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# The effect of product innovation, CSR, environmental sustainability and technology innovation on firm performance: a mediated moderation model

Yun Hsuan Su

Department of Accounting, National Chengchi University, Taipei City, Taiwan

## ABSTRACT

The importance of product innovations has increased to the centre of priorities at every level of the firm organisational structure. This study examines the possible links between product innovation, environmental sustainability, and CSR with firm performance (FP) relationships in Malaysian fashion industries. This research has employed environmental sustainability (ES) as a mediating variable. We also examine how technology innovation (TI) affects the link between ES and FP as a moderator. First, we collected data from 310 respondents working in the fashion industry in Malaysia using a survey instrument to arrive at the conclusions. Furthermore, managers were chosen as responders because of their crucial role in the firm's strategic growth. Moreover, data is only collected from firms registered on the Bursa Malaysia Stock Exchange. In addition, data for this research were obtained between February and August 2022. Then we used structural equation modelling (SEM) to analyse the data. The scales' validity and reliability were rigorously examined, and both were found acceptable. According to the study, product innovation (PI), CSR, and ES each directly influenced the FP. Furthermore, the study concluded that the mediating variable ES and moderator technology innovation positively affected FP.

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## 1. Introduction

Innovation is essential for continuing firm performance, and the issue of technological innovation has fascinated the interest of extensive research (Brem et al., 2016; Cattani & Malerba, 2021). Innovations can be put into three categories: product innovations, process innovations, and organisational innovations, which are methods for organising a firm's assets in innovative or improved forms. Several studies have shown a correlation between innovative practices and firm performance (Hanelt et al., 2021; Le & Ikram, 2022). Chindasombatcharoen et al. (2022) used an instrumental variable to regulate the endogeneity between innovation and FP. Several past studies have examined innovation and firm performance and identified substantial

**CONTACT** Yun Hsuan Su  [grace911121@gmail.com](mailto:grace911121@gmail.com)

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impacts (Christa & Kristinae, 2021; Hameed et al., 2021). According to Marion and Fixson (2021), firms participating in R & D are more likely to develop innovative new products. It is generally accepted that the launch of a brand-new product is a sign of innovation, and the degree to which that product is successful on the market can be used to quantify the effects of innovation. To be more precise on the possibilities for product innovation and improvement, the dynamic of the worldwide business environment requires firms to adapt to the changing desires and requirements of their potential customers. In this scenario, innovation has evolved into a crucial factor driving environmental sustainability and firm performance.

Due to the prevalent ideology of modern businesses, which is focused on maximising profits to increase shareholder value, there is no longer the expectation that firms would act responsibly toward society. As a result, CSR is an idea, and the concept itself sounds sarcastic (Sardana et al., 2020). It should not come as a shock that CSR is frequently viewed as a strategic instrument for gaining reputational legitimacy and enhancing a firm's market potential, thereby increasing its performance. This view is supported by the statement that CSR has been demonstrated to affect firm performance positively (Xu et al., 2022; Shaukat et al., 2016). It's possible that for the same strategic reasons, firms are placing a greater emphasis on activities that fall under the CSR umbrella since these activities are perceived as helpful to society and the environment (Komodromos & Melanthiou, 2014). Therefore, it is believed that inclusive and sustainable review and verification can impact the avoidance of social and environmental risks, as well as the efficiency and credibility of firms (De Grosbois, 2016). The answer to the abovementioned issue is even less clear-cut in an economy that is still developing like Malaysia's. The reasons behind an individual's realisation of corporate social responsibility (CSR) in various circumstances may vary for cultural and sociological reasons. In the Malaysian context, it is important to determine whether or not there is a positive correlation between CSR and firm performance. However, it is similarly important to determine whether or not CSR is affected by formal and informal norms incorporated in an institutional context (Luo et al., 2017).

Environmental sustainability (ES) has recently become widely accepted as a major element in firm operations. Environmental sustainability (ES) is about a firm's activities to maintain the natural environment and resources, such as water, air, and soil (Singh, 2019). In the modern era, environmental sustainability (ES) is considered to be a worldwide subject that has surfaced at an organisational level due to various factors such as global warming (Arora et al., 2018), scarcity of natural resources (Ahmed et al., 2020), and greenhouse gasses emission (Yusuf et al., 2020). Although, Škare and Porada-Rochoń (2023) analysed data for 23 economies from 1890 to 2019 to determine how CO<sub>2</sub> emissions have changed in relation to technological development, capital intensity, GDP per capita, population growth, and labour productivity. However, as per Howes et al. (2017), ES-relevant concerns are essential for the industrial sector due to two primary intentions. First, in these days and age, business enterprises are required to announce their documents regarding the consumption of energy sources and the destruction made to the natural environment due to these resources. Second, there are laws and legal restrictions in place in many countries to guarantee that the influence that business operations have on society as a whole is of a high enough quality. In light of this, environmental sustainability

(ES) supports firms in reducing the resources they use, the damages they cause to the environment, and enhancing their environmental impact (Khan et al., 2021). Additionally, research on the issue of encouraging the transition to a more sustainable energy structure and adapting to changing climatic conditions has recently shifted to place a greater emphasis on the development of clean energy (Su et al., 2022a; Qin et al., 2023). Despite this, environmental sustainability (ES) has not yet been well investigated in terms of its statistical assessment, and several effects, including the one on firm performance, are still developing. In addition, most of the literature relevant to environmental sustainability (ES) is biased and is determined by survey studies (Montabon et al., 2007). Since much earlier environmental sustainability and firm performance studies were focused on developed nations (Roxas et al., 2017), there is still an obvious literature gap, particularly in developing nations like Malaysia. A few studies examined the association between ES and FP and found contradictory results (Hami et al., 2015).

