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Chapter

Sustainability and Corporate Innovation

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Abstract

Sustainable development is one of the prominent goals promoted by the United Nations (UN) and identifies innovation as one of the important elements. Therefore, sustainable development is a combination of both developmental and environmental imperatives through innovation, implying a new way of science incorporating the technology integration and social philosophy. This chapter discusses how sustainability creates business opportunities and be counted toward the future investment for the firms. It is the path leading from creative thinking and corporate innovation. Thus, the relationship between corporate innovation and sustainability plays a vital role for firms to gain competitive advantages such as gaining value creation, creating cooperation value with the stakeholders, tapping into new markets and customer segments, and creating a transformational solution. Firms can be sustainable not only by profit maximization, but also address the maximization of the interests' stakeholders by not causing any impact on nature and environmental resources.

Keywords: corporate Innovation, innovation performance, sustaining innovation, text-based corporate innovation, sustainability

1. Introduction

Many studies recently examine the relationship between sustainability and corporate innovation specially focusing on the idea of promoting innovation as well as ensuring its sustainable development. While innovation is considered as a core business process, it is fully receiving increasing attention for firms in all; on the other hand, sustainability is considered a way to do business without having damaging effects on the environment, economy, and society. Kiron et al. [1] have conducted the global executive survey on sustainability in 2012 and demonstrate that sustainability is a key driver of innovation. Michelino et al. [2] show an important link between innovation and sustainability in the pursuit of environmental, economic, and social development. To accurately measure and assess both sustainability and corporate innovation is not an easy work to do. Given the fact that businesses nowadays are facing serious challenges including pandemics and other major disruptions such as technology disruption, the process of doing both assessments becomes even more complex and difficult to do. An imperative research need is to develop science-driven

frameworks for conducting both systematic sustainability assessment (SA), and innovation measurements [3]. Huang [3] suggests that it is important to conduct a fundamental study on the sustainability dimensions of technology innovation and develop systematic methodologies and effective tools for technology inventors, especially in its early development stage, is critical. Complexities to measure sustainability come with implementing sustainable practices; for example, when management develops its own a sustainability plan, they must ensure that their business can adapt to evolving regulations on time as well as publicities are becoming aware of the firms' sustainability practices. To be certain to have sustainability in business and creating wealth for all stakeholders, all corporations need to have the long-term balance among the economic, environmental, and social dimensions and gain environmental protection, economic growth, and social stability.

Conventionally, many researchers regularly count on research and development (R&D) expenditures and patent investment as innovation indicators [4–6], which these measurements have some serious weaknesses as they do not fully capture the nature and scope of innovative output [7]. While R&D expenditures measure observable input, it fails to capture the quality of innovation output [8]. Even though, patent can only measure innovation output with respect to intellectual properties, but it cannot resolve one of the serious problems of being inability to consider other aspects of innovation output such as a new marketing method, a new organizational method in business practices, workplace organization, or external relations. This is because such innovation aspects of output are not patentable [9, 10]. Due to the limitation of the existing corporate innovation indicators, new innovation indicators are designed to overcome the limitation and weakness of R&D expenditures and patent investment as innovation indicators. New innovation survey has created and already widespread used is Community Innovation Survey (CIS) survey and Smith [11] have summarized 2002 onward journal publication using CIS data. Nowadays, there is a new novel measure of corporate innovation not from the survey but adopted from the textual descriptions of firm activities by financial analysts. Bellstam, Bhagat and Cookson [6] developed this text-based corporate innovation indicators using a textual analysis of analyst reports of S&P500 companies, which allows us to see the big picture that the organization is trying to achieve through easily accessible analyst reports. It is of great important for investors and shareholders to understand what promotes innovation investment in their owned firms. Emphasizing that investment in innovation bares risk, but it can also improve business opportunity and lead to shareholders' sustainable benefit in the long run. Moreover, this textual-based measure of innovation incorporates many aspects of intellectual investment and captures the topic of R&D, patent, and non-patented practices, which is deemed beneficial to the firm.

Kiron et al. [1] explain innovation connects corporate sustainability with business profits. A previous literature reports a positive linkage between innovation and a range of various positive performance outcomes [12]. Innovation is also a key element in assisting firms to gain competitive advantage [13], expand market share [14], and improve performance [15]. Firms can be sustainable not only by profit maximization, but also address the maximization of the interests and value-added of various stakeholders by not causing any impact on nature and environmental resources. This chapter elaborates on the research gap and problem of the assessments for both technology and innovation assessments versus sustainability assessments, especially when we are experiencing major disruptions including trade war as well as pandemics starting in 2019.

2. Corporate sustainability

According to the United Nations World Commission on Environment and Development, sustainability is defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs. The practice of sustainability recognizes the ability to support as well as integrate economic development, social development, and environmental protection with the assumption of having limited resources and employing them conservatively and wisely with a careful view to long-term priorities and consequences of how to use these resources. Business sustainability also known as corporate sustainability is the management and coordination of environmental, social and financial demands, and concerns to ensure responsible, ethical, and ongoing success. In today's rapidly changing world and considering a values-driven approach, it is very important to incorporate sustainability when developing business strategies because it is vital to a company's long-term success. A lot of organizations are integrating sustainability into their business strategy. In a recent McKinsey survey, 70% of respondents said their companies have a formal governance of sustainability in place. Spiliakos [16] shows that the goal of a sustainable business strategy is to make a positive impact on environment, society, and economy. These organizations monitor the impact of their operations to ensure that short-term profits don't turn into long-term liabilities. Many successful organizations participate in sustainable business practices such as optimizing supply chains to reduce greenhouse gas emissions, relying on renewable energy sources to power facilities, using sustainable materials in the manufacturing process, etc.

