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Article

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Mediation of brand reputation and image in the relationship between perceived corporate social responsibility and brand equity and loyalty of technology companies among Generation Z: the moderating role of gender

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ABSTRACT

This study examines whether the effects of perceived corporate social responsibility (PCSR) on brand equity and brand loyalty are jointly mediated by brand image and brand reputation in the technology industry. It also explores the moderating role of gender in these relationships. The sample consisted of 420 Generation Z members from Lima, selected through gender-stratified random sampling. The study focuses on the technology sector, represented by the large FAANG companies (Facebook, Amazon, Apple, Netflix, and Google), justified by their high stock market visibility and relevance in business strategy research. Data were collected using a 21-item instrument, and PLS-SEM structural equation modeling was employed to explain brand equity and brand loyalty, as well as to validate the items and hypotheses. The results support positive effects between PCSR, brand equity, and brand loyalty, highlighting the previously unexplored mediation of brand image. Additionally, it was found that gender moderates the relationship between PCSR and brand loyalty, with a stronger effect observed among women. The Hierarchy of Effects Model, which examines direct effects, mediators, and moderators, is proposed as the theoretical framework. Practical implications suggest that brand managers should recognize the mechanisms linking PCSR, brand equity, and brand loyalty to effectively attract Generation Z.

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1. Introduction

In a dynamic business context, corporate social responsibility (CSR) serves as an ethical beacon, guiding corporate practices with a focus on sustainability (Meng et al., 2024). As a result, technology organizations are redefining themselves as socially responsible entities (Okafor et al., 2021). CSR is defined as 'a form of corporate self-regulation that emphasizes a firm's social, economic, and environmental responsibility towards a broader group of stakeholders' (Wang et al., 2022, p. 278). However, Perceived Corporate Social Responsibility (PCSR) goes beyond this, influencing consumers' attitudes and brand preferences through authentic CSR actions (Jeon et al., 2020). The problem here is that there is a limited comprehensive understanding of how PCSR affects consumer behavior in the generation of brand equity and brand loyalty. At the same time, there is widespread skepticism in the marketplace about the brand image associated with CSR (Khan & Fatma, 2023). This skepticism not only raises doubts about the authenticity of CSR but also questions its potential to enhance brand image.

The motivation for this study is to address the gap in knowledge regarding the key mediators between PCSR and brand equity, as well as brand loyalty in technology companies. This gap not only limits the understanding of PCSR's influence on consumer behavior but also constrains companies in their efforts

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to strengthen brand loyalty and overcome skepticism surrounding the brand image of technology firms. To mitigate this issue, brand perceptions should be characterized by a strong reputation (Rasoolimanesh et al., 2023), a positive image with strong projection capabilities (Safeer & Liu, 2023), brand equity grounded in positive consumer perceptions (Islam et al., 2024), and brand loyalty driven by social and environmental commitment (Yuan et al., 2023). In this context, Generation Z emerges with unique values and perspectives (Palomo et al., 2023; Shtembari & Elgün, 2023). This cohort was selected because it will represent the largest group of consumers with significant purchasing power (Liu et al., 2023). As such, it requires ongoing research from academics and marketing specialists to gain a concrete understanding of their ethical consumption habits (Guo & Luo, 2023).

The technology companies selected for this study were Facebook, Amazon, Apple, Netflix, and Google (FAANG), recognized as the five most powerful media companies in history (Hazlett, 2024). These companies stand out in the stock market, and their analysis is valuable in other areas, as their strategies offer important lessons for businesses aiming to expand their market presence. Among the key strategies they employ are innovation and a strong focus on customer orientation (Patil & Girigosavi, 2024). In this context, from an economic perspective and considering the unique characteristics of FAANG technologies, it is feasible to treat them as a collective entity due to their broad and heterogeneous scope (De Bustos & Izquierdo, 2019). These brands interact consistently with Generation Z. For example, on Facebook, Generation Z socializes and fulfills their need for communication (Bodroža & Jovanović, 2016; Mude & Undale, 2023).