The major aim of this study is to analyse the link between product innovation, CSR, ES, and firm performance. Given that performance is the only focus of any firm. Furthermore, due to this research, environmental sustainability is also a mediator in the relationships discussed above. In addition, the research uses technology innovation as a moderator in the association with ES and FP. Therefore, it was performed to understand the nature of this relationship better. The present research has several important contributions and repercussions. For instance, this is pioneering research because it develops a research model to incorporate product innovation, corporate social responsibility (CSR), environmental sustainability, and technology innovation on firm performance. While past research has ignored these factors. Furthermore, managers can use product innovation, CSR, environmental sustainability and environmental strategy, and technology innovation to increase the firm performance of Malaysian fashion and textile sectors.

Moreover, the findings of the present study may be useful for businesses in Malaysia in trying to correct the misconception that financing environmental initiatives entails extra costs that reduce the economic performance of a firm. This misconception has been perpetuated by a widely held belief in the business community that this belief is accurate. Second, previous studies have shown that the association between product innovation, CSR, environmental sustainability, and technology innovation on firm performance can be better addressed when mediators and moderators are present (Gupta & Gupta, 2020; Ramadani et al., 2019). In this context, we propose that environmental sustainability (ES) could be a potential mediator amongst product innovation. Consequently, it is illogical to generalise the findings from developed economies to emerging market economies. However, the current research investigates the relationship from the perspective of a developing nation such as Malaysia, an area where the subject of the current research still needs significant consideration.

The manuscript is structured as follows. First, the introduction part of the manuscript contains the background information for the research presented. Then, in the literature review and hypothesis formulation section, secondary sources of knowledge about the present research are outlined, and the testable hypotheses are established. Next, in the research methodology part, we have to detail the survey technique, sample design, testing of hypotheses, etc. Finally, in the "result and discussion" section, the

main emphasis is on providing a detailed explanation of the analysis and comparing it to the research that has already been done. Finally, at the end of the last part conclusion and the future direction, we highlight the most important and new findings from the research and recommend some important directions for future study.

## 2. Literature review and hypothesis development

### 2.1. Product innovation and firm performance

Product innovation may be defined as the development of new products to satisfy the requirements of an external marketplace or the requirements of individual users (Reguia, 2014). Visnjic et al. (2016) state that product innovations have a beneficial long-term influence on stock market performance. Additionally, the effect is long-lasting throughout the period. Product innovation can be categorised as either the launch of a new product exclusive to the firm or the launch of a new product in the marketplace (Ramadani et al., 2019). In addition, these innovations are considered a potential resource of inconsistency between the competing firms operating within a market and organisational performance (Imran & Jingzu, 2022). Therefore, essential elements contribute significantly to an organisation's viable portfolio (Rousseau et al., 2016).

Furthermore, products often have a distinctive quality because they are produced inside the firm. As a result, they are susceptible to a certain level of uncertainty along with legal safety, which establishes barriers against synthetic. Furthermore, product innovation advantage protects the firm from competition and market threats (Liu & Atuahene-Gima, 2018). According to the findings of Harjadi et al. (2020), product innovation positively influences firm performance. Studies conducted similarly and demonstrated the same related results were conducted by Zaefarian et al. (2017) and Lee et al. (2019). They concluded that organisations that innovated new products and had significant growth in sales from those products were less likely to be affected by the phenomenon known as cannibalisation, and those firms also noticed an improvement in their performance. Research conducted by Brazilian firms revealed that "product innovation also results in outstanding sales growth rates" (Goedhuys & Veugelers, 2012). Apart from the launch of new products, process innovation brings with it the possibility of being linked to lower levels of growth performance. It's certainly not possible that the advantages of a more cost-effective production method won't become apparent until after an initial phase of reorganisation has been completed.

Masso and Vahter (2008) explored association in Estonia throughout different stages and concluded that product innovation positively affected production during the initial attempt (1998–2000). In contrast, process innovation did not demonstrate any effect at all. The contrary outcomes remained discovered during another attempt (2002 and 2004), wherever the process innovation demonstrated a constructive association between innovation and performance. It was argued that the Estonian organisations missed the conventional marketplaces because of the financial disaster in Russia and that product innovation was assumed essential to reorganise and move into the new marketplace. Several researchers, like Christa and Kristinae (2021) and Mitrega et al. (2017), concluded that product innovation has a beneficial influence on the performance of the firms. Iavorska (2014) investigated the link between product innovation and

firm performance. The study was established on a representative sample of 6800 Ukrainian corporations and looked into the link between product innovation and firm performance. The study concluded that product innovation significantly reduces the ROA in the next phase due to purchases of property, plant, and equipment (PP&E), has a higher lagged part of brand-new products in the firm manufacture range and has a beneficial impact on ROA. In addition, creativity is seen as essential, and its relationship to leadership and business entrepreneurship cannot be overstated (Škare et al., 2022). This indicates that a greater differentiated firm can support economies of scope. On the other hand, there is not a discernible effect that introducing new products has on the profit margin before interest and taxes. Considering the information presented above, we recommend the hypothesis stated below:

*H1: Product innovation has a positive and significant impact on firm performance*

