

Conference Paper

Efficacy of Enterprise Risk Management in Enhancing Sustainability and Financial Performance in the Solar PV Industry: A Conceptual Framework

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Abstract.

As an alternative to fossil fuels, solar PV electricity can help mitigate global warming and improve the environment by lowering greenhouse gas emissions (GHG). More nations have developed programs to encourage the production and use of PV electricity, considering the potential of renewable energy for sustainable development. The government of Malaysia wants solar PV to be the primary source of renewable energy by 2030. To reduce global warming, renewable energy technology must be implemented more widely. However, the production of solar photovoltaic modules raises serious sustainability concerns. These concerns include using conflict minerals, toxicity, and limited supply or supply chain governance risks of rare materials. Even though solar energy projects are technically feasible, stakeholders still view the region's initiatives as risky due to ongoing governance problems. Domains related to solar project deployment that involve installation, operation, and management are particularly susceptible to governance issues, such as a lack of accountability and transparency. Renewable energy investments upfront are risky and expensive. Risks in the solar PV value chain include subpar design and manufacturing decisions, inventory losses, quality problems during the execution process, and cultural and societal problems brought on by the absence of an effective risk management system. This study thus investigates how the implementation of ERM influences the company's financial performance. Enterprise Risk Management (ERM) is a technique that regulates, and coordinates offset risks all over the firm to manage and integrate all risks holistically. As a result, this paper provides a conceptual and theoretical framework for how corporations use risk management to lower the cost of capital and improve sustainable development in the solar PV industry. The suggested theoretical and conceptual framework, supported by stakeholder and legitimacy theory, provides a foundation for empirically validating the entangled interaction between the relevant variables. It is advocated that measuring variables such as enterprise risk management, financial performance, and sustainability performance be based on previous research and frameworks and recommendations produced by major organizations. The purpose of this paper is to guide Malaysian solar PV companies in the implementation of sustainability and risk management.

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1. Introduction

To achieve organizational goals, one must make a few decisions, and each decision entails some level of risk (Shah et al., 2021). Risk is a fact that cannot be avoided when running a business. COSO (2017) believes that businesses will face an uncertain future in the next years. As a result, the necessity of risk management is increasingly being acknowledged (S. Q. A. Shah, F. W. Lai, et al., 2022). The enterprise risk management framework is the risk management framework that is now being used by many firms and is more widespread than other risk management systems (Saeidi et al., 2019). The Committee Of Sponsoring Organization Of The Treadway Commission (COSO), the leading expert in the field of ERM, defined ERM as: “a process, effected by an entity’s board of directors, management and other personnel, applied in a strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, and to provide reasonable assurance regarding the achievement of entity objectives” (COSO, 2004). ERM allows all risks to be thoroughly recognized, classified based on impact, and efficiently managed (Lai et al., 2021; Mukhtar et al., 2022). All information gained through enterprise risk management can assist business leaders in making sound decisions about investments, capital utilization, performance evaluation, reward systems, employee training, and evaluation. Enterprise Risk Management (ERM) has grown in popularity as a method of managing risk comprehensively. The implementation of ERM in a company is anticipated to yield several benefits. For example, value maximization risk management theory assumes that ERM adoption results in a variety of tangible and intangible benefits for firms, these benefits include an improved risk/return profile, increased management trust in corporate operations, and risk evaluation (Shad et al., 2019; Shad & Lai, 2015a, Shad & Lai, 2015b). Furthermore, it improves company entrepreneurship, profitability, and competitiveness. Strengthens corporate governance and internal control while adhering to regulatory agencies. The primary objective of ERM is to maximize shareholders’ value (Sobel & Reding, 2004). ERM adoption helps the corporation comprehend the underlying risks in all parts of business operations, providing an objective basis for allocating company resources and enhancing decision-making. Existing research has investigated the impact of ERM on business performance and value. Many studies have discovered evidence to support the idea that ERM improves business performance and value. (Farrell & Gallagher, 2019). Risk management techniques for company sustainability include adopting new technology, selling new products in response to client trends and requests, or modifying and upgrading existing products in response to customer

requirements (Farrell et al., 2021). Enterprises that do not follow modern management methods and do not upgrade their technology have a decreased chance of surviving the volatile market and economic environments. Multiple research has investigated the impact of enterprise risk management methods on financial performance; however, few studies have focused on the business's long-term viability (Purvis et al., 2019; Shad et al., 2020).