The literature has focused on studying the direct and indirect effects of PCSR on brand perceptions; however, there are still theoretical gaps in the understanding of key mediators between PCSR, brand loyalty, and brand equity (Tan et al., 2022). Therefore, exploring brand image as a novel and significant mediator contributes to a better understanding of the effects between PCSR, brand equity, and brand loyalty (Rasoolimanesh et al., 2023; Zhang & Ahmad, 2021). This also expands the limited research on the impact of PCSR on consumer loyalty (Mai et al., 2022), extends research on the mediation of reputation between PCSR and brand equity (Aggarwal & Saxena, 2023), and identifies the ethical consumption habits of Generation Z (Guo & Luo, 2023). Thus, the objectives of this study are (1) to establish whether brand image and brand reputation mediate the relationship between PCSR, brand equity, and brand loyalty, (2) to analyze the direct relationship between PCSR, brand reputation, and brand image on brand equity and brand loyalty, and (3) to examine the moderating effect of gender on the relationship between PCSR, brand equity, and brand loyalty. The research questions are shown in Table 1.

To address these limitations, the theoretical Hierarchy of Effects Model (HEM), developed by Lavidge and Steiner (1961), provides a framework for evaluating how brand advertising influences purchase decisions (Read & Brown, 2023). The HEM illustrates how customer responses occur hierarchically and sequentially across various contexts (Ho et al., 2022). Specifically, it demonstrates the multiple causal effects at different stages, which are individually analyzed to characterize consumer behavior at specific points in time (Bauman et al., 2008). This is crucial for influencing customers' cognitive, emotional, and conative responses based on their perceptions (Pérez & Rodríguez del Bosque, 2015; Smith et al., 2008).

One of the theoretical implications of this study is the proposal of a model based on the HEM that analyzes the relationships between PCSR, brand equity, and brand loyalty in the technology sector—a topic that has been relatively understudied. In this model, brand image is introduced as a novel mediator, which, along with brand reputation, demonstrates joint mediation. Furthermore, the study reveals that gender moderates the relationship between PCSR and brand loyalty, particularly among women. These findings suggest that brand managers in the technology sector can attract Generation Z by understanding their ethical consumption habits. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to analyze the relationships among the proposed variables. The target population consisted of Generation Z members residing in Lima, with cross-sectional data collected from four universities.

The following section presents the literature review, including the conceptual framework and supporting hypotheses. The methodology section then details the population, sample, instrument and multivariate technique. The fourth section presents the data analysis and results. Section five contains the discussion of the results. The sixth section includes conclusions and theoretical and practical implications, as well as limitations and recommendations for future studies.

Table 1. Research questions.

Item	Research questions	Type of relationship	
1	RQ1: What is the relationship between PCSR and the brand equity of technology companies in Generation Z?	Direct relationship	
2	RQ2: What is the relationship between PCSR and brand reputation of technology companies in Generation Z?		
3	RQ3: What is the relationship between PCSR and branding to technology companies in Generation Z?		
4	RQ4: What is the relationship between PCSR and brand loyalty of technology companies in Generation Z?	Moderate relationship	
5	RQ5: What is the relationship between brand reputation and brand equity of technology companies in Generation Z?		
6	RQ6: What is the relationship between brand reputation and brand loyalty to technology companies in Generation Z?		
7	RQ7: What is the relationship between brand image and the value of technology companies in Generation Z?		
8	RQ8: What is the relationship between brand image and brand loyalty to technology companies in Generation Z?		
9	RQ9: What is the relationship between brand equity and brand loyalty to technology companies in Generation Z?		
10	RQ10: What is the moderating effect of gender between the PCSR relationship and brand equity of technology companies in Generation Z?		Mediation relationship
11	RQ11: What is the moderating effect of gender between the PCSR relationship and brand loyalty of technology companies in Generation Z?		
12	RQ12: What is the mediation of brand reputation between the PCSR relationship and brand equity of technology companies in Generation Z?		
13	RQ13: What is the mediation of brand reputation between the PCSR relationship and brand loyalty to technology companies in Generation Z?		
14	RQ14: What is the mediation of brand image between the PCSR relationship and brand equity to technology companies in Generation Z?		
15	RQ 15: What is the mediation of brand image between the PCSR relationship and brand loyalty to technology companies in Generation Z?		