The UN-level Sustainable Development Goals (2015–2030) address the global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice. Beyond helping curb global challenges, sustainability can drive business success. Several investors today use environmental, social, and governance (ESG) metrics to analyze an organization's ethical impact and sustainability practices. Yilmaz [17] shows that as firms perform better in the pillars of sustainability, they have a lower perceived riskiness resulting in a lower cost of capital. Eliwa et. al. [18] show the evidence of lending institutions rewarding firms in 15 EU countries for their environmental, social, and governance (ESG) performance and disclosure in terms of lowering their cost of debt capital. Sze et. al. [19] empirically examine the financial impact of Environmental, Social, and Governance (ESG) practices on firms in emerging markets. Their results confirm (1) sound ESG practices by corporates could have a long-term cost reduction effect on their debt funding; (2) the effect on cost reduction is more evident for firms in high greenhouse gas emission sectors and during market turbulence; and (3) the country-level ESG performance plays a role only since the adoption of the Paris Agreement in 2015. Their findings and evidences highlight the role of capital providers in encouraging firms to engage in a holistic approach to sustainability, and firms should actively engage in environmental and social initiatives and improve their governance mechanisms. However, it is worth to mention that in time of economic policy uncertainty (EPU), firms with high corporate innovation are likely to face a pronounced increase in cost of financing, which leads to reduce firm value. Hall and Lerner [20] suggest that in the time of EPU, financing corporate innovation tends to be costlier because of the high uncertainty of investment outcomes. Denlertchaikul et. at. [21] show empirical evidence that in times of greater uncertainty, it is more difficult to value corporation innovation.

However, the future direction of sustainable business concerns economic values, environmental policy, and stakeholder engagement for business opportunities.

Therefore, many companies invest billions of dollars every year in sustainability activities. According to Morningstar Direct dated in June, 2019, US sustainable funds attract 8.9 billion US dollars, which is greater than the value of inflows for the whole of 2018 at 5.5 billion US dollars. Many large mutual funds and ETFs, commanding billions of dollars, exercise investments strategies based on sustainability. More recently, according to Morningstar during 2021's First, Second, and Third quarters, sustainable fund flows keep reaching New and New Heights. Stankiewicz [22] says that most of the new options available to investors were launched with sustainability mandates, but firms also occasionally change the investment strategies of existing funds to target sustainability. Murugaboopathy and Maan [23, 24] report that an increase in the number of sustainable products across the globe, market appreciation, and positive inflows continued to drive global sustainable fund assets upward. Thus, the importance of sustainability cannot be overemphasized. Nevertheless, it is still vital that integration of sustainability into functional work doubles the likelihood that a company will report financial value from these efforts. The idea of sustainability is often broken down into three pillars: economic (profits), environmental (planet), and social (people). In business, sustainability refers to doing business without negatively impacting those areas as a whole. As environmental, social, and governance issues have become ever more important influencers of customer and employee expectations, many companies have tightened their embrace of the sustainability programs that address those issues. The online McKinsey Global Survey in 2017 concludes that nearly 90% of participants representing the full range of regions, industries, tenures, company sizes, and functional specialties say that their companies are pursuing sustainability programs as well as elevating the importance of diversity and inclusion. While the first top reason for implementing a sustainability agenda is better alignment between an organization's practices and its goals, missions, or values, the second top reason is to build, maintain, and improve firm's reputation.

In addition, the survey also looks at the influence of key trends on the organizations' commitment to sustainability. Those respondents indicate that advances in sustainability-related technologies, as well as safety and security concerns, are the top reasons these organizations have increased their commitment. Business sustainability strategies can involve in the following examples such recycle technologies, big data and advance analytics, and renewable sources of energy. From the surveys, the top of wider adoption of sustainability-related technologies is for those companies that have greatly increased their use of energy-efficient equipment, and more innovative ones, such as digital platforms for stakeholder engagement. Therefore, it is worthwhile to highlight the importance that the company innovates considering the three dimensions of sustainability - social, environmental, and economic along with well-designed financial planning through the lens of sustainability and with a deeper knowledge of financial analysis, financing, valuation, risk assessment, and sustainable investments.

3. Sustainability assessment methodologies

Sustainability assessment methodologies are determined to measure sustainability performance. Sustainability development indicators (SDIs) are commonly used to measure firm performance as well as improve performance based on information on declining trends related to the three dimensions of economic, environment, and

social aspects, which may have impact on corporate sustainability. In addition, SDIs help in providing information to decision-makers to formulate strategies and communicate the achievements to all stakeholders. Spohn [25] identifies two distinctive main approaches depending on its framework and SDI selection process. There are (a) the “top-down” approach (framework and the set of the SDIs defined by experts and researchers) and (b) the “bottom-up” approach (framework designed and the SDI selected by various stakeholder participants).

Singh et al. [26] explain, compare, contrast various sustainability indexes as well as summarize the following frameworks of sustainability assessment tools.

