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Applying data mining techniques to predict the market performance of publicly traded companies

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ABSTRACT

The advent of the Internet has brought about a transformation in the conventional methods of disseminating company information, presenting corporations with new channels of engagement with investors. Through an analysis of domestic firms listed on the Philippine Stock Exchange (PSE) during the period from 2018 to 2019, this study has probed the Voluntary Disclosure Index (VDI) as an indicator of Internet reporting, discovering that it is influenced by various characteristics of the firm, such as profitability, capital structure, and leverage. Nonetheless, the evidence supporting the impact of internet reporting on market performance remains limited. The objective of this research was to investigate the influence of Internet financial reporting (IFR) on three major market performance indicators: (a) Stock Price, (b) Stock Returns, and (c) Company Value, utilizing the weighted voluntary indexes derived from the VDI checklist. Market data pertaining to 58 publicly listed Philippine companies across various sectors were collected from the PSE database. The study's findings suggest that there are no significant relationships between the domains of the disclosure index and market performance. However, it was observed that the technological features of a company's website can positively influence earnings per share (EPS). By shedding light on the VDI within the context of Philippine companies, this paper makes a valuable contribution to the existing literature. Furthermore, the insights gained from this research could assist regulatory bodies and companies in formulating pertinent policies concerning internet reporting, thereby enhancing corporate governance and the practices of publicly listed companies in the Philippines.

1. Introduction

In the current economic environment, it is difficult for businesses and corporations to function without an accounting and financial reporting system (Baidybekova et al., 2021). The growth of financial accounting and reporting is unachievable without the advancement of the information society and the implementation of administrative management in a digitalized environment (Baidybekova et al., 2021). The conventional method of providing corporate information has been altered by the prevalence of the Internet in the business sector. The fast expansion of the Internet provides firms with new channels of communication with investors (Siahaan et al., 2021). As such, disclosure of information on the firm's website will lessen ambiguity over the company's prospects (Allport and Pendley, 2010; Khan, 2007; Raman et al., 2003; Sabrina et al., 2019; Suciani et al., 2020). Studies imply that investors prefer to invest in their home markets due to knowledge asymmetries between local and overseas investors and behavioral biases generated by unfamiliarity with other markets (Amiram, 2012), highlighting the importance and relevance of corporate reporting to a broader audience. Accordingly, increased timeliness and efficiency in receiving financial information, a simplified and accelerated investment selection process, and affordable company information are the three key advantages for users who gather financial

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information about firms through their websites (Khan et al., 2017).

The secrecy has a significant negative impact on business value, indicating that ASEAN countries with a high secrecy index must reduce their level of secrecy in order to increase firm value by increasing investor trust in the ASEAN region's financial reporting systems. However, the requirement for in-house expertise, the need to keep the information current, and information security issues deter organizations from using the Internet for Financial Reporting (Khan et al., 2017).

Finally, the proponents' analysis of domestic companies listed in the Philippine Stock Exchange (PSE) for 2018-2019 revealed that VDI is driven by the firm's specific characteristics, particularly the company's profitability, capital structure, and leverage. However, this result is opposite to the Philippine companies in the ASEAN Stock Exchange, indicating that profitability and capital structure do not influence IFR (Angela and Rachmawati, 2021).

Few academics in the Philippines have investigated the voluntary disclosure index (VDI) among publicly listed firms. Much less on the investigation of the VDI's impact on a company's financial performance, which could potentially serve as a motivating factor for companies to disclose financial information using the Internet (Hussein and Nounou, 2021). Hence, the current status and the benefits of IFR to Philippine companies remain inconclusive.

This paper investigated the impact of Internet financial reporting (IFR) on the following three key market performance indicators: (a) Stock Price, (b) Stock Returns, and (c) Company Value. The proponent intends to seek the current VDI of select Philippine publicly listed companies (PLCs) as a measure of IFR for 2021 and determine whether these domains of VDI impact market performance.

The study will contribute to the literature on IFR practices in the Philippines. Further, the result of this study may provide insights to regulatory bodies to formulate policies related to financial reporting using the company websites and as a basis for developing future research directions on IFR-related topics.

2. Related literature

Numerous research studies on IFR are oriented towards identifying the factors that impact businesses' voluntary disclosure practices through online platforms (Mokhtar, 2017; Murdayanti and Khan, 2021) and few on the perceived benefits of IFR. According to the literature, among the benefits of IFR to users of corporate information is improved financial statement dependability as Blockchain, Internet of Things (IoT), smart contracts, and Artificial Intelligence (AI) can alleviate financial reporting and auditing concerns (Roszkowska, 2020). Additionally, IFR increases speed and efficiency in accessing financial information, simplifies investment decision-making, and delivers affordable corporate information (Khan et al., 2017). Similarly, increased information and analysis, worldwide access, and mass communication are further benefits of online financial reporting (Khan et al., 2017). A study of IFR in Egypt revealed that hard copy financial reports are still necessary for transparency except for verifiability; most considered Corporate Internet Reporting to improve accounting information's quality (Ahmed et al., 2018). In a different study, Egyptian enterprises with greater voluntary disclosure are likely to have more complicated annual reports and less profitable organizations and firms with earning management techniques add optional material to annual reports, reducing readability issues (El-Din et al., 2022).