## **2.2. CSR and firm performance**

Unethical behaviour is critical since it may economically damage the whole firm (Nguyen et al., 2021). This term implies that disregarding ethical standards in the workplace might harm the firm's performance. According to Feldman (2014), for the whole history of developmental economics, the concept of CSR has been seen as very important to the performance and fulfilment of economic goals. The involvement of firms in CSR activities enhances the importance of such firms, especially in contentious fields of endeavour (Vollero et al., 2019). The relationship between the two factors was much larger in particularly vulnerable sectors (Ahsan et al., 2022). It has been suggested that CSR lowers a corporation's equity and debt costs (Gong et al., 2021; Magnanelli & Izzo, 2017; Yeh et al., 2020). Environmentally responsible initiatives have the potential to save operational expenses, which can lead to greater firm financial performance (Jo et al., 2015). Productivity is significantly impacted by sustainable firm productivity and the reduction of waste produced by the business. Pérez and Del Bosque (2015) Reported that it has a close relationship with the satisfaction of CSR stakeholders. According to Aguilera-Caracuel and Guerrero-Villegas (2018), firms who are intentionally involved in CSR continue to enhance their representation strategically and create great relationships with shareholders, both of which increase the firms' overall business performance. Firms participating in CSR activities build stronger socio-organisational relationships, encouraging consumers to purchase more of the firm's products and services (Kim et al., 2020). Consumers are deemed important to firm performance. Similarly, Su et al. (2022b) conducted a study in China and found that consumers promote the internal circulation of the Chinese economy.

CSR has a significant effect on the level of participation of employees and the management of the firm's risks. First, the employee's involvement in CSR helps create a solid link between employees and the business, which considerably increases employee loyalty and firm performance (Lu et al., 2020). firms that practice corporate social responsibility make it a point to train and educate their employees to fulfil their need for long-term sustainable growth (Turcsanyi & Sisaye, 2013). To begin, CSR strengthens the ties that bind employees and firms together. This, in turn, stimulates higher levels of employee productivity and engagement, guiding to greater levels

of overall firm performance (Ikram et al., 2019). In addition, engagement of CSR in firm strategy is beneficial when it comes to hiring talented employees. Second, firm actions that fall under the umbrella of "CSR" primarily encourage firms' openness (Watts, 2015). Previous research has supported the line of consistent logic and reasoning for the relationship between CSR and firm performance (Anser et al., 2018; Bai & Chang, 2015; Kong et al., 2020; Mitra, 2021). The following hypothesis is supported by all of the evidence that is currently available.

*H2: CSR has a positive effect on firm performance*

### **2.3. Product innovation and environmental sustainability**

There is much evidence indicating that innovation is associated with measures of sustainability and sustainable growth initiatives (Dressler & Bucher, 2018; Oliveira-Duarte et al., 2021; van der Waal et al., 2021) through several approaches. Within the context of the strategy, sustainability has prompted businesses to explore incorporating sustainability into their development, ultimately leading to competitive advantage via innovation (Alfawaire & Atan, 2021). As per Baah et al. (2021), sustainability is a cost-saving and innovative approach to provide a competitive advantage. Furthermore, firms are motivated to adopt sustainable business practices by the rules and norms imposed by regulatory authorities (Baah et al., 2021). As a result, such rules and legislation fostered innovation and created conditions conducive to developing innovative practices related to sustainability (Peng et al., 2021). In addition to the numerous indirect associations, there is a direct relationship between innovation, environmental sustainability, and the preservation of natural resources. According to Dey et al. (2011), supply chain businesses are both cost-effective and friendly to the environment due to the incorporation of innovative products such as GPS and hybrid fuel technology. These improvements have been made possible through the use of hybrid fuel technology. Furthermore, Imran et al. (2021) demonstrated that innovation is responsible for disseminating information on the need to decrease carbon emissions.

When determining the indirect and direct relationships between innovation and sustainability, this study aims to establish an association between product innovation and environmental sustainability. In addition, innovation indicates the launch of a new product, procedure, marketing approach, or organisational system that is much more effective than before (Bhutta et al., 2021). Although prior researchers, such as (Adams et al., 2016; Goodman et al., 2017), have comprehensively investigated challenges associated with sustainability-oriented innovation, there needs to be more consent on the statistical data that reflects the association between them. We find a small number of studies that associate product innovation with environmental sustainability (Andersén, 2022), process innovation with environmental sustainability (Moyano-Fuentes et al., 2018), and organisational innovation and economic sustainability (Maletič et al., 2021). However, we have not found several studies that attempt to evaluate the relative strength of linkages between product innovation and environmental sustainability from the perspective of Malaysia. Therefore, we develop hypotheses that relate product innovation with environmental sustainability to close this

gap. From the perspective of Malaysian firms, the following hypotheses are presented product innovation and environmental sustainability.

*H3: Product innovation has a positive effect on environmental sustainability.*

#### **2.4. CSR and environmental sustainability**

Different researchers, including Li et al. (2022) and Ikram et al. (2019), CSR to the environment refers especially to the actions that a firm uses to preserve the environment, climate, and wastage to decrease the emission of waste. Currently, firms are concentrating on preserving the environment in their interactions. They are forced through governing bodies to adhere to environmentally friendly principles, which are ensured through several ISO accreditations. This shift in corporate culture directly results from increased public awareness of environmental issues. Taking up social obligations concerning the environment can be of great assistance in working toward the goal of attaining sustainable environmental development. However, this objective may be accomplished through conserving and protecting the natural environment as a consequence of enticing active measures aimed at reducing the risks posed by natural hazards and hazardous waste (Keller & DeVecchio, 2016). In a subsequent section of their research, Hoover and Harder (2015) underlined that management procedures are not being put off to their resources and that firms are also considering measures to tackle the problems of maintaining the environment. They are attempting to mitigate their actions' negative effects on climate and the natural environment.