2. Literature review

2.1. Theoretical model: the hierarchy of effects model in a business context

The HEM is presented as an analytical approach that explains the phases of the buyer's decision-making process. It facilitates the understanding of commercial strategies that require comprehensive approaches (Lorente et al., 2021). In this model, cognitive, affective, and conative processes are causal and linear, requiring positive responses at each stage (Read & Brown, 2023). The structure of this model allows for the identification of specific stages for implementing corporate strategies. The process begins at the cognitive stage (moving from unconsciousness to awareness and knowledge of the product) (Lavidge & Steiner, 1961; Trail et al., 2024). This is followed by the affective stage (involving liking, preference, and conviction) and, finally, the conative stage (purchase) (Zhang & Ahmad, 2021). In this context, the HEM is positioned as a suitable model for analyzing consumer behavior.

Most importantly, the HEM describes the linear stages that consumers go through when deciding whether or not to purchase a product (Lavidge & Steiner, 1961; Trail et al., 2024). Moreover, the HEM analyzes how consumers perceive a brand's CSR in communications and whether these perceptions can predict cognitive attitudes toward the brand (Hazel & Kang, 2018). It also explains how CSR influences customers' beliefs and attitudes, placing perceived image and reputation in the affective dimension and brand loyalty in the conative stage (Pérez & Rodríguez del Bosque, 2015; Tan et al., 2022). This implies that the HEM is a mechanism that companies could leverage to influence their users at each stage of the purchase process.

2.2. Perceived corporate social responsibility

PCSR is a specific perception that arises from consumers toward companies that voluntarily make social and environmental commitments. It is defined as 'consumers' perceptions of a company's level of and commitment to social, environmental, and ethical responsibility' (Hazel & Kang, 2018, p. 65). These strategic actions are positively received by consumers because PCSR influences customers' brand attitudes, as well as brand attachment and preference (Jeon et al., 2020). Therefore, it is essential for companies to align their PCSR actions with the expectations of their stakeholders, making an understanding of CSR crucial for the industry as an organizational strategy (Fatima & Elbanna, 2023). Operationally, CSR is typically classified into five key dimensions: ethical, legal, economic, philanthropic, and environmental (Jing

et al., 2023; Lu et al., 2020a; Mazur et al., 2023). The ethical dimension relates to the general principles and conduct that guide the organization (Quezado et al., 2022); the legal dimension refers to compliance with legal regulations in business operations (Szegedi et al., 2023); the economic dimension emphasizes long-term profitability through ethical, transparent, and legal accounting practices (Abbass et al., 2023); the philanthropic dimension involves a commitment to society through acts of solidarity and altruism (Carroll, 1998); and the environmental dimension pertains to the company's efforts to protect the environment, including reducing waste and pollution and maintaining air quality (Currás et al., 2018; Abbass et al., 2023). In summary, all dimensions of CSR should not be viewed merely as mandatory elements or strategic tools but should instead be perceived as sustainable and authentic dimensions by consumers.

2.3. Brand perceptions

2.3.1. Brand equity

It is a buyer's perception of being positively or negatively influenced by brand management. According to Parris and Guzmán (2023), this value refers to the added or diminished worth of a brand, resulting from its own management or the collaboration of other stakeholders. These variations may stem from the differential effects of knowledge and brand image (Keller, 1993). Thus, managing brand equity not only creates a competitive advantage but also elevates its position in the market. In this context, CSR represents a factor that enhances brand equity through the perception of positive and authentic values in organizations. Given this, CSR becomes a strategic predictor of brand equity (Hanaysha, 2023; Tan et al., 2022). Therefore, the technology sector, through its CSR actions, serves as a potential generator of brand equity based on consumer perception and experience.