2. Literature Review

The literature on ERM is organized around three major concepts. The first literature strand is primarily descriptive and focuses on how organizations execute ERM programs in practice (Altuntas et al., 2011, Akbar et al., 2020). (Yazid et al., 2012) survey includes a question in the study, why companies establish an ERM program; the top three explanations are "impact of risk management," "motivation from the board of directors," and "compliance with Toronto Stock Exchange requirements.". The second literature strand investigates the relationship between firm-specific features and the firm's willingness to use the ERM strategy. (Liebenberg & Hoyt, 2003) discover that companies with more financial leverage are more likely to hire a Chief Risk Officer (CRO); they interpret their finding as proof that companies launch ERM programs to lessen information asymmetries about the firm's risk profile. A third body of research examines the value effects of adopting ERM. (Feng et al., 2012; Mukhtar, Shad, Woon, & Hamad, 2023) used the Tillinghast Towers Perrin ERM survey of the financial sector to demonstrate how ERM enhances the firm performance of the company. They specifically show that companies with ERM programs have greater cost-effectiveness and return on assets. In recent years, businesses' risks have primarily stemmed from Sustainability problems. These issues arise from using natural resources in manufacturing that hurt business ethics, environmental damage, and other factors (Li et al., 2016). This assertion is supported by The World Economic Forum's (2018) Global Risks Report, which indicates that risks related to environmental or social issues, such as extreme weather conditions, water crises, natural disasters, and the complete collapse to mitigate and adapt to climate change, dominate the top risks for businesses. With the rise of environmental and social challenges, the role of governance, such as improving internal control efficacy and overseeing culture to manage risk, is becoming increasingly crucial (Shad & Lai, 2019).

3. Theoretical Framework

According to stakeholder theory, there are larger groups (stakeholders) in companies, such as shareholders, managers, employees, creditors, suppliers, consumers, state officials, and society, who are interested in the actions, goals, and conduct of the company's operation. (Freeman & Medoff, 1984; Jan et al., 2022; S. Q. A. Shah, F.-W. Lai, et al., 2022). Because its actions will impact those groups, the corporation must make choices that reflect its interests. Their pleasure will arise along with the company's good intentions, thus affecting the company's future performance and worth. It also sends a message about the good attitude of the company that has completed a portion of the contract and bases its activities on the community and environmental value systems. Shad et al. (2019). In other words, the corporation should consider external and internal issues. Social and environmental variables can be viewed as external influences that force businesses to function efficiently and effectively to sustain and improve their performance. (Freeman & Reed, 1983). It is possible to think of governance as an internal aspect that enhances business operations and encourages performance improvement. When internal and external influences are combined with ERM, their combined impacts can be more powerful than the sum of their individual effects. (Altanashat et al., 2019). The legitimacy thesis is an additional viewpoint. The perception that action is desirable, appropriate, or reflects socially formed norms, values, beliefs, and resolution processes is known as legitimacy. (Suchman, 1995). (Deegan, 2002) argues that legitimacy is attained when a corporation respects or is consistent with a society's environment and value systems. According to the legitimacy theory, a business will remain in operation if society acknowledges that it upholds the community's values. The legitimacy theory urges businesses to ensure that their actions and results are acceptable to society. Companies manage risks and outline their Sustainability responsibilities in their annual reports to be approved by society. Social approval is anticipated to increase a company's value, increasing its ability to generate profits. This may inspire or support investors in their decision-making.

4. Conceptual Framework

The suggested conceptual framework includes an ERM implementation model with connections to the sustainability and financial performance of the firm, see Fig 1. The conceptual framework views the accepted ERM model as an independent variable whose application will improve the dependent variable of the firm's sustainability and

financial performance. The ERM is adopted. The eight COSO ERM integrated framework components were used in this study to evaluate the ERM practices of the organizations. On the other side, the cost of capital can be used to measure the dependent variables, which are company financial performance, and sustainability performance can be measured by using the Sustainability Reporting Guide and Toolkits (SRGT), a framework designed by Bursa Malaysia to provide reporting criteria to analyze the sustainability practices of companies listed on Bursa Malaysia.