The firms' stakeholders are also essential for implementing CSR initiatives to protect the environment (Viveros, 2016). It has been shown that environmental corporate social responsibility (CSR) protects the environment and gives a competitive advantage to the organisations that practice it. According to Sila and Cek (2017) and Xie et al. (2017), the effect of CSR on the environment in developing nations has a substantial influence on the economy and the environment. Based on the studies mentioned above, the following hypothesis has been anticipated:

*H4: CSR has a positive effect on environmental sustainability.*

#### **2.5. Environmental sustainability and firm performance**

Presently, businesses around the globe are under constant pressure from various interest groups to conduct their operations in a more environmentally friendly manner, so much so that many have moved their environmental policy from merely reducing pollution to preventing it entirely (DeBoe, 2020). Multiple stakeholders, such as non-governmental organisations, the government, and other international organisations, are represented among these pressure groups. Similarly, the researchers revealed post-epidemic impacts on the economy and the government dynamically implementing stimulus measures to improve the economy (Su et al., 2022c). There has been a shift in the mindset of stakeholders, including customers and employees, due to several climate-related issues. Because of this, customers and employees expect firms to implement sustainable policies and procedures (Ahmad et al., 2021). Due to the significance of environmental

sustainability, researchers studied the impact of oil prices on green bonds and found a positive relationship (Su et al., 2023). Researchers have also suggested that a firm's environmental performance may improve if it adopts a sustainability policy for the environment (Soares et al., 2017). Therefore, it can be argued that there is a link between ES plans and the environmental performance of firms (Bilan et al., 2020). To achieve a competitive advantage, businesses employ environmental sustainability plans to meet formal legal duties and satisfy a wide range of shareholders, enhancing the business's competitive atmosphere and environmental performance (Tu & Wu, 2021).

Similarly, an organisation can place itself in a better place relative to its opponents by adopting environmental sustainability initiatives. These strategies increase not only the organisation's inside practices of the organisation as well the exterior outcomes of the firm in the form of improved sales and marketing outcomes (Taherdangkoo et al., 2019). An efficient response to environmental sustainability strategies can have an assortment of positive effects for a firm. These effects include social advantages (Du et al., 2015) and environmental and economic benefits. However, the researchers said that countries with reduced CO2 emissions are the most financially stable countries in the world (Su et al., 2023). Existing research provides substantial evidence supporting the hypothesis that ES is a relationship between ES and environmental performance (Latan et al., 2018). In conclusion, it is clear that continuing to pursue environmental sustainability initiatives effectively pays off a firm and supports the firm in achieving a competitive advantage (Singjai et al., 2018), decreases the amount of manufacturing and risk (Epstein et al., 2015), enhance synergic impact (Yong et al., 2020), and strengthen firm reputation (González-Rodríguez et al., 2019). As a result, we prepared the following hypothesis.

*H5: Environmental sustainability has a positive effect on firm performance.*

## **2.6. The moderating role of technology innovation**

Although several studies have investigated the adoption of information technology (IT) with a multi-stage analysis from the perception of technology use (Buonincontri & Marasco, 2017; Rajaretnam & Sheth, 2018), the question of how performance impacts differ across different stages of dispersion has not received enough attention. Therefore, the practitioner needs to grasp the association between the spread of technology innovations and the firm's performance. Researchers who study management information systems (MIS) have spent a decade attempting to comprehend the information technology (IT)'s role in firms. The term "information technology (IT)" refers to the phenomenon in which empirical investigations have found either a little or nonexistent increase in firm productivity as a result of massive investments in information technology (IT) (Thatcher & Oliver, 2001). The insufficient methods used to measure the value of information technology (IT) may be a key contributor to these conflicting findings (Luftman et al., 2017). Historically, when evaluating the firm performance, the emphasis has often been on financial measures, such as the amount of income generated through sales or the return on investment. As a result, many studies argued for non-financial measures, particularly customer-based indicators; nevertheless, there was no consensus on the specific measurements that should be used (Astuti & Rahayu, 2018). In addition, previous

research has proposed a method in which the impact of IT on the performance of an organisation is mostly mediated through intermediate business processes (Al-Shmam et al., 2021; Liao et al., 2018). On the other hand, acquiring new knowledge and increasing individual perspectives often drive redesigning business processes. Both of these factors are significant intermediate results that play a significant role in developing value through technology innovation.

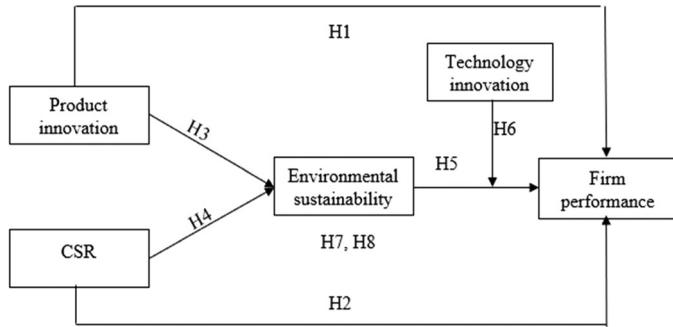
Awa et al. (2017) presented the technology–organisation–environment model in an enterprise setting to explain the adoption of technology innovations. It was carried out in the context of the problem of technological innovation. The TOE model has seen widespread use in a variety of information technology (IT) contexts, including e-business and supply chain technologies, intending to determine critical antecedents of widespread implementation of information technology (IT) (Chan et al., 2012). This research proposes technology innovation, organisation, and environment as factors that might predict the dissemination of innovative technology inside a firm. As a result, we contend that technology innovation has the potential to play a significant part in moderating the relationship between environmental sustainability and firm performance.