2.3.2. Brand loyalty

Brand loyalty is defined in several ways: on one hand, as the repetitive purchase of a product by a consumer, and on the other, as recommendations made among consumers. Thus, brand loyalty develops through a strong commitment to purchase and repurchase, demonstrating a preference for one brand over other available options (Huh et al., 2023). Additionally, loyalty is also reflected in purchase behavior influenced by consumer word-of-mouth (Wang et al., 2023a). It can be argued that loyalty is strengthened by a genuine commitment from companies to their CSR actions. Today, technology facilitates the manifestation of loyalty through both offline and online purchases (Frasquet et al., 2024), even extending to website loyalty (Guo et al., 2023). In this context, CSR presents new opportunities for technology companies by fostering long-term relationships based on consumer loyalty.

2.3.3. Brand reputation

Brand reputation is a perception derived from an organization's ability to consistently satisfy the needs and expectations of consumers. Ghorbanzadeh and Sharbatian (2024) define it as the evaluations of a company's capacity to meet the expectations of its stakeholders. Likewise, brand reputation is founded on the affective elements that consumers associate with the organization. Reputation encompasses not only evaluations but also what people believe about an organization (Quoquab et al., 2019). In this context, CSR serves as a competitive advantage and a source of positive reputation for technology companies. By engaging in authentic CSR practices, technology brands can maintain a strong reputation, attracting customer preference over their competitors (Nasir et al., 2024) and contributing to greater organizational visibility (Uyar et al., 2023).

2.3.4. Brand image

Brand image refers to consumers' perceptions of a brand, shaped by the associations that remain in their memory (Keller, 1993). However, brand image is not only a reflection of a company's characteristics; it should also be perceived as a representation of its attitudes, influencing consumers' perceptions (Bang et al., 2021). Consumer-focused images can be categorized into three types: functional, symbolic, and experiential (Han et al., 2019b). In this context, it is crucial that the public projection of a brand image

authentically reflects CSR initiatives (Safeer & Liu, 2023). For this reason, while a positive brand image may be promoted based on CSR, it is the authenticity of actions that consumers will truly value. Table 2 describes the typologies for each brand perception.

2.4. Technology companies

The technology sector is ideal for evaluating CSR and brand perceptions, as it not only reflects innovation but also prioritizes dynamic strategies linked to consumer requirements. Goldschlag and Miranda (2020) indicate that these companies invest in research and development due to their fundamental role in the economy through the introduction of new products and services. This industry is dynamic and flexible in response to constant changes, necessitating a high level of specialization (Booker & Williams, 2022; Sergei et al., 2023). Thus, adapting to change enables them to meet new regulations and remain attractive to consumers.

Currently, technology companies are incorporating CSR strategies that extend beyond philanthropy to include socially responsible practices in their operations. Cooper and Wang (2024) argue that companies demonstrate their commitment through initiatives that go beyond altruistic actions, such as inclusion policies and environmental sustainability programs. However, these actions must be authentic; otherwise, companies risk becoming reactive organizations, transforming CSR into a liability rather than a successful model.

2.5. FAANG technology brands

FAANG companies currently dominate the stock market as representatives of the technology sector, justifying their evaluation in various contexts. According to Patil and Girigosavi (2024), they are not only high-tech companies with the best performance in the United States, but their innovation strategies and customer orientation also make them business benchmarks worldwide. Despite their diversity within the technology industry, the FAANGs can be collectively referred to as information technology companies. Moreover, in a communications ecosystem, companies such as Facebook, Amazon, Apple, Netflix, and Google control a broad and heterogeneous scope. From an economic perspective, they possess unique attributes that facilitate joint analysis (De Bustos & Izquierdo, 2019). In that sense, due to their focus on innovation and customer perspective, FAANGs are ideal candidates for a joint assessment of brand perceptions among Generation Z consumers.

Table 2. Types of Brand Perceptions.