1. The Pressure State Response (PSR) PSR-framework of 1998 OECD is based on the concept of cause-and-effect phenomena and defines the impact of human activities, which exert “pressures” on the environment and result in change in the quality and the quantity of environment conditions. (the “state”)
2. The Driving Force Pressure State Impact Response (DPSIR) model is an extension of the PSR framework and has been adopted by the European Environmental Agency (EEA) and the European Statistical Office in 1997.
3. The Lowell Center for sustainable production (LCSP) indicator framework primarily focuses on the environmental, health, and safety aspects of sustainable production.
4. The hierarchical structure of the global reporting initiative (GRI) framework adopted by the United Nations Environment Program (UNEP) in association with the United States nongovernmental organization, Coalition for Environmentally Responsible Economics (CERES). They launch the Global Reporting Initiative (GRI) in 1997, and the GRI uses sustainability reporting on three dimensions, which are social, economic, and environmental.
5. The United Nations Commission on Sustainable Development (UNCSD) devised a framework focusing on assessing the performance of government toward sustainable development goals with its framework comprising four dimensions, which are social, environment, economic, and institutional. They are broken down into 38 sub-indicators and 15 main indicators.
6. The Institute of Chemical Engineers (IChemE) sustainability metrics formulated by The Institution of Chemical Engineers (IChemE) covering three dimensions of environment, economic, and social to assess the sustainability performance of process industry.
7. The Wuppertal Institute framework of sustainability defined by the United Nations Commission on Sustainable Development (CSD). It addresses the four dimensions of social, environment, economic, and institutional.

Recent study by Huang [27] suggests that technology disruption and pandemics especially Covid-19 have caused an unprecedented shock to everyone. Its negative effects allow most of industries for huge transition to much more sustainable and resilient industries, which provide us research opportunities in sustainability science and engineering.

4. Corporate innovation

Innovation is the key to firm survival, the study of processes that support innovation is of great interest to practitioner and researchers. Organization for Economic Co-operation and Development (OECD) reports that innovation can influence long-term economic growth. There have been many innovation surveys (most of them are done in 2003) in different sectors both public and private, but there is no international standard providing definitions that apply in these sectors. This is a substantial gap, which prevents the analysis and understanding of innovation in the whole economy and how innovation in one sector is influenced by activities in others. Therefore, the benefit of using a general definition of innovation is that innovation can be measured in a consistent way in all sectors. These indicators can be used to inform policy development and for monitoring and evaluation of existing policy.

Later, the 2018 Oslo Manual [28] is rewritten to provide new definition of innovation, which facilitates international comparability and provides a platform for research and development on innovation measurement. The general concept of innovation is the implementation of something new to meet a given objective. Innovation can commonly refer to either the notion of process of innovation (what is done by a subject) or the notion of outcome (what comes out). In this 2018 manual, both must be relevant and are able to be measured. While the process view conceptualized as innovation activities, the outcome view conceptualized as innovations. Therefore, it is important to have the international standard definitions of innovation because the common definitions must be applicable to every sector and employed by every potential user. Using the same definitions in all sectors would support coherence of data and consistency of analysis. However, to quantify, measure innovation, and make comparison across sectors are still difficult to do. Next section discusses how to measure or quantify corporate innovation.

4.1 Measures of corporate innovation

Innovation can create the economic and social impacts of inventions and their ideas depend on the diffusion and uptake of related innovations. Its measurement implies commensurability and innovation requires implementation, either by being put into active use or by being made available for use by other parties, firms, individuals, or organizations. Meaning that there would be at least some levels of the innovation that are qualitatively similar so we can try to quantify them and make comparison. Moreover, innovation is a dynamic and pervasive activity that occurs in all sectors of an economy. These dynamic and complex activities and relationships represent significant challenges for measurement. Precise definitions of innovation and innovation activities are required to measure innovation and its subsequent economic outcomes. In fact, and unfortunately, it is not easy to quantify and to measure because for some aspects of innovation, its characteristics cannot do the exact measurement of key innovation process and outputs. Smith [11] suggests that innovation measurement should be primarily derived from the management and economics disciplines. Management perspectives on innovation cover how innovation can change a firm's position in the market and how to generate ideas for innovation. Economic perspectives examine why organizations innovate, the forces that drive innovation, the factors that hinder it, and the macroeconomic effects of innovation on an industry, market, or economy. Current major established indicators used for innovation analysis fall into three board areas of indicator use in science, technology,

and innovation (STI) analysis. Innovation indicators are Research and Development (R&D), Patent Application, and bibliometric data. In addition to those three classes of indicators, there are additional indicators other researchers have used. For example, Saviotto [29] and Saviotti [30] use techno metric indicators exploring the technical performance characteristics of products. In 2003 World Economic Forum, many consultants developed synthetic indicators of innovation for scoreboard purposes. Nevertheless, the following discussion focuses on research and development (R&D) and patents using the OECD's Frascati Manual [31] since bibliometric data are related primarily to scientific publication and citation rather than innovation.

Even though R&D expenditure and patent tend to be common innovation proxies, both of these measures are still subject to serious limitations when we use them as proxies for corporate innovation. First, although the number of patents is commonly used by a large number of scholars because it has the advantage of being easy to quantify, some of the innovation outputs are not patentable [9–11]. Examples of innovations that are not patentable are improved production processes, new marketing techniques, and improved service. Thus, it fails to capture all the corporate innovation output. On the other hand, R&D expenditure is seen as input of innovation, but it fails to capture the quantity and quality of innovation output [8]. This is because some innovation projects may fail and do not contribute to firm innovation. So, in order to clearly overcome these limitations and problems for R&D expenditure and patent, many researchers have attempted to find new indicators to measure corporate innovation such as innovation survey or texted-based innovation index, etc. Next sections discuss innovation proxies from commonly used one to new innovation measurements.