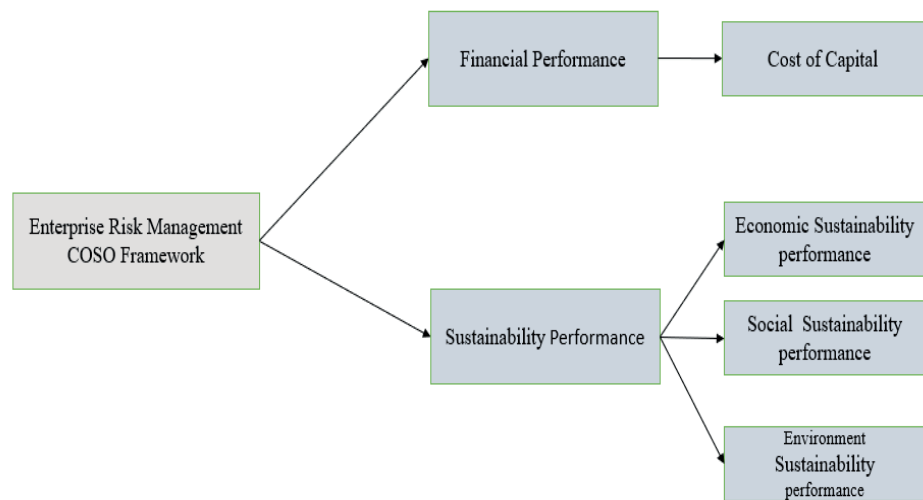


Figure 1: Conceptual Framework of the study .

5. Research Context and Variables Explanation

5.1. Solar PV industry in Malaysia

Solar PV electricity, as an alternative to fossil fuels, can help to mitigate global warming and improve the environment by lowering greenhouse gas emissions (GHG). Considering the potential of renewable energy for sustainable development, more nations have developed policies to encourage the creation and utilization of PV electricity (Hussain et al., 2022). With a total installed capacity of more than 399,613 MW, the global installation of solar PV capacity increased by 35% to 40% yearly between 2006 and 2017. (BP, 2018). The government of Malaysia wants solar PV to be the primary source of renewable energy by 2030. The production of PV power can influence jobs, family income, tax income, and economic growth. Several studies have demonstrated that the rapid growth of PV power generation can boost household income by expanding work opportunities. (Corona et al., 2019). However, regulations and labor market conditions

significantly impact how much PV generation contributes to net employment (ÇETİN & Güzel, 2019). Although the PV power business is predicted to enhance government tax revenues, net government tax revenues are negative due to government subsidies for PV power generation. (Ezzaeri et al., 2018). Despite the advantages of solar energy, increased investment in solar PV projects can be impeded by possible risks. This is due to the high initial expenses associated with renewable energy investment. Poor design and production choices, inventory losses, issues with outsourcing quality, and cultural and social issues are just a few risks that can arise in the solar PV value chain because of the absence of an efficient risk management system. When the organization provides the context, it is simple to recognize, evaluate, and manage that risk. The corporate sector, including financial institutions and even oil and gas corporations, is well-versed in ERM. However, the solar PV industry has not utilized the ERM framework to its full potential. ERM is distinctive in that it emphasizes value maximization by lowering systematic and unsystematic risk, which will improve business performance. The value generation process will be accomplished by lowering the investment's capital costs for solar PV.

5.2. Enterprise risk management

Enterprise Risk Management (ERM) is an independent variable that can be operationalized as an all-encompassing framework designed to help companies establish, evaluate, and improve their internal control while maximizing the chance to accomplish four different organizational-wide objectives at various levels, including strategic, operational, compliance, and reporting goals. The ERM framework comprises eight interrelated components, i.e., supportive internal environment, objective setting, event identification, risk assessment, risk response, control activities, information, communication, and monitoring. The ERM framework considers operations at all organizational levels, including enterprise-level, divisional, and business unit processes.