Perception	Types	Author (s)
Brand equity	Financial value. The monetary return on its assets and its impact on financial results.	(Goyal and Verma (2024) (Keller, 1993)
	Consumer-based value. It is the reflection of the strength of the brand based on the perception of customers, with a positive image to attract and retain customers.	
	Employee value. It recognizes that employee awareness and loyalty influence corporate culture and long-term sustainability.	(Hue & Oanh, 2023)
	Stakeholder value. It is the brand's ability to respond to the demands of consumers and shareholders, and the wide range of stakeholders, which strengthens the resilience and sustainability of the brand.	(Winit & Kantabutra, 2022)
Brand loyalty	Attitudinal loyalty drives consumers to recommend, defend, maintain positive buying interests towards one brand and ignore others.	(Saini & Singh, 2020)
	Behavioral loyalty is the repeated buying behavior of consumers.	(Zou et al., 2022)
Brand reputation	Customer-based corporate reputation. It influences consumer engagement behaviors.	(Choi et al., 2022)
	Favorable capability reputation. It establishes that a brand focuses on quality and innovation.	(Johnson et al., 2019)
Brand image	A socially responsible reputation reflects a commitment to philanthropic activities, community engagement, and cause-related marketing	(Biehal & Sheinin, 2007; Schmietz & Epstein, 2005)
	Functional image. It is developed to solve external problems related to the consumption of a product.	(Singh et al., 2023)
	Symbolic image. It is not directly related to the product itself but is instead based on the buyer's intrinsic needs, such as personal growth, social approval, exclusivity, prestige, and ego.	(Boley et al., 2022)
	Experiential image. It aims to satisfy intrinsic needs for sensory pleasure, variety, and cognitive stimulation	(Yuan et al., 2022)

The FAANG companies represent highly visible CSR standards in a global environment. However, they have not been exempted from adverse situations due to their influence on the world economy (Conyon et al., 2022). In response to these challenges, the FAANGs promote various CSR actions that reflect authenticity. For example, Meta, formerly Facebook, is a social networking platform that promotes the use of affordable and non-polluting energy, as well as data confidentiality (Albreem et al., 2023). Amazon.com is committed to reducing carbon emissions from its deliveries by 50% by 2030 (Faccia et al., 2023). Apple Inc. focuses on renewable energy and the recycling of returned products (Sahadevan & Mishra, 2023). Netflix Inc. promotes diversity and sustainable content creation as key aspects of its CSR initiatives (Antoniazzi & Bengesser, 2023). Finally, Google LLC is dedicated to developing products that meet data privacy (Erdos, 2020) and sustainable development (Simionescu et al., 2020) standards. In summary, these actions not only demonstrate business strategy but also reflect a long-term commitment to society and the environment.

2.6. Generation Z

Generation Z has emerged as the leading generation of consumers who prioritize brands that engage in CSR, with technology companies being their top choice. Born after 1995, this cohort is defined not only by their status as digital natives, having grown up in a hyper-connected world (Chen et al., 2023; Ismail et al., 2021), and their advanced tech skills (Guo & Luo, 2023), but also by their heightened interest in CSR efforts, particularly those focused on environmental preservation (Chen et al., 2023), which sets them apart from previous generations (Andruszkiewicz et al., 2023).

On the other hand, Generation Z is set to become the largest market segment, making their purchasing behavior in relation to CSR highly significant. These factors justify selecting this cohort as the focus of analysis. Furthermore, given their growing influence and importance in the marketplace, continuous academic research on Generation Z is essential to gaining a deeper, more concrete understanding of their ethical consumption habits (Guo & Luo, 2023). Thus, it is evident that a technology company's CSR efforts can foster the ethical consumption habits of Generation Z, leading to the development of positive brand perceptions.