*H6: Technology innovation moderates the relationship between environmental sustainability and firm performance.*

## **2.7. The mediating effect of environmental sustainability**

Since the early 1990s, several management scholars have adopted the concept of organisational environmental sustainability as their guiding principle. As a result, the natural environment and firms' operations have become intimately connected. For example, researchers working for the World Bank first developed the idea of environmentally responsible improvement, which later evolved into “environmentally sustainable development” (Bank, 1992). Additionally, in a different mechanism, scholars such as Chang and Fang (2023) highlighted that green energy plays a vital part in the sustainable economic development of the country. Environmental sustainability aims to ensure that the systems that support life on the planet will continue to do so forever. In its most basic form, it describes a set of practices intended to enhance human well-being by protecting the sources of raw materials, reducing waste to the greatest extent possible, and avoiding human damage (Danso et al., 2020). The points that these scholars made highlighted the fact that the position that a firm play regarding environmental practice and initiatives changes with time. In addition, a significant portion of the philosophical content of these ideas is comprised of the innovation and CSR that have already been discussed. CSR is the practice of accounting for environmental concerns alongside concerns regarding a firm's overall performance. As the new century continues, innovation, corporate social responsibility, and environmental concern are becoming more important components of the long-term objectives of the firms (Bocquet et al., 2017; Rousseau et al., 2016; Sardana et al., 2020).

Environmental sustainability is an important activity responsible for implementing the strategic plan to improve firm performance (Feng et al., 2018; Shad et al., 2019). Recently, several firms have formulated and implemented mission statements that comply with environmental regulations. Similarly, annual environmental reports are included within the expanding scope of financial reporting. Certain firms go so far as to



**Figure 1.** Research framework.

Source: Author's Estimation.

allocate vice president and board posts specifically for environmental professionals. The development and adoption of favourable environmental policies enhance a firm's efficiency and, as a result, act as the main source of competition (Danso et al., 2019). Firms are in an ideal situation to attain CSR and innovation integration and improve their competitiveness at the same time if they reduce, reuse, and recycle trash. Therefore, the following sections investigate the possible role that environmental sustainability might play as a mediator in the association with product innovation, CSR, and firm performance. The research framework model and hypothesis are shown in Figure 1.

*H7: Environmental sustainability mediates the relationship between product innovation and firm performance.*

*H8: Environmental sustainability mediates the relationship between CSR and firm performance.*

### 3. Research methodology

#### 3.1. Data collection and sample size

A survey technique was employed to obtain responses for this research. This study focuses on fashion and textile businesses in the industrial sector. The population surveyed consists only of businesses in the fashion industry, as indicated by relevant keywords such as "textiles." Because Malaysia's fashion and textile industry businesses are boosting competitiveness and the country's economy. According to Farhana et al. (2022), Malaysia's fashion and textile sectors contribute significantly to the country's economy. In all, the sector was responsible for the direct employment of more than 90,000 employees, and its exports in 2017 were \$3.3 billion. The data collection method used was an online survey of textile firms. According to previous scholars, this method is quite useful. However, it is still useful because of many advantages, including saving money, attracting new participants quickly, and easily communicating with data sources. In addition, it involves obtaining a wide range of samples. This data was collected only from firms that are members of the Bursa Malaysia Stock Exchange. Managers of the firms were selected as respondents for this research because managers play an important role in the overall strategic development of the firms (Chaudhry & Amir, 2020). According to Wei et al. (2020), managers are responsible for representing their firms while responding to survey questions. In addition, the data used in this study

were collected from February 2022 through August 2022. Apart from this, the managerial levels of the firms would have a complete awareness of the performance of the firms. At the beginning of the survey, each participant gave their informed consent, and their responses' confidentiality was maintained throughout the process.

Out of 450 questionnaires given to different organisational managers, 360 participants in an online survey provided their feedback. After validating the responses, 30 questionnaires were assessed as insufficient, while 310 were selected for further investigation. As per Comrey and Lee (1992), various sample sizes, such as sample sizes below 50 being regarded as weaker, 51 to 100 being regarded weak, 101 to 200 is regarded as adequate, 201 to 300 as regarded as good, 500 being regarded very good, and 1000 is deemed an excellent. Consequently, the sample size for this study was 310, which is deemed adequate. Consequently, the present investigation meets the criterion mentioned above.

### 3.2. Profile of respondents

In this part, questions about the respondents' demographic information were addressed. In this research, male respondents made up 64% of the total, while female respondents made up 36%. In addition, the majority of the respondents had a master's degree, 58%, while 48% had completed an M.Phil, and the remaining respondents were undergraduates. By age, 43% of the respondents ranged between 18 and 27, while respondents whose ages ranged from 28 to 37 years comprised 51% of the total, the remaining respondents were older than 38 years.

### 3.3. Measures

To measure the variables, this research used well-established scales from the literature. Table 1 presents the evaluation criteria that were used in the conduct of this research. First, the firm performance was evaluated using 5 items from earlier research (Paré et al., 2020). Second, the measure of product innovation was rated using a 5 items scale based on the product innovation scale developed by Chaudhuri et al. (2021). Third, questions about CSR were included in the study as part of the dependent variable, and the number of items used for measurement was 6. These questions were taken from the research conducted by Masurel and Rens (2015). While environmental sustainability and technological innovation were assessed using 6 and 5 items, respectively. These items were taken from the research conducted by Green et al. (2018) and Li et al. (2006), respectively. Finally, each variable was given a score on a 5-point Likert ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated a higher position for that particular variable's construct.

**Table 1.** Summary of variables and items.

Construct	Sources	No. of Items
Firm Performance	Paré et al. (2020)	5
Product Innovation	Chaudhuri et al. (2021)	5
CSR	Masurel and Rens (2015)	6
Environmental sustainability	Green et al. (2018)	6
Technology innovation	Li et al. (2006)	5

Source: Author's Estimation.