The company may also benefit from engaging in IFR, including improved corporate image, company teller technological progress, and increasing positional competitiveness (Khan et al., 2017). Interestingly, this is supported by empirical evidence from Australia as it reported a correlation between a company's social media strategy and its environmental, social, and corporate governance (ESG) ranking for Australian companies (Xiang and Birt, 2021).

In Ukraine and the context of the digital economy, the requirement to disclose information for tax purposes and to ensure the transparency of business processes in the global space bolsters the significance of international financial reporting standards (IFRS) and the exchange of tax and financial information resulting to good management and investment choices (Chumakova et al., 2020).

Research in Indonesia sought to determine how IFR moderates the relationship between financial performance and business value (IFR) for the manufacturing industry and revealed that IFR could augment the impact of financial performance on enterprise value. When a business employs IFR to send a positive signal to investors, and those investors respond by investing in the company, the effect of financial performance on firm value increases (Agustina and Suryandari, 2017). Further, analysis in Malaysian companies suggests a link between financial success and IFR disclosure stance as stakeholders believed that ritualistic IFR disclosure is empirically valid to evaluate underperforming enterprises but deny the opportunistic IFR disclosure stance in valuing well-performing enterprises, even though it potentially may boost firms' value (Keliwon et al., 2018). Similarly, empirical evidence in India indicates a link between voluntary disclosures and the value of a company, as measured by Tobin's Q, as the market places a higher value on businesses that give optional information on social and environmental concerns, corporate governance, and financial information (Charumathi and Ramesh, 2020).

Schoenfeld (2017) reported that an increase in transparency correlates with more stock liquidity, suggesting that voluntary disclosure boosts the liquidity of stocks. A study of non-finance Kompas100 listed firms indicated that the companies' aggregate VDI was favorably appreciated on the market through good levels of stock prices (Hutagaol-Martowidjojo and Richard, 2020). In contrast, a controlled empirical study in Indonesia cannot characterize the impacts of voluntary disclosure on the earning response coefficient (ERC) evaluated by cumulative abnormal return and leverage, price to book value, and firm size (Fuady, 2018). Moreover, empirical data in Bangladesh show a favorable and substantial relationship between integrated reporting disclosure index and performance metrics, mainly return on assets, equity, and market-to-book value (Islam, 2021; Sahore and Verma, 2017). Similar results can be found in the banking sector in Yemen (Al-Homaidi et al., 2020).

3. Methodology

Considering the study's nature, scope, and variables, this quantitative investigation mainly depended on secondary data and data mining techniques (Fig. 1). This study was anchored by the works of Sahore and Verma (2017) and Hussein and Nounou (2021). However, using relevant data from all sectors in the Philippines and the measure of the market, performances cover average stock price, market values, and earnings per share. Further, descriptive and correlation analyses were used to describe the current status of IFR in the Philippines and determine the domains that influence PLC's market performances.

The samples are similar companies purposively drawn from the previous research study of the proponents. However, the samples were re-evaluated based on the following inclusion criteria: (1) Functional company websites, (2) Listed the PSE in 2021, (3) Availability of Performance indicators in the PSE. After the re-evaluation, 58 samples remained in the study, which reflects 20% of 286 publicly listed traded firms in the Philippines. Sectors, as categorized by the PSE, are well represented in the samples as shown in Table 1.