4.2 Research and development (R&D) indicators

The commonly used proxies of corporate innovation are research and development expenditures (R&D) [4, 5]. *The Frascati Manual 2015* is the key OECD document for the collection of R&D statistics known as *the Standard Practice for Surveys of Research and Experiment Development*. The institutional classification in the Frascati Manual 2015 is also recommended for innovation data for international comparison purposes. This OECD's Frascati Manual is one of a range of activities that can generate innovations, or through which useful knowledge for innovation including creative and systematic work undertaken in order to increase the stock of knowledge and to devise new applications of available knowledge. R&D activities must meet five criteria, which are novel, creative, address an uncertain outcome, systematic, and transferable and/or reproducible. R&D comprises basic research, applied research toward a specific practical objective, and experimental development to produce new products or processes or to improve existing products or process. By definition, Research and Development (R&D) is an innovation activity, and there is an intention for innovation. That is, all types of R&D investments that are carried out or paid for by business enterprises are considered by definition as innovation activities of those firms. R&D expenditure data can be collected as the intramural and extramural R&D expenditures. Intramural R&D expenditures are all current expenditures plus gross fixed capital expenditures for R&D excluding depreciation costs on capitalized R&D or physical assets used in R&D. Extramural R&D expenditures cover the purchase of R&D services from other parties. The OECD Frascati Manual attempts to discover a way for measuring one key dimension of science, technology, and innovation (STI) so that R&D investment is systematically encouraged and monitored around the world.

However, policymaking nowadays is still largely focused on what is easier to measure. There is, therefore, an urgent need to capture how ideas are developed and how they can become the tools that transform organizations, local markets, countries, the global economy, and the society.

Although many indicators of innovation exist, R&D is still widely considered to be the main key driver of innovation. However, with a strong highlight on R&D, a firm ignores the great variety of other available methods of innovation. Arundel et al. [32] emphasize on that the capacity for innovation of manufacturing firms with little or no R&D activities is likely to be systematically underestimated. That is, those firms do not possess any or few R&D investments, the lack of R&D resources can be easily considered a firm's weakness regarding these firms' capacity for innovation. Santamaría et al. [33], Barge-Gil et al. [34]; Kirner et al. [35] show that non-R&D-intensive firms are not less innovative or competitive per se compared with their R&D-intensive counterparts. Kirner et al. [35] and Som [36] document that those firms simply do not often pursue a first-mover strategy, and they tend to focus to a greater extent on customer- and market-driven innovations.

4.3 Patent data

Besides using R&D expenditure as a proxy for corporate innovation, another commonly used innovation proxy is patent activities [4, 5]. Iversen [37] defines patent as a public contract between an inventor and a government that grants time-limited monopoly rights to the applicant for the use of technical invention. The OECD Patent Statistics Manual [38] defines the characteristics of patented inventions as well as is periodically revised to take into account new challenges and developments. Its method is to identify the technical expertise in emerging technologies and analyses publicly available patent application data containing information on the technological fields of relevance to the invention as well as unstructured information on the nature of the claims. In general, the patent system gathers information about new technologies into a protracted public record of inventive activity, which provides striking advantages as an innovation indicator. Examples are patents granted for inventive technologies with commercial promise. The major sources of patent data are the records of the US Patent Office and the European Patent Office. Patents also have weaknesses since they are an indicator of invention rather than innovation. They spot the emergence of new technical principle, not a commercial innovation. In addition, it is obvious that the patent indicator misses many non-patented inventions and innovations. Some types of technology are not patentable. Example is when new business formulae on the internet. Can we consider this new business model is able to be patented? Therefore, the understanding is that not all technological development activities result in patentable inventions, and firms do not seek patent protection for all of their inventions.

4.4 Innovation survey indicator: European Commission implements the Community Innovation Survey (CIS)

The European Commission implements the Community Innovation Survey (CIS) is a harmonized survey of innovation in enterprises coordinated by Eurostat and currently carried out every 2 years in EU member states and several European Statistical System (ESS) member countries). CIS is an innovative action in a number respect. First, it is an attempt to collect internationally comparable innovation measures. Second, it collects data at a highly disaggregated level and makes it available to

analysts. CIS collects data on two types of product innovations, three types of process innovations, four types of organizational innovations, and four types of marketing innovations referred to Oslo Manual 2018 [28]. As known, Community Innovation Survey (CIS) is the survey-based indicators carried out in all EU member-states. However, is this CIS survey really the best to use for innovation indicators? Is it justified? Next section discusses the most recent innovation indicator known as the texted-based corporate innovation index.

4.5 Texted-based corporate innovation indicators

The texted-based corporate innovation index is constructed from a textual analysis of analyst reports of S&P 500 firms, which fit into a topic modeling tool called the Latent Dirichlet Allocation (LDA) method of Blei, Ng, and Jordan [39]. It draws content from a common set of 15 topics on the text of a large corpus of analyst reports and then measures the level of a firm's corporate innovation by the intensity with which analysts write about the innovation topic. The topics are selected based on the word distribution that has the smallest Kullback-Liebler divergence with a benchmark innovation textbook. The selected topics are considered a reliable innovation proxy, both qualitatively and quantitatively. The examples of the words used are service, system, technology, product, and solution. Qualitatively, the words selected are the words that analysts usually use to describe firm innovation. Quantitatively, the topic correlates strongly with patents among the patenting firms.

Bellstam, Bhagat, and Cookson [6] demonstrate that the text-based corporate innovation index not only strongly correlates with patenting efficiency but also captures innovation activities by firms that do not generate patents. Recently, the textual analysis method had gained popularity and is used by many researchers when conducting empirical research (for example, [40–42]). Textual-based measure of innovation incorporates many aspects of intellectual investment. It captures the topic of R&D and patents, as well as non-patented practices, which is deemed beneficial to the firm. Another important advantage of the text-based innovation index is that it can be computed for firms that do not disclose their R&D expenditure. Text-based innovation allows us to see the big picture of the plan that the organization is trying to achieve through analyst reports, which are easily accessible. Thus, the obvious advantage of the text-based innovation index is that it can capture innovation for firms that do not patent and R&D. Another important advantage of the text-based innovation index is that it can be computed for firms that do not disclose their R&D expenditure. Moreover, many researchers lately when conducting empirical research on corporate innovation use the textual analysis method. This method has recently gained popularity among many researchers and recent studies (for example, [43–48]).