5.3. Sustainability performance

Three elements comprise overall sustainability performance, economic, environmental, and social sustainability. The triple bottom line is the term used to describe these three sustainability pillars (3BL) (Jan et al., 2021). Corporate sustainability as a business strategy for allocating resources from firms for environmental, social, and governance policies is still relatively new (Jan et al., 2021). When allocating resources, a business

with a sustainability focus should maintain equilibrium among all stakeholders, including owners (Shah et al., 2023; Shahzad et al., 2023; Tahir et al., 2018, Hammad et al., 2022). However, many businesses think that taking greater steps to be green will hurt their ability to compete (S. A. A. Shah et al., 2022). They think pursuing sustainability will increase costs and have no immediate financial rewards. Crane et al. (2018). The PV business has numerous positive economic effects (Hussain et al., 2023; Jenniches et al., 2019). They can be evaluated by fully accounting for the economic connections between various sectors or by integrating the entire industry's value chain into the economic system (Bailey et al., 2019; Hussain et al., 2022). In investigating the financial effects of renewable energy sources, input-output (I-O) analysis is frequently utilized. (Garrett-Peltier, 2019). PV energy is regarded as clean and renewable. Its manufacturing process nevertheless contributes to environmental contamination, and it is important to consider its life-cycle energy consumption and its direct and indirect pollutant emissions (Dong et al., 2020; Shamsul Azha et al., 2020). LCA is frequently used to analyze environmental consequences, improve the design and management of the PV industry, and promote cleaner production technologies to understand better environmental performance (Mukhtar, Shad, Won, et al., 2023; Hammad et al., 2023; Wang et al., 2020). The production of greenhouse gases, pollutants, and water use all differ significantly as solar radiation and PV power generation technology advance. Although the jobs in the solar PV sector are not brand-new professions, some newly developed technological processes used in producing solar modules and other job characteristics involve new working circumstances and, as a result, new potential for employees' health and safety. Thus, the World Health Organization considers the occupational health and safety issue essential to sustainable development (WHO, 2007). Each stage of the life cycle of a PV system is likely to experience risks that are related to both health and safety. PV system installation, maintenance, and disassembly involve physical agents that are mostly linked to accidents and injuries that pose safety issues. Major physical risks connected to the installation of PV systems (Mukhtar, Shad, Woon, Haider, et al., 2023; Polzin et al., 2019), Falls from heights, ergonomic risks, injuries from handling bulky solar panels and their harsh edges, as well as electric shock risks, are the main risks. However, a few studies have assessed sustainable Solar PV. This study conceptualizes the Sustainability performance of Solar PV as the dependent variable, measured by Sustainability Reporting Guide and Toolkits (SRGT). A framework developed by Bursa Malaysia, Sustainability Performance Indicators for the Solar PV Industry, is given in Table 1.

TABLE 1: Sustainability Performance Indicators for the Solar PV Industry.

Dimensions	S. No	Proxy Element
Environment Sustainability	1	Water Intensity
	2	Product End-of-Life Management and Recycling
	3	Waste Intensity
	4	Energy Intensity
Social Sustainability	1	Human rights
	2	Health and Safety
	3	Diversity
	4	Occupational Health & Safety
Economic Sustainability	1	Ethical Business Conduct
	2	Ethical Business Conduct
	3	Information Security and Privacy Protection