## 4. Results and discussions

### 4.1. Data analysis

The research was based on the feedback provided by survey respondents, and PLS (SEM) was employed to analyse the data acquired. The SEM approach is particularly helpful in understanding the connections between the variables (Wong, 2013). Therefore, it was determined that a PLS-SEM technique would be suitable (Hair et al., 2019). PLS-SEM is especially recommended when the investigation is linked to a limited number of hypotheses, where precise measurement of the framework cannot be assured, and when the data does not follow the normal distribution (Chin et al., 2020). Furthermore, in exploratory research such as this one, the PLS-SEM method is useful in that it helps to provide better findings (Hair et al., 2019). Moreover, the PLS-SEM was more suitable because, for CB-SEM, there are preconditions required pertaining sample size, the sample to be distributed normally, and the model to be accurately stipulated (Richter et al., 2016). These prerequisites call for appropriate variables to be selected and related to convert a theory into an SEM. PLS-SEM could meet these prerequisites (Sarstedt et al., 2014). The software known as Smart PLS 4.0 was used in this situation.

### 4.2. Assessment of the measurement model

At first, the reliability and validity of the measurement model were investigated and analysed. As seen in Table 2, the values of the outer loading that were determined during the test had a satisfactory level of reliability. All of the outer loadings of the observed variables have values that are more than 0.50 and range between 0.535 to 0.897 (Hair et al., 2017). Furthermore, the convergent validity exceeded due to the average variance extracted (AVE) values for all constructs exceeding the cut-off value of 0.50 and falling between the range of 0.577 to 0.709, respectively. The latent variables' composite reliabilities (CR) range from 0.869 to 0.924 and are higher than the acceptable thresholds for exploratory research (Kline, 2015).

The technique recommended by Fornell and Larcker (1981) was employed to analyse the discriminant validity. According to the findings in Table 3, all of the variables and the square roots of AVE (between 0.202 to 0.842). Comparing the AVE of every variable with its squared correlation with the other variables demonstrates how the AVE technique of testing discriminant validity based on the Fornell-Larcker criteria is carried out. The values of the AVE square root are shown along the diagonal in Table 3, while the other contains correlations between the other variables. These correlations are greater in every aspect, indicating that the discriminant validity is appropriate (Hair et al., 2017). We also measure the Heterotrait-Monotrait ratio (HTMT) as an additional measure of the discriminant validity of the test. The HTMT is also determined and must be lower than 0.85 (Henseler et al., 2015). Table 4 demonstrates that the HTMT values for every single construct are lower than the threshold values, as they can be verified. (Table 5)

### 4.3. Hypothesis testing

The bootstrapping method was also used to test hypotheses in conjunction with Smart PLS. It is possible to test hypotheses using this method, which is a significant

**Table 2.** Reliability and validity of the construct.

Variable	Items	Outer loading	C.R	Cronbach's alpha	AVE
Firm performance	FP1	0.890	0.924	0.898	0.709
	FP2	0.897			
	FP3	0.882			
	FP4	0.804			
	FP5	0.725			
Product innovation	PI1	0.738	0.869	0.809	0.577
	PI2	0.857			
	PI3	0.813			
	PI4	0.809			
	PI5	0.535			
CSR	CSR1	0.770	0.895	0.861	0.587
	CSR2	0.764			
	CSR3	0.696			
	CSR4	0.822			
	CSR5	0.818			
	CSR6	0.720			
Environmental sustainability	ES1	0.537	0.881	0.835	0.557
	ES2	0.818			
	ES3	0.820			
	ES4	0.832			
	ES5	0.701			
	ES6	0.728			
Technology innovation	TI1	0.852	0.878	0.824	0.594
	TI2	0.841			
	TI3	0.822			
	TI4	0.624			
	TI5	0.687			

Source: Author's Estimation.

**Table 3.** Discriminant validity Fornell-Larcker criterion.

Variable	CSR	ES	FP	PI	TI
CSR	0.766				
ES	0.661	0.747			
FP	0.470	0.202	0.842		
PI	0.584	0.692	0.239	0.759	
TI	0.547	0.616	0.278	0.629	0.771

Source: Author's Estimation.

**Table 4.** Discriminant validity HTMT criterion.

Variable	CSR	ES	FP	PI	TI
CSR					
ES	0.748				
FP	0.515	0.226			
PI	0.684	0.838	0.292		
TI	0.641	0.737	0.307	0.777	

Source: Author's Estimation.

**Table 5.** Hypotheses results (direct & indirect).

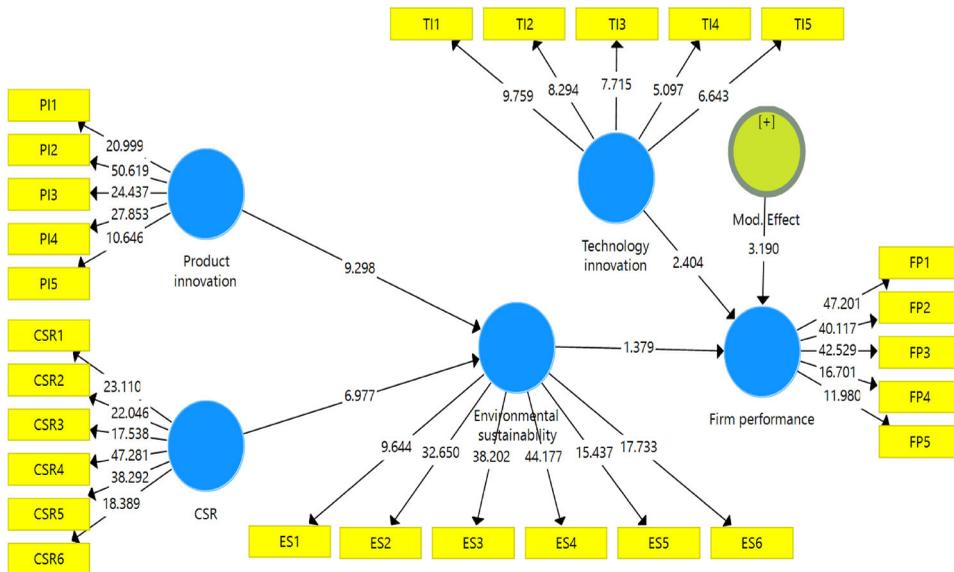
Hypothesis	Paths	$\beta$ -Value	S. D	t-value	p-values	$f^2$
H1	PI -> FP	0.258	0.063	4.095	0.000	
H2	CSR -> FP	0.149	0.038	3.921	0.000	
H3	PI -> ES	0.465	0.050	9.298	0.000	0.339
H4	CSR -> ES	0.390	0.056	6.977	0.000	0.239
H5	ES -> FP	0.124	0.090	1.379	0.169	0.002
H6	Mod. Effect -> FP	0.214	0.067	3.190	0.002	
H7	PI -> ES -> FP	0.158	0.042	3.762	0.000	
H8	CSR -> ES -> FP	0.129	0.035	3.686	0.000	