It is of great importance for investors and shareholders to understand what promotes innovation investment in their owned firms. Emphasizing that a long-term investment in corporate innovation bares high risk, but it is an action to enhance benefits to the shareholders in the long run. Therefore, it is not overstated to mention that innovation is one of the key factors that boost the performance and growth of the firm, especially for those technology firms where innovation plays a major role for the firm to thrive. Previous literature reports a positive linkage between innovation and a range of various positive performance outcomes [12]. Innovation is also a key element in assisting firms to gain competitive advantage [13], expand market share [14], and improve performance [15]. Next section discusses the linkage between innovation and performance outcomes.

5. Linkage between innovation and positive performance outcomes

The effect of corporate innovation on firms' performance is widely examined in the literature. Many theoretical and empirical studies document that corporate innovation tends to improve firm performance [49–51]. For example, studies found that an increase in corporate innovation will lead to the following effects on firm; increase firm profitability [52], positive impact on firm's profit margin [53], increase firm's market value [54], increase in firm's intangible assets [55]. Thus, corporate innovation is generally perceived as a crucial key factor in firm performance and firm growth. This fact is reflected through the significant increase in research and development investments among US firms since the 1970s [56]. In many studies, innovation is regarded as intangible assets [55–57]. Examples of intangible assets are intellectual capital, human capital (the value of employee training, morale, loyalty, knowledge, etc.), and process-related capital (the value of information technology, production processes, etc.) [56]. Empirical studies show that intangible asset in the form of intellectual capital contributes to the lower cost of capital and creates value-added to the firm and therefore is positively associated with firm performance [58, 59]. The reason is that intangible asset is considered as the firm's strategic resource, able to create value-added for the firm. For example, the know-how, goodwill, and trademark help the firm to strengthen its competitive advantage putting the firm in a better position in utilizing the existing resources [60]. Innovation helps firms to achieve competitive advantage and enhance firm's productivity [61]. Consequently, this not only lowers the firm cost of production and improves the firm's competitiveness, but also eventually helps to improve firm performance [6, 62]. Stewart [59] showed that firm's performance depends on the ability of its resources to create value-added. A study done by Tan et al. [63] confirmed these results. Using data from 150 publicly traded companies in Singapore, Tan et al. [63] showed that intellectual capital is positively associated with the current firm's financial performance. Thus, it is generally believed that an innovation-orientated firm is likely to have better firm performance than a firm that is not innovation-driven.

Despite the numerous findings on the positive association between corporate innovation and firm performance, some studies argue that the high cost of innovation investment may outweigh the benefits [64]. This is because the innovation development process requires a huge amount of capital investment while taking a substantial risk. Additionally, the process involves firms repeatedly making mistakes and failures, such that the lessons learned can be applied to improve product and service; therefore, only firms with sufficient capital and accumulated profit will be able to handle investment failure [65]. In short, investment in innovation is risky and challenging due to its uncertain outcomes, exacerbating the information asymmetry and conflicts of interest with financiers [66]. Consequently, the firm faces financial constraints. Thus, it is possible to argue that due to the nature of innovation consisting of high uncertainty, high-risk nature, and high cost of investment, the favorable effect of corporate innovation on firm performance is reduced.

6. Sustaining innovation

Traditionally, it has been assumed that the primary purpose of a firm is to make a profit and to increase its value in the long run. Recently, it has become widely recognized that firms will take their responsibility not only toward their shareholders but

also toward other stakeholders. The World Bank Council for Sustainable Development defines sustainability as “the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large.” Sustainability also focuses on the survival and well-being of all related stakeholders. Therefore, sustainable firms should consider environmental, social, and governance issues and integrate them into their operations and processes.

Innovation is “any practices that are new to organizations, including equipment, products, services, processes, policies and projects” [67]. Khazanchi et al. [68] suggest that innovation is one of major relevance for companies, as it can be the source of additional revenues from new products or services, which can help to save company costs or improve the quality of existing processes. Therefore, the management team needs to have innovativeness as a positive attitude toward changes of introducing new products to the market, or opening up new markets, through combining strategic orientation with innovative behavior and process. Hult et al. [69] suggest that innovativeness seemed to be useful in helping firms to compete with their competitors with those new products. Thus, innovativeness is a key attitude in any management teams to be innovative, thus coming out with new ideas for the competitive advantage and durability of their firms. Due to substantially changes in world environment as well as technology disruption, the production and consumption patterns have been rapidly changed over the past decades. In order to survive and not be disrupted, many companies believe they would urgently need to transform their organizations. In addition, this major change is also leading to transformations in society and in the environment, and creating demands and constraints for companies, so that competitiveness is increasingly related to the adoption of innovation management that includes sustainability.