Generation Z is heavily influenced by the social groups surrounding them, as well as by the endorsements of personalities promoting a brand. This cohort is particularly responsive to social pressure, which manifests through opinions on corporate behavior that drive ethical consumption (Alsaad, 2021). Their purchasing decisions are shaped by real-time monitoring and sharing of information, with group opinions playing a significant role through digital platforms (Robichaud & Yu, 2022). One effective strategy in this context is influencer marketing, where the image and values of the influencer must align with those of the brand to shape consumer perceptions (Weinlich & Semerádová, 2024). In summary, technology companies can leverage CSR alongside strategies like influencer marketing, provided they maintain an authentic image that aligns with the organization's core values.

2.7. Generation Z and its ethical consumption

The ethical consumption behavior of Generation Z is ambivalent, as they hold diverse and sometimes conflicting views on brands. Some researchers characterize this generation as individualistic (Sakdiyakorn et al., 2021), driven by hedonic motivations in their consumption choices (Koch et al., 2020). However, they are also described as realistic; open to dialogue, and socially tolerant (Pricope et al., 2023). Understanding their purchasing decisions can be challenging, as their consumption styles differ significantly from those of previous generations (Dragolea et al., 2023). This complexity raises questions about the extent to which Generation Z can be reliably described as ethical consumers.

Generation Z has a preference for companies with well-established CSR policies; however, they often limit their purchases of ethical products due to the typically higher prices of such goods. This cohort is indeed concerned about the social and environmental impact of their purchases (D'Arco et al., 2023), yet they perceive ethical products to have higher retail prices (Guo et al., 2020). To address this dilemma, technology companies must rise to the challenge of standardizing their products aimed at Generation Z to achieve more competitive pricing while maintaining their ethical standards.

2.8. Direct effects on the model

2.8.1. PCSR and brand equity

Technology companies develop numerous marketing campaigns with a CSR focus to generate brand equity and appeal to Generation Z. As a result, the differential impact of brand awareness can be identified as brand equity, which is reflected in customer responses to brand marketing efforts (Keller, 1993). However, Zhao et al. (2021) emphasize that brand equity relies on sustained interaction between the brand and the consumer, driven by the brand's ability to meet consumer expectations. In particular, Generation Z consumers show a strong preference for socially responsible brands that align with their values and fulfill their desires.

In the HEM, technology companies play an important role in promoting their CSR and environmental sustainability values. Thus, Ooi et al. (2022) indicate that the cognitive approach to CSR not only refers to how consumers perceive it, but also to environmental concerns. As a result, companies that adopt ethical and sustainable practices tend to influence consumer brand equity (Kim et al., 2023). Previous findings concur in establishing a directional relationship from PCSR to brand equity. For example, Sung and Lee (2023) argue that brand equity would benefit from improved PCSR. This led to the following hypothesis:

H1. PCSR positively influences the brand equity of technology companies among Generation Z consumers.

2.8.2. PCSR and brand reputation

PCSR begins at a cognitive stage, focusing on shaping the perception of brand reputation. This suggests that companies investing in CSR may gain a competitive advantage in the market (Tahssili & Shahhoseini, 2023), as effective communication with stakeholders fosters positive perceptions and strengthens brand reputation (Latif et al., 2020).

In this scenario, PCSR operates within the cognitive layer of the HEM, fostering brand awareness and enhancing reputation among consumers. Through targeted advertising strategies, various CSR initiatives are communicated to stakeholders, who perceive these efforts as indicative of a positive reputation and a firm's commitment to sustainability (Flores et al., 2020). Additionally, as PCSR is situated in the cognitive layer and reputation in the affective layer, this transition of perceptions can lead to two types of user responses: cognitive and affective. In the HEM, a consumer develops affection for a product after acquiring knowledge and information on the subject (Zhao et al., 2021). This flow of perceptions manifests through distinct consumer behaviors; on one hand, cognitive beliefs about CSR are formed alongside affective responses (Hazel & Kang, 2018). On the other hand, a strong commitment to social and environmental responsibility can enhance brand reputation (Quintana et al., 2021). This led to the proposition of the following hypothesis:

H2. PCSR has a positive impact on the brand reputation of technology companies among Generation Z.