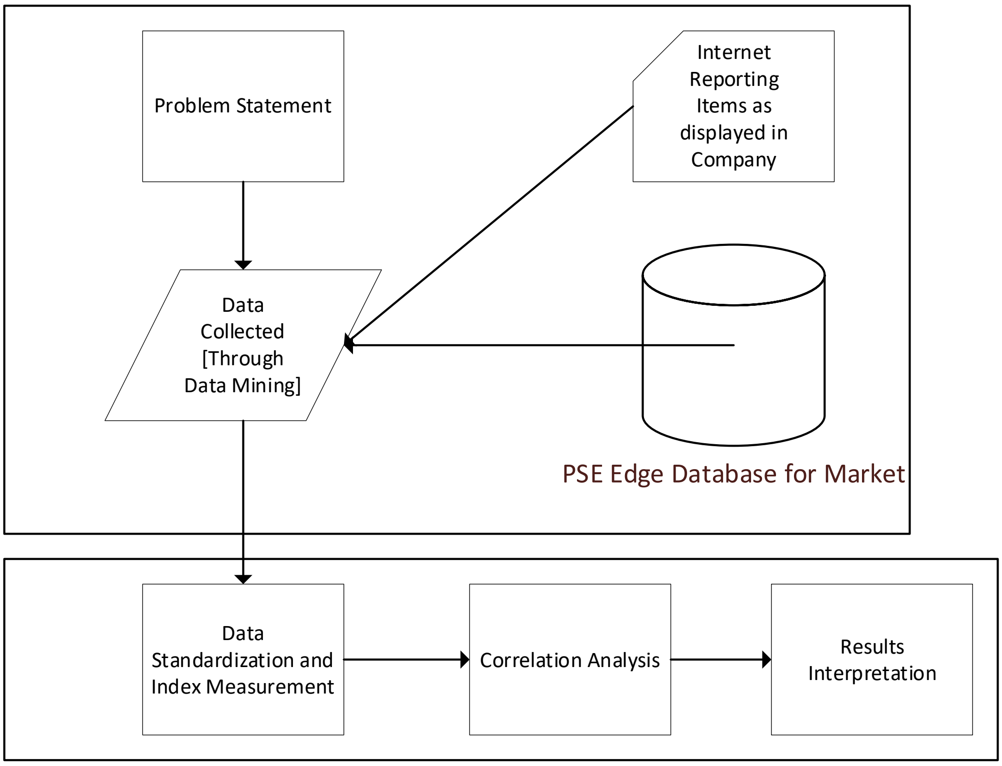

Fig. 1: Architectural design of the study

Table 1: Distribution of samples per sector as classified by PSE

	A	B	C
Sectors	Count as per PSE listing	Pro-Rate Percentage (A / ΣA)	Number (Rounded) of Companies as Samples (ΣC x B)
Financials	31	12%	7
Holding Firms	40	16%	10
Industrial	62	24%	14
Mining and Oil	24	9%	5
Property	35	14%	8
Services	59	23%	13
Small, Medium, and Emerging Board	4	2%	1
Total	255	100%	58

3.1. Index measurement

A descriptive analysis was conducted to describe the VDI of individual Philippine PLCs and the aggregate VDI. The company's websites were evaluated using a comprehensive checklist (Table 2) developed by Marston and Polei (2004) for a similar investigation. If a corporation exposes an item of information listed in the index on its website, it receives a score of one (1); if it does not disclose an item, it receives a score of zero (0). The checklist will then generate a total score evaluating the website's content and presentation dimensions. Since the importance of the content is seen to be greater than that of the presentational element, weights of 60% and 40% are to be assigned, respectively (Marston and Polei, 2004).

Table 2: VDI checklist's components and weights

Domains	Dimension	Description	Weights
A	Content	Investor-Related Information	30
B	Content	Timeliness, social and environmental disclosure, contact details, and other information	30
C	Presentation	Technological features	15
D	Presentation	Convenience and usability	25

The checklist encompasses four (4) distinct domains. The first domain comprises twenty-seven (27) items, primarily concentrating on financial information dissemination, encompassing the reporting of financial statements, their analysis, auditor reports, management analysis, analysts' forecasts, and other pertinent data for investors. The second domain encompasses fourteen (14) items that center around the promptness of information provision, market-related data, reports concerning social responsibility, and disclosures pertaining to environmental matters. The third domain entails ten (10) items, including factors such as website loading times, hyperlinks within the annual report, availability of financial data in processable formats, incorporation of graphic images, and accessibility to sound and video files. Finally, the fourth domain comprises sixteen (16) items, assessing the presence of specific features like a help site, internal search engine, page recommendation function, and mailing list, among others. An index will be calculated for each company within each domain, employing a weighted formula as follows:

$$I_{(a-d)} = K_{(a-d)} \sum_{i=1}^{n} \frac{X_i}{n} \quad (1)$$

where, $\mathrm{I}_{(a-d)}$ =Index for domains A to D, respectively; $\mathrm{K}_{(a-d)}$ =Weights assigned for domains A to D, respectively; X = Domain score of the company; n=maximum number of items in a domain. The overall index was calculated as follows:

$$VDI = I_a + I_b + I_c + I_d \quad (2)$$

3.2. Data standardization

In order to allow comparison of data collected, the market performance indicators, remarkably average stock prices, market values, and the earnings per share will be converted to standardized values with the use of the following equation:

$$z = \frac{X-\mu}{\sigma} \quad (3)$$

where, $z =$ Standardized value; $X =$ data or the observation value; $\mu =$ mean of the data set; $\sigma =$ Standard Deviation.