Therefore, those management teams must realize the importance of adopting sustainable innovation practices to minimize negative social and environmental impacts resulting from their activities and, consequently, to achieve higher corporate performance. Therefore, sustainable innovation is simply the creation of something new that improves firm performance and its valuation in the three dimensions of sustainable development: social, environmental, and economic. Such improvements are not limited to technological changes and may relate to changes in processes, operational practices, business models, thinking, and business systems [70]. The adoption of sustainable innovation practices can affect business performance. Many studies show some evidence to link the results of investments in sustainable innovation to business performance (For example, [71, 72]). Hansen et al. [73] observe that sustainable innovation is a device that covers both sustainability issues and the inclusion of new customer and market segments, thus adding a positive value to the firm’s global capital. In addition, Aguilera-Caracuel et al. [74] suggest sustainable innovation can contribute to business sustainability, since it has a potential positive effect on a company’s financial, social, and environmental performance. Nidumolu et al. [75] document that success is related to the fact that sustainability is perceived as a new innovation frontier for large organizations. Successful large companies reconcile sustainability with innovation and achieve their competitive advantage, because they redefine products, technologies, processes, and business models, and still reduce costs, by using less inputs; and new processes and products also generate additional revenues or allow the creation of new businesses. Klewitz and Hansen [76] document that small and medium-sized enterprises are increasingly recognized as fundamental for sustainable development. Zee et al. [77] and Robinson and Stubberud

[78] observe that large companies are more inclined to produce green products and services while small businesses tend to have higher levels of environmental awareness and a greater belief in the importance of sustainability.

7. Conclusion

Innovation is the key to firm survival and important for firm long-term business success as well as it can also influence long-term economic growth. Firms innovated successfully have typically been rewarded with high growth, big profits, and easy access to the new markets. Most organizations look at corporate innovation as a major and significance for all companies since innovation can be the source of additional revenues from their new products or services. Also, innovation can help to save firm costs or improve the quality of existing processes. The commonly used proxies of corporate innovation are patent activities and R&D expenditure. However, both of these measures are subject to serious limitations when used as proxies for corporate innovation because some innovation projects may fail and do not contribute to firm innovation. Adopting new innovation proxies is what many researchers are doing currently and new proxies' examples of are Community Innovation Survey (CIS) carried out in all EU member-states, or most recently a novel text-based innovation index constructed by Bellstam, Bhagat, and Cookson [7]. The obvious advantage of using the text-based innovation index is that it can capture innovation for firms that either they do not have patent and R&D expenditures or they do not disclose their R&D expenditure. Therefore, the text-based innovation can overcome the limitations imposed by the other innovation proxies.

Sustainability assessments and measurements are very complex appraisals. There exist various types of sustainability indicators and framework for a variety of systems and applications as well as numerous sustainable development indicators. Future studies are recommended on the assessment information aggregation, which leads to both an accurate design framework and a suitable formation of complex sustainability performance indices, especially with the current and unprecedented shock around the world. For example, the negative effects of the COVID-19 pandemic start to recede, many industries must work collaboratively in order to change their strategies in order to make their transitions smoothly as well as to still gain their business sustainability. These unpredicted circumstances may help create a supportive number of research opportunities in sustainability fields to improve existing sustainability assessment as well as to develop powerful decision analysis and decision-making methodologies to facilitate in reshaping technology innovations.

Notes/thanks/other declarations

Suwongrat Papangkorn is a corresponding author and is also C2F postdoctorate researcher. This project is funded by National Research Council of Thailand (NRCT): N42A650683.

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References

- [1] Kiron D, Kruschwitz N, Reeves M, Goh E. The benefits of sustainability-driven innovation. *MIT Sloan Managing Review*. 2013;**54**(2):69-73
- [2] Michelino F, Cammarano A, Celone A, Caputo M. The linkage between sustainability and innovation performance in IT hardware sector. *Sustainability*. 2019;**11**(16):4275
- [3] Huang Y. Technology innovation and sustainability: Challenges and research needs. *Clean Technologies and Environmental Policy*. 2021;**23**:1663-1664
- [4] Acharya VV, Subramanian KV. Bankruptcy codes and innovation. *Review of Financial Studies*. 2009;**22**:4949-4988
- [5] Lerner J, Sorensen M, Stromberg P. Private equity and long-run investment: The case of innovation. *The Journal of Finance*. 2011;**66**:445-477
- [6] Hsu PH, Tian X, Xu Y. Financial development and innovation: Cross-country evidence. *Journal of Financial Economics*. 2014;**112**(1):116-135
- [7] Bellstam G, Bhagat S, Cookson JA. A text-based analysis of corporate innovation. *Management Science*. 2020;**67**(7):4004-4031
- [8] Aghion P, Van Reenen J, Zingales L. Innovation and institutional ownership. *The American Economic Review*. 2013;**103**:277-304
- [9] Moser P. Innovation without patents: Evidence from world's fairs. *Journal of Law and Economics*. 2012;**55**:43-74
- [10] Hall B, Helmers C, Rogers M, Sena V. The choice between formal and informal intellectual property: A review. *Journal of Economic Literature*. 2014;**52**:375-423
- [11] Smith K. Measuring innovation, in *The Oxford Handbook of Innovation*. Oxford: Oxford University Press; 2006
- [12] Garcia-Morales VJ, Matías-Reche F, Verdu-Jover AJ. Influence of internal communication on technological proactivity, organizational learning, and organizational innovation in the pharmaceutical sector. *The Journal of Communication*. 2011;**61**:150-177
- [13] Hitt MA, Hoskisson RE, Johnson RA, Moesel DD. The market for corporate control and firm innovation. *Academy of Management Journal*. 1996;**39**(5):1084-1119
- [14] Franko LG. Global corporate competition: Who's winning, who's losing and the R&D factor as one reason why. *Strategic Management Journal*. 1989;**10**(5):449-474
- [15] Morbey GK. R&D: Its relationship to company performance. *Journal of Product Innovation Management*. 1988;**5**(3):191-200
- [16] Spiliakos A. What Is Sustainability in Business? HBS Online. USA: President & Fellows of Harvard College; 2018
- [17] Yilmaz I. ESG-based sustainability performance and its impact on cost of capital: International evidence from the energy sector. *International Journal of Applied Economics Finance and Accounting*. 2022;**12**(2):21-30
- [18] Eliwa Y, Aboud A, Saleh A. ESG practices and the cost of debt: Evidence from EU countries. *Critical Perspectives on Accounting*. 2021;**79**:102097