2.8.3. PCSR and brand image

In a technology market committed to developing socially responsible activities, assessing PCSR and brand image as key perceptions is essential for attracting consumers. In this context, Ab Hamid et al. (2023) highlight that the challenge lies in projecting a favorable image. Dong et al. (2024) further argue that understanding CSR within various social and cultural contexts enables the organization's brand image to achieve broader recognition.

It is well known that CSR can serve as a safety net for companies during times of crisis. On one hand, Sujanska and Nadanyiova (2023) argue that CSR strategies protect a company from losing credibility by preserving its image and ensuring transparency. On the other hand, organizations benefit from CSR initiatives as a means to promote positive assessments of their image through social communications (Lau et al., 2021). In summary, CSR protects the company through its brand image. Within the framework of the HEM, it has been demonstrated that CSR can influence brand image in an emotional manner (Bianchi et al., 2019). This supported the following hypothesis:

H3. PCSR has a positive impact on the brand image of technology companies among Generation Z.

2.8.4. PCSR and brand loyalty

In the technology sector, for CSR to effectively impact loyalty, it must be supported by specific conditions. Given its influence on competitiveness, CSR must enable companies to thrive through key strategies that affect a competitive market (Al-Omoush et al., 2024; Ishaq et al., 2023). Moreover, Latif et al. (2020) argue that CSR can enhance customers' perceptions of the company, which, in turn, leads to greater loyalty. Indeed, a fundamental purpose of CSR is to influence consumer loyalty through a sustained strategy, benefiting both the short term and the future.

Sustained brand loyalty is important for Generation Z, not only based on PCSR but also considering brand commitment. Research has found that brand commitment serves as a bridge between PCSR and brand loyalty. On this basis, Ooi et al. (2022) indicate that PCSR is positioned within the HEM as a cognitive component that precedes brand commitment, which, in turn, supports customer loyalty. Similarly, positive PCSR can strengthen emotional connections with brand loyalty (Lu et al., 2020b). In summary, various findings suggest a relationship between PCSR and brand loyalty, leading to the formulation of the following hypothesis:

H4. PCSR has a positive impact on brand loyalty among technology companies within Generation Z.

2.8.5. Reputation and brand equity

Within the technology sector, brand reputation can significantly influence brand equity for Generation Z, particularly when a brand's reputation is rooted in social responsibility and situated within the affective layer of HEM. In this context, Rasoolimanesh et al. (2023) suggest that CSR practices contribute to building a strong brand reputation, as customers assess goods and services based on this reputation. Indeed, Mahmood and Bashir (2020) argue that brand reputation is positively correlated with brand equity and enhances customers' purchase intentions.

In the HEM, consumers' perceptions of reputation and brand equity are interconnected through the affective and conative layers, respectively. In this framework, Ahmadi and Ataei (2024) strongly support the model positing a positive association between brand reputation and emotional attachment. Furthermore, the role of reputation in generating brand equity is significant and cannot be overlooked (Aggarwal & Saxena, 2023). In summary, based on the findings of Cowan and Guzman (2020), which assert that the attributes of brand equity are reinforced by those of brand reputation, it is logical to formulate the following hypothesis:

H5. Brand reputation has a positive impact on the brand equity of technology companies among Generation Z.

2.8.6. Brand reputation and loyalty

Generation Z people associate reputation with brand loyalty, establishing long-term relationships with organizations. Moreover, Sarstedt et al. (2023) indicate that a lasting bond between customers and the organization not only fosters loyalty but also builds a solid reputation. For Generation Z, reputation is linked not only to quality but also to factors related to the projection of social responsibility, such as ethics. In this regard, Alwi et al. (2017) suggest that perceived price, quality, and ethics are interconnected with brand reputation and subsequently consumer loyalty. In addition, brand reputation is influenced by brand commitment; it is a crucial attribute that promotes customer loyalty, reflecting the company's ability to fulfill its commitments (Tran, 2023).

