate life cycle explains that such companies are mainly located in a period of growth [28]. It can be seen that the profitability of a company improves as it actively attracts customers and thoroughly manages customers for continuous growth [27]. Third, it was found that companies with management strategies that emphasize internal processes have a low stability ratio, that is, a debt ratio. According to the corporate life cycle theory, these companies are more likely to belong to maturity [30], suggesting that the capital structure is improved by reducing the debt-to-equity ratio for sustainable and stable growth. Fourth, it was found that companies that emphasize the learning and growth perspectives have a significantly high growth rate. According to the corporate life cycle theory, these companies are likely to be in the period of growth [26,30], and it can be interpreted as investing in the education of employees from a long-term perspective.

This paper makes academic contributions through the following points. First, although there are many studies on companies, there are not many studies that have conducted empirical analysis of companies belonging to the information security industry with a focus on the information security industry. The results of this study suggest that there is some relationship between the management strategy and financial ratio that companies emphasize. Second, this study collected text data from the company's business report, extracted what management strategies the company emphasized, and converted them into variables. This research method can be said to have contributed to the expansion of the scope of the research by quantifying the non-quantitative information of the company and allowing empirical analysis to be conducted. Third, for endogenous control, this study presented reliable research results using a two-stage model. In addition, to derive objective analysis results, two financial ratios for profitability, stability, and growth were used to derive the empirical analysis results. This rigorous, augmented analysis methodology is expected to present good guidelines for subsequent researchers conducting corporate research.

In practice, the research results in this paper have contributed the following points. First, the analysis results of this paper can be useful data on what information companies in the information security industry can present to stakeholders such as shareholders, creditors, and investors when establishing management strategies. Second, it can be seen from this paper that it is possible to extract the management strategies that the company emphasizes from the texts in the company's business report. This reminds us of the importance of corporate business reports and means that important qualitative information such as corporate management strategies can be delivered to stakeholders outside the company through business reports. Third, in this paper, through empirical analysis, it was found that the company's pursuit and corporate behavior change due to the management strategy emphasized by the company, which can ultimately have a significant impact on the financial ratio index. These findings indirectly suggest that it is possible to predict how the company's financial situation may change in the future due to the company's management strategy.

In the era of artificial intelligence, the prospects of information security companies are bright at a time when the importance of information is gradually being emphasized. However, many information security companies are associated with poor financial conditions. For sustainable growth, information security companies should recognize that management strategies can be indicators that can imply a company's financial ratio and establish management strategies appropriate to the current situation.

6. Conclusions

In this study, the business report, the most representative report that discloses non-financial information about a company, was collected to identify the company's management strategy. This study extracted keywords after crawling the business overview contents of the business report using text-mining techniques. It also identified the management strategies emphasized by companies by dividing these keywords into the financial perspectives, customer perspectives, learning and growth perspectives, and internal process perspectives.

The empirical analysis investigated how the profitability, stability, and growth rate change according to the company's strategy using the two-stage model proposed by Heckman (1979) [6]. This paper provides useful information on the management strategies and financial ratios of relatively small and financially poor information security companies by examining how their financial position changes according to the management strategies emphasized by the companies in the information security industry.

The research results in this paper are summarized as follows. First, it was confirmed that a company that emphasizes a financial perspective in a business report is highly profitable. Second, companies that emphasize customer perspectives in business reports were found to be highly profitable. Third, it was found that companies that emphasize the internal process perspective in the business report have high corporate stability. Fourth, it was confirmed that companies emphasizing the learning and growth perspective in the business report have low corporate stability but high growth potential.

This study differs from previous studies in the following respects. First, the company's management strategy was identified by extracting unstructured text information from the company's business report through a text-mining technique and quantifying it. Second, a new research methodology that has not previously been researched using management strategy and financial information (profitability, stability, and growth), which are non-financial information of a company, was presented. Third, a new management strategy analysis method was proposed in the field of management strategy by classifying the company's management strategy through the BSC frame.

This paper has contributed points and expected effects in the following respects. First, this paper's quantification method for text data is expected to present a method for quantifying numerous non-quantitative data to subsequent researchers. Second, this study proved that management strategies can be grasped using the contents of a company's business report. Since this method of identifying management strategies is based on the actual business content of the company, it is expected to be a more accurate method than the existing method for identifying management strategies. Third, this paper presents the characteristics of the management strategy and financial ratio of information security companies by presenting the results of research on information security companies that have not been studied much so far. This is expected to provide useful information to information security companies in terms of establishing management strategies.

The limitation of this study is that the sample period is not long due to the difficulty of collecting business reports by companies, and the COVID-19 period is included in the sample period. However, in this study, the research results were presented through additional analysis to overcome the distortion problem concerning the results caused by the COVID-19 period. Various studies on information security companies seem to be needed for the development of the information security industry, and our researchers plan to conduct a study on the impact of the management strategies of information security companies on future corporate value in future studies.

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