- [19] Sze A, Tang I, Li W, Yu I-W. Is the Cost of Corporate Debt Influenced by ESG Factors? Evidence from the EMEAP Region (Preprint). Hong Kong: Hong Kong Monetary Authority; 2022
- [20] Hall BH, Lerner J. Handbook of the Economics of Innovation. Elsevier-North-Holland: The Financing of R&D and Innovation; 2010
- [21] Denlertchaikul N, Chatjuthamard P, Jiraporn P, Phiromswad P. The interaction effect of text-based corporate innovation and economic policy uncertainty on firm performance. Bangkok, Thailand: Sasin School of Management. 2022
- [22] Stankiewicz A. Sustainable Fund Flows Reach New Heights in 2021's First Quarter. USA, Chicago: Morningstar; 2021
- [23] Murugaboopathy P, Maan A. Global Sustainable Fund Assets Hit Record \$2.3 tln in Q2, Says Morningstar. USA: Thomson Reuters, Reuters; 2021
- [24] Murugaboopathy P, Maan A. Global Sustainable Fund Assets Hit Record \$3.9 tln in Q3, Says Morningstar. USA: Thomson Reuters, Reuters; 2021
- [25] Spohn OM. Sustainable Development Indicators within the German Water Industry – A Case Study Carried out at Chalmers. Sweden: University of Technology; 2004
- [26] Singh RK, Murty HR, Gupta SK, Dikshit AK. An overview of sustainability assessment methodologies. *Ecological Indicators*. 2012;15(1):281-299
- [27] Huang Y. Reinforcing sustainability assessment and reshaping technology innovation for highly sustainable manufacturing in the post-COVID-19 era. *Smart and Sustainable Manufacturing Systems*. 2020;4(3):341-345
- [28] OECD/Eurostat. Oslo Manual, Guidelines for Collecting and Interpreting Innovation Data. Paris: OECD Publishing; 2018
- [29] Saviotti PP. Technological Evolution, Variety and the Economy. USA, Northampton: Edward Elgar Publishing; 1996. p. 727
- [30] Saviotti PP. Considerations about a production system with qualitative change. In: Foster J, Metcalfe JS, editors. *Frontiers of Evolutionary Economics. Competition, Self-Organization and Innovation Policy*. Aldershot: Edward Elgar Books; 2001. pp. 197-227
- [31] OECD/Eurostat. Oslo Manual, Guidelines for Collecting and Interpreting Innovation Data. Paris: OECD Publishing; 2005
- [32] Arundel A, Bordoy C, Kanerva M. Neglected innovators: How do innovative firms that do not perform R&D innovate? Results of an analysis of the Innobarometer 2007 survey No. 215, INNO-Metrics Thematic Paper. 2008
- [33] Santamaría L, Nieto MJ, Barge-Gil A. Beyond formal R&D: Taking advantage of other sources of innovation in low- and medium technology industries. *Research Policy*. 2009;38:507-517
- [34] Barge-Gil A, Nieto MJ, Santamaría L. Hidden innovators: The role of non-R&D activities. In: Paper presented at the 25th Celebration Conference 2008 on Entrepreneurship and Innovation—Organizations, Institutions, Systems and Regions. Copenhagen, CBS, Denmark; 2008
- [35] Kirner E, Kinkel S, Jaeger A. Innovation paths and the innovation performance of low-technology firms—An empirical analysis of German industry. *Research Policy*. 2009;38:447-458

- [36] Som O. Innovation without R&D. Heterogeneous innovation patterns of Non-R&D-performing firms in the German manufacturing industry. Wiesbaden: Springer; 2012
- [37] Iversen E Patents in K. Smith (ed.). Science, Technology, and Innovation Indicators: A Guide for Policymakers. Idea Report 5; Step Group Oslo. 1998
- [38] OECD. The OECD Innovation Strategy, getting a Head Start on Tomorrow. Paris: OECD Publishing; 2009a
- [39] Blei DM, Ng AY, Jordan MI. Latent Dirichlet allocation. *Journal of Machine Learning Research*. 2003;**3**:993-1022
- [40] Kriebel J, Debener J. The Effect of Digital Transformation on Bank Performance. 2019. Available at SSRN: <https://ssrn.com/abstract=3461594> or <http://dx.doi.org/10.2139/ssrn.3461594>
- [41] Mukherjee A, Manpreet S, Žaldokas A. Do corporate taxes hinder innovation? *Journal of Financial Economics*. 2007;**124**:195-221
- [42] Ranta M, Ylinen M, Järvenpää M. Machine learning in management accounting research: Literature review and pathways for the future. 2021. Available at SSRN 3822650
- [43] Chen PF, Lee CC, Zeng JH. Economic policy uncertainty and firm investment: Evidence from the US market. *Applied Economics*. 2019;**51**(31):3423-3435
- [44] Cong LW, Liang T, Zhang X. Textual factors: A scalable, interpretable, and data-driven approach to analyzing unstructured information. *Interpretable, and Data-driven Approach to Analyzing Unstructured Information*. 2019
- [45] Erel I, Stern LH, Tan C, Weisbach MS. Selecting directors using machine learning. *The Review of Financial Studies*. 2021;**34**(7):3226-3264
- [46] Gentzkow M, Shapiro JM, Taddy M. Measuring group differences in high-dimensional choices: Method and application to congressional speech. *Econometrica*. 2019;**87**:1307-1340
- [47] Hanley KW, Hoberg G. Dynamic interpretation of emerging risks in the financial sector. *The Review of Financial Studies*. 2019;**32**(12):4543-4603
- [48] Li Q, Wang J, Cao G, Zhang J. Financial constraints, government subsidies, and corporate innovation. *PLoS One*. 2021;**16**(11):e0259642
- [49] Guo Y, Wang L. Environmental entrepreneurial orientation and firm performance: The role of environmental innovation and stakeholder pressure. *SAGE Open*. 2022;**12**(1):2158
- [50] YuSheng K, Ibrahim M. Innovation capabilities, innovation types, and firm performance: Evidence from the banking sector of Ghana. *SAGE Open*. 2020;**10**(2):1-12
- [51] Su X, Xu A, Lin W, Chen Y, Liu S, Xu W. Environmental leadership, green innovation practices, environmental knowledge learning, and firm performance. *SAGE Open*. 2020;**10**:1-14
- [52] Sougiannis T. The accounting-based valuation of corporate R&D. *The Accounting Review*. 1994;**69**(1):44-68
- [53] Eberhart A, Maxwell W, Siddique A. An examination of long-term abnormal stock returns and operating performance following R&D increases. *The Journal of Finance*. 2004;**59**(2):623-650
- [54] Armstrong C, Davila A, Foster G. Venture-backed private equity valuation and financial statement information.