Source: Author's Estimation.

advantage compared to parametric testing (Chin, 2010). A bootstrapping method is recommended for PLS-SEM analysis because of its reliability (Henseler et al., 2009). This study has five direct, two mediating, and one moderating hypotheses.

Within the framework of this study, there are a total of eight hypotheses: five direct, two mediating, and one moderating. We used SmartPLS 3.3.7 edition for the hypothesis analysis and performed bootstrapping based on 5,000 subsets. The PI has a significant and positive association with FP ( $\beta=0.258$  and  $p=0.000$ ), which supports the hypothesis that H1 is accepted. In addition, CSR strongly correlated with FP ( $\beta=0.149$  and  $p=0.000$ ) and accepted H2. In addition, PI has a positive and substantial significant correlation with ES ( $\beta=0.465$  and  $p=0.000$ ); as a result, H3 is accepted. As a result of the observation that H4 CSR has a significant and positive relationship with ES ( $\beta=0.390$  and  $p=0.000$ ), the hypothesis is accepted. ES has a positive relationship with FP; however, this relationship is not statistically significant ( $\beta=0.124$  and  $p=0.169$ ), and H5 is supported. As a result of the finding that the moderating impact of technology innovation is ( $\beta=0.214$  and  $p=0.002$ ) and the conclusion that technology innovation positively moderated the link between ES and FP, H6 is supported. Finally, the findings of mediation PI and CSR with FP ( $\beta=0.158$  and  $p=0.000$ ,  $\beta=0.129$  and  $p=0.000$ ) show that the relationship with FP is positively and significantly mediated, and the decisions are H7 and H8 are confirmed. The correlation between the different variables is seen in Figure 2.

The  $f^2$  indicates whether or not exogenous variables affect endogenous variables (Imran et al., 2021). The  $f^2$  may be subdivided into numerous categories, as recommended by Cohen (1988), small effect ( $f^2 = 0.02$ ), medium effect ( $f^2 = 0.15$ ), and larger effect ( $f^2 = 0.35$ ). According to Table 5, the effect of PI on ES is larger. At the same time, the influence of CSR on ES is the medium effect, and the influence of ES is smaller on endogenous variables.



**Figure 2.** Structural model.  
Source: Author's Estimation.

**Table 6.**  $R^2$  and  $Q^2$ .

	R Square	Q2
Environmental sustainability	0.580	0.311
Firm performance	0.079	0.052

Source: Author's Estimation.

#### 4.4. The predictive power of the model

The degree of variation attributed to exogenous variables as a whole is denoted by  $R^2$ . According to Table 6, the exogenous variable may explain 58% of the indicated ES, whereas only 7% of the indicated FP. According to (Cohen, 1988), three different levels of  $R^2$  include weak ( $R^2$  equal to 0.02–0.13), moderate ( $R^2$  equal to 0.13–0.26), and substantial ( $R^2$  equal to more than 0.26). The findings of this study show that the ES meets the criteria as substantial, whereas the FP score was weak. Using the blindfolding method, the cross-validated redundancy, also known as  $Q^2$ , is calculated in SmartPLS to determine the predictive power of the research model. As per Chin (2020), the  $Q^2$  value should be larger than zero. The evidence presented in Table 6 reveals that both the ES and FP  $Q^2$  values are larger than zero. As a result, the model has a strong capacity for predictive power.

### 5. Conclusions and policy implications

According to the conclusions of this research, the relationship between PI, CSR, and FP can be partially explained by considering environmental sustainability (i.e., natural resources) as a mediating variable. Management should effectively concentrate on environmentally sustainable practices, product innovation, and CSR to improve the FP. The product invention positively affects the firm's growth, which supports H1. According to the findings of Na and Kang (2019), product innovation contributes greatly to improving the sustainable performance of the Malaysian fashion industry. Not many studies look at how product innovation impacts the performance of firms in the Malaysian setting. Based on the results of this study, firm managers should consider product innovation when making decisions. If management fails to consider these resources while making decisions to assess a firm's performance, the firm may have challenges related to lower performance (Lin et al., 2013). During the strategic planning process, the management should concentrate on problems with product innovation and give a strong policy that encourages innovation perception in all departments.

According to the findings of this research, CSR has a positive and significant impact on the performance of firms., although this influence is minor, and this supports H2. The results contradicted Javed and Husain (2021), who discovered that CSR did not affect the FP. According to our research, management suffers CSR issues throughout the managerial decision process due to a lack of knowledge that may reduce business performance. Suppose the management of the firm needs to enhance the FP. In that case, it is crucial to strengthen relations with customers, suppliers, competitors, and departments to gather relevant environmental information. For instance, this research proposes that management should have feedback on changes in the manufacturing process, CSR policies, product demand, and the environmental initiatives of competitors. The management team must overcome the obstacle of perceived CSR, which

harms the FP. If management emphasises CSR more and gathers the appropriate information, the gap between CSR and firm performance may be reduced. If this is the case, the outcome must be different. In addition, positive and significant relationship between PI and es, which H3 confirms. A limited number of studies showed that product innovation, specifically ecological innovation, is positively associated with the sustainability of the environment (Dangelico et al., 2017). Moreover, the findings of this research, for firms to be successful in developing PI, they need the capacity to recognise opportunities for new product development and properly manage resources.