Accordingly, it may be necessary to standardize data semantics, properties, structure, formats, and interfaces to maximize data analysis's advantages (Gal and Rubinfeld, 2018).

4. Results and discussion

4.1. Descriptive analysis

The descriptive analysis showed that publicly listed companies in the Philippines reported higher indexes in domains A and B and lesser in domains C and D (Table 3). The result shows that Philippine companies put more emphasis on the content of information disclosed on their respective company websites compared to the presentational features. As for the content dimension, Philippine companies regarded investor-related information as more important than social and environmental disclosures. This finding is in line with the empirical evidence from the United Arab Emirates and Saudi Arabia (Al-Janadi et al., 2012) and in Egypt (Elfeky, 2017) where voluntary disclosure is lacking for the vast majority of social and environmental data points. Additionally, the indexes revealed that all domains could be maximized since the indexes reported figures lower than 100%. There are items in the checklist that can be included in the company disclosures for Philippine companies as revealed in the individual index per domain and the overall VDI. Similar status was reported for banking and finance companies in Sri Lanka (Abeywardana and Panditharathna, 2016) showing that disclosures regarding general information, corporate environment, financial performance, and risk management exceeded 61% in 2015.

In contrast, on average, disclosures regarding corporate strategy, forward-looking information, human and intellectual capital, competitive environment and outlook, and corporate social responsibility information were below 45% (Abeywardana and Panditharathna, 2016), indicating that there is significant room for improvement in the context of voluntary disclosures.

Table 3: Descriptive analysis

Domains	Dimension	Description	Index
A	Content	Investor-Related Information	78.72%
B	Content	Timeliness, social and environmental disclosure, contact details, and other information	66.29%
C	Presentation	Technological features	54.38%
D	Presentation	Convenience and usability	63.57%
		Overall VDI	67.47%

4.2. Correlation analysis

Table 4 presents the relationship of the VDI to market performance indicators. All domains except domain C to earnings per share have no impact on market performance indicators revealing a p-value of more than .05. Apparently, this VDI status in the Philippines does not support the empirical pieces of evidence from Indonesian companies on market values, Nigerian companies on stock prices (Ofoegbu and Odoemelam, 2018), Indian non-manufacturing companies on stock returns (Sahore and Verma, 2017), Malaysian companies on earnings response coefficient (Fah and Huei, 2016), Egyptian companies on company value and stock prices (Hussein and Nounou, 2021), and Australian companies on financial performance (Xiang and Birt, 2021) where VDI correlates with market performance indicators. However, the finding is consistent with the results for some companies listed in the ASEAN Stock Exchange (Angela and Rachmawati, 2021; Craig and Diga, 1998).

Furthermore, domain C, which relates to a technological feature of company websites, impacts the company's earnings per share (EPS). This could mean that graphic images, shorter loading times, and video and audio files on the company websites would most likely influence stock returns.

5. Conclusion

This research study reveals a noteworthy scope for improvement in the voluntary disclosure practices of the Philippines, as indicated by the Philippine Disclosure Index (PDI) status. Through correlation analysis, it was observed that only the technological features, representing the third domain of the PDI, demonstrated a significant association with IFRS' impact on market performance. Conversely, the first, second, and fourth domains of the PDI exhibited no significant relationship with market performance.

Table 4: Pearson correlations matrix

		Domain A	Domain B	Domain C	Domain D	Average stock price	Market value	Earnings per share
Domain A	Pearson's r	—	0.515***	0.179	0.411**	0.044	0.133	-0.015
	p-value	—	< .001	0.179	0.001	0.745	0.319	0.911
Domain B	Pearson's r		—	0.296*	0.551***	0.156	0.063	0.170
	p-value		—	0.024	< .001	0.243	0.638	0.203
Domain C	Pearson's r			—	0.343**	0.199	-0.069	**0.301***
	p-value			—	0.008	0.134	0.609	**0.022**
Domain D	Pearson's r				—	0.126	0.162	0.001
	p-value				—	0.346	0.224	0.995
Average Stock Price	Pearson's r					—	-0.145	0.134
	p-value					—	0.277	0.317
Market Value	Pearson's r						—	-0.107
	p-value						—	0.426
Earnings Per Share	Pearson's r							—
	p-value							—

*: p < .05; **: p < .01; ***: p < .001

Furthermore, the study found that among the indicators of market performance, only EPS significantly influenced stockholders' decision-making. Conversely, neither stock price nor company value (market value) played a substantial role in influencing stockholders' decisions to invest in a PSE-listed company. As a result, investors tend to focus extensively on the potential returns they could achieve per share and over the long term when considering the purchase of company shares.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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