Review of Accounting Studies.
2006;**11**(1):119-154

[55] Kramera J-P, Marinelli E, Iammarino S, Revilla Diez J. Intangible assets as drivers of innovation: Empirical evidence on multinational enterprises in German and UK regional systems of innovation. *Technovation*. 2011;**31**(9):447-458

[56] Skinner D. Accounting for intangibles – a critical review of policy recommendations. *Accounting and Business Research*. 2008;**38**(3):191-120

[57] Carayannis EG, Campbell DFJ, Rehman SS. Happy accidents: Innovation-driven opportunities and perspectives for development in the knowledge economy. *Journal of Innovation and Entrepreneurship*. 2015;**4**:7

[58] Riahi-Belkaoui A. Intellectual capital and firm performance of US multinational firms. *Journal of Intellectual Capital*. 2003;**4**(2):215-226

[59] Stewart TA. The case against knowledge management. *Business*. 2002;**3**(2):80-83

[60] Aw BY, Batra G. Technological capability and firm efficiency in Taiwan. *World Bank Economic Review*. 1998;**12**(1):59-79

[61] Mohnen P, Hall BH. Innovation and productivity: An update. *European Business Review*. 2013;**3**:47-65

[62] Mann RJ, Sager TW. Patents, venture capital, and software start-ups. *Research Policy*. 2007;**36**(2):193-208

[63] Tan HP, Plowman D, Hancock P. Intellectual capital and financial returns of companies. *Journal of Intellectual Capital*. 2007;**8**(1):76-95

[64] Chan L, Lakonishok J, Sougiannis T. The stock market valuation of research and development expenditures. *The Journal of Finance*. 2001;**56**(6):2431-2456

[65] Coad A, Segarra A, Teruel M. Innovation and firm growth: Does firm age play a role? *Research Policy*. 2016;**45**(2):387-400

[66] Freel M et al. Small firm innovation, growth and performance: Evidence from Scotland and Northern England. *International Small Business Journal*. 2004;**22**:561-575

[67] Lin CY. Factors affecting innovation in logistics technologies for logistics service providers in China. *Journal of Technology Management in China*. 2007;**2**(1):22-37

[68] Khazanchi S, Lewis MW, Boyer KK. Innovation-supportive culture: The impact of organizational values on process innovation. *Journal of Operations Management*. 2007;**25**(4):871-884

[69] Tomas G, Hult M, Hurley RF, Knight GA. Innovativeness: Its antecedents and impact on business performance. *Industrial Marketing Management*. 2004;**33**(5):429-438

[70] Szekely F, Strebler H. *Strategic Innovation for Sustainability*. Lausanne, SW: International Institute for Management Development; 2012

[71] Gunday G, Ulusoy G, Kilic K, Alpkan L. Effects of innovation types on firm performance. *International Journal of Production Economics*. 2011;**133**(2):662-676

[72] Wagner M. The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects. *Ecological Economics*. 2010;**69**(7):1553-1560

[73] Hansen E, Grosse-Dunker F, Reichwald R. Sustainability innovation cube: A framework to evaluate sustainability-oriented innovations. *International Journal of Innovation Management*. 2009;**13**(4):683-713

[74] Aguilera-Caracuel J, Ortiz-de-Mandojana N. Green innovation and financial performance: An institutional approach. *Organization and Environment*. 2013;**26**(4):365-385

[75] Nidumolu R, Prahalad CK, Rangaswami MR. Why sustainability is now the key driver of innovation. *Harvard Business Review*. 2009;**87**(9):56-64

[76] Klewitz J, Hansen EG. Sustainability-oriented innovation of SMEs: A systematic review. *Journal of Cleaner Production*. 2014;**65**(1):57-75

[77] Zee SML, Fok LY, Hartman SJ. Exploring the relationships between organizational size and market focus and commitment to the green movement and impacts of organizational culture: A comparative study of Jamaica and the United States. *International Journal of Business and Social Science*. 2011;**2**(22):19-34

[78] Robinson S, Stubberud HA. Green innovation in Germany: A comparison by business size. *Journal of International Business Research*. 2013;**12**(1):47-56