CSR has a positive and considerable impact on ES, which provides evidence that our hypothesis H4 is appropriate. According to this research, firms should focus on the CSR policies they have implemented. For instance, a firm may acquire new green understanding, convert new green knowledge, and implement new technology. Although the relationship between ES and FP is minimal, it improves FP favourably. This helps support our H5 hypothesis. In addition, management and employees may work together to build ES technology via coordination. Therefore, ES provides more accurate findings explaining the connection between ES and firm performance. The results of Golicic and Smith (2013), who noted that ES is positively related to FP, were confirmed by our research findings. In addition, the relationship between ES and FP and technology innovations is positively moderated, which supports H6. According to the findings of Abdallah et al. (2016), technological innovations have a positive relationship with the operational performance of businesses. As per our research findings, management should make investments in introducing innovative technologies into the day-to-day procedures of the firm, as well as in the employees' health and safety, the employees, the schooling of employees regarding the avoidance of pollution, and the reduction of waste. In conclusion, ES is a positive mediator of the link between PI, CSR, and FP, which supports hypotheses H7 and H8.

## **5.1. Implications of the study**

### **5.1.1. Practical implication**

Our research has several important practical implications, particularly for senior management in the Malaysian fashion business and for industry professionals. Today, policymakers and textile managers in the fashion industry focus on firm performance. In the meantime, they can adopt our research model of firm performance to minimise energy, air emissions, pollution, non-renewable resources, and water waste and incorporate innovation and environmental programs and policies. The findings of this research have implications for managers as well as for practitioners. The present study sheds light on an important question: how improvements in product innovation, corporate social responsibility (CSR), environmental sustainability, and technology innovation might boost a country's economic growth. The research closes a gap in the existing literature. It makes it possible for management in the Malaysian fashion industry to focus on studying exogenous variables to improve firm performance. This study represents a managerial point of view to investigate how product innovation, environmental sustainability, and CSR contribute to firm performance. If firms in Malaysia's fashion, fibres, and textiles industry want to enhance their performance, they must

focus on environmental sustainability. For instance, the process of strategic planning at a firm ought to include consideration of issues about innovation and the environment; the upper management team ought to be responsible for making decisions that are proactive and forward-thinking, and employees responsible for innovation and the environment should be involved in the process of strategic development at the firm. In addition, the findings of this investigation reveal that firms prioritise protecting the environment and formulate transparent policy statements that encourage innovation awareness in all aspects of their operations. The management has to focus on performance variables while making decisions, such as budgeting, environmental expenditures, innovation investment, encouraging constant improvement, providing data for reporting purposes, and providing data for internal decision-making.

### ***5.1.2. Theoretical implications***

This study contributes to the current literature on firm performance by determining the critical factors that must be addressed to achieve environmental sustainability, product innovation, and CSR in emerging nations like Malaysia. In Malaysia, it was found that the fashion industry was still in the beginning phases of developing and implementing its plans. The conclusions of this research suggest that the fashion industry in Malaysia is on the increase in most elements related to sustainable practices. Therefore, to achieve performance targets, managers of firms should concentrate on the areas mentioned above. On the other hand, the fashion business has only a limited commitment to the principles of sustainability and CSR. The validated latent variables, obtained by confirmatory factor analysis, provide a major addition to knowledge in the fashion industry. The research indicates that this circumstance strongly moderates the link between TI and FP; nevertheless, other factors connected to FP are still developing and need senior management's attention.

### ***5.2. Limitations and future directions***

Many implications and contributions may be obtained from the present study; however, there are also certain limits that subsequent researchers can address. Given that the scope of this research was limited to the Malaysian fashion industry or consumer industries and that it was a quantitative study in which data was collected from firm managers, future research must be conducted with a concentration on the fibres and textiles industry across a variety of qualitative studies. For this study, the researcher collected data from the Malaysian fashion industry. After the successful implementation of firm performance, similar information may be gathered from other sectors to evaluate the same hypothetical foundation in two distinct contexts. In this particular study, the researchers only collected data from 310 respondents who were employed as managers in Malaysian fashion industries; however, in future studies, it is recommended that this be conducted with 500 or 700 respondents. That will be important research within the setting of Malaysia; as far as the scholar is concerned, prior research has yet to be performed on the subject of this study. Furthermore, it has been suggested that future research on this issue should be carried out in other developing countries. This is because the findings might not apply to other nations. The

findings obtained from various sectors and nations might be compared to one another after that. Identifying the challenges that prevent businesses in Malaysia and other developing countries from implementing environmentally friendly product and process innovation and environmental performance techniques could be another crucial subject for future research to address to improve the body of awareness concerning firm performance. The present study used a cross-sectional research approach. It did not consider the possibility that there may be shifts over time in product innovation, CSR, environmental sustainability, technology innovation, and firm performance within the Malaysian fashion sector. Therefore, other researchers might employ a study model similar to the one used to determine whether or not the outcomes are the same. For this study, data were obtained from managers; however, in future research, co-workers and frontline employees may be included in assessing the environment's sustainability. In addition, the data was gathered from firms registered with the Bursa Malaysia Stock Exchange; a future comparison with East Malaysia's and West Malaysia's fashion industries may also be beneficial.

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