5.4. Financial Performance

There have been both objective and subjective measurements used to define corporate performance. Traditional accounting-based indicators, seen as objective measures, dominate a company’s performance (Alshehhi et al., 2018). Return on assets (ROA), return on equity (ROE), earnings per share (EPS), and Tobin’s Q are accounting-based measurements (Shah et al., 2018; Tahir et al., 2023). Typically, the information for these measures is derived from yearly reports that have been externally documented and audited. (Almadhoun et al., 2018) Conducting the literature of 132 studies on firm performance published in prestigious journals between 2002 and 2017, they discovered that ROA and ROE are frequently used as performance indicators in 53 and 27 studies. Subjective measures, usually perceived measures, have also been used to assess the success of businesses (Mishra & Suar, 2010). Questionnaires or interview surveys can be used to gather the information needed to calculate subjective metrics of firm performance. (Wall et al., 2004). The cost of capital has only sometimes been utilized as a proxy for business performance in studies (Xu et al., 2015). The cost of capital indicates a firm’s financial stability (Alrjoub & Ahmad, 2017).thus this study conceptualizes financial performance as a dependent variable that the cost of capital is used to measure. The cost of debt and equity make up the cost of capital. The company’s average interest rate for borrowing is called the cost of debt (Cd). Cost of equity (Ce) measures the rate of return that shareholders (including dividends) expect to get in exchange for taking on the risk of investing in that company.

The following formula can be used to compute Cd: $C_d = Total\ interest\ expenses \times (1 - Effective\ tax\ rate)$

And the calculation of C_e is based on the capital asset pricing model (CAPM) as follows:

$$C_e = R_f + \beta (R_m - R_f)$$

Where,

C_e is the cost of equity,

R_f is the rate on risk-free investments and is a measure of systematic risk,

β is systematic risk measure,

R_m is the market return, an $(R_m - R_f)$ is the market risk premium.

6. Discussion

As per the study Jagoda and Wojcik (2019), risk management attempts to prevent predictable events and is a crucial strategic goal that raises product quality and lowers production costs, improving growth, resources' efficiency, cleanliness, and resilience. According to the literature, businesses must improve their governance procedures and adopt an efficient risk management framework due to the rise of new risks, including social and environmental risks and compliance requirements, particularly in the renewable energy sector. (Shad et al., 2018; Prewett & Terry, 2018). Due to Solar's competitive sustainability profile and significant socioeconomic benefits, which are intimately related to its sustainability qualities, solar has experienced rapid growth over the past few years. Sustainability is a difficult idea to grasp. The sustainability performance of the sector is to reduce the number of resources and energy used during the production process (Lai et al., 2021). This suggests that the solar industry must consider sustainability issues at every value chain stage. A wide range of factors must be considered, including the effects on ecosystem preservation and biodiversity and the evaluation of fair working conditions, social inclusion, and gender equality levels. Risk and reward are at the core of the business, and effective risk management has emerged as the key strategy to deliver maximum shareholder value while reducing the potential for share value loss. This study aims to confirm whether adequate risk management techniques provide reward systems to firms to reduce the cost of capital and reduce the sustainability risk to improve the industry's sustainable development (Shad et al., 2022).

7. Conclusion

This paper proposed a conceptual framework for an ongoing study to examine the effect of ERM on the financial performance and sustainability performance in Malaysia's solar PV industry, as shown in the framework above. There will be some implications of the suggested model. First, this study establishes a theoretical framework for risk management implementation and highlights its benefits for the sustainability and financial performance of the organization. The study also suggested an index based on the COSO ERM framework to evaluate risk management practices, assess a company's financial performance via its cost of capital, and evaluate the sustainability performance of Malaysian solar PV companies via the Sustainability Reporting Guide and Toolkits (SRGT), a framework created by Bursa Malaysia. Thirdly, the results of this study will make a significant contribution to the literature on ERM, corporate executives, and regulatory agencies, and additionally, it will help businesses recognize and pinpoint the strategic elements that will facilitate the effective adoption of ERM in the context of sustainable risk management. Investors can make better investment judgments when a company's financial and non-financial activities are more accountable and transparent. The results can support and enhance Malaysia's 12th plan to increase the use of domestic renewable energy sources to support the security of the nation's electricity supply and long-term socioeconomic growth. The finding can also supplement Malaysia 12th plan's policy Objectives: (1) To increase RE contribution in the national power generation mix; (2) To facilitate the growth of the RE industry; (3) To ensure reasonable RE generation costs; (4) To conserve the environment for future generation; and (5) To enhance awareness on the role and importance of RE. It also supports the government's objective to strengthen and facilitate the RE industry's growth. Additionally, it will assist the national government in achieving its objectives to expand the share of renewable energy in the country's power generation mix and protect the environment for future generations.

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