In the HEM, brand reputation is positioned in the affective layer, while brand loyalty is in the conative layer. Thus, Rasoolimanesh et al. (2023) indicate that a strong brand reputation combined with emotional connections contributes to high consumer loyalty. In summary, with the findings of Latif et al. (2020) regarding a solid reputation influencing customer loyalty, the following hypothesis is proposed:

H6. Brand reputation has a positive impact on brand loyalty for technology companies among Generation Z.

2.8.7. Image and brand equity

For Generation Z, brand image is essential for generating brand equity; however, a symbolic brand image that conveys social approval can simultaneously foster other perceptions. Indeed, Jannah et al. (2024)

argue that brand image not only influences brand equity but also serves as a foundational step in building trust with consumers.

In the HEM, brand equity is situated in the conative layer, potentially influencing purchase preference. Manansala et al. (2024) assert that brand image is an essential indicator of brand equity, as it significantly impacts purchasing decisions. This suggests a positive relationship between brand image and the brand equity of organizations (Peng et al., 2024; Rasoolimanesh et al., 2023), which supports the hypothesis:

H7. Brand image has a positive impact on the brand equity of technology companies among Generation Z.

2.8.8. Brand image and loyalty

Socially responsible technology companies project an affective brand image that can foster long-term brand loyalty among Generation Z consumers. This brand image not only helps companies differentiate themselves from their competition but also influences consumers' choice of a specific brand (Watson et al., 2024). In fact, Hanaysha (2021) suggests that a positive brand image attracts new customers, increases revenues, strengthens market positioning, encourages positive word-of-mouth, and enhances loyalty.

Attitudinal loyalty, positioned in the conative layer of the HEM, fosters a commitment to purchase a brand's products in the future and consume them repeatedly, regardless of the circumstances (Trail et al., 2024). In summary, a positive brand image is closely linked to customer loyalty (Lang et al., 2023; Riyadi, 2021), which supports the rationale for the following hypothesis:

H8. Brand image has a positive impact on brand loyalty for technology companies among Generation Z.

2.8.9. Brand equity and loyalty

Technology companies that invest in CSR initiatives significantly influence consumer perceptions and purchasing decisions by enhancing brand equity and brand loyalty. Ren et al. (2023) argue that brand equity reflects the extent to which companies attain outcomes based on consumers' subjective opinions. This value is critical in shaping decisions regarding long-term purchases and repurchases (Vukasovic, 2022). However, the existing literature presents ambivalent relationships in this context, indicating that the interplay between brand equity and brand loyalty can flow in both directions, suggesting a complex dynamic that warrants further investigation.

In the HEM, brand equity and brand loyalty are positioned in the conative phase. Indeed, consumer loyalty becomes attitudinal when the consumer not only makes repeated purchases of a product but also endorses it (Barry, 2012; Castañeda et al., 2009). In fact, Generation Z shows a preference for major tech companies such as social media platforms, even willing to pay a premium for valuable brands, which leads to attitudinal loyalty (Ebrahim, 2020). For example, consumers invite their friends on social media to join Facebook (Almazyad et al., 2023), while on Amazon, online reviews serve as a source of recommendations (Vollero et al., 2023). Additionally, loyal consumers recommend and defend brands like Apple (Bhandari et al., 2024). Conversely, Yoo et al. (2000) argue that behavioral loyalty is a component of brand equity, where the consumer repeatedly purchases a product without necessarily recommending it. However, attitudinal loyalty, situated in the conative layer of the HEM, would help explain both repurchase and recommendation of a product. This reinforced the following hypothesis:

H9. Brand equity has a positive impact on brand loyalty for technology companies among Generation Z.

2.9. Moderating effects on the model

2.9.1. PCSR, brand equity, and gender moderation

For technology companies, Generation Z's gender may moderate the relationship between PCSR and brand equity. Rachmawati et al. (2022) suggest that gender acts as a moderating variable, potentially influencing the direction and strength of this association. This implies that the relationship between PCSR and the perception of brand equity may vary depending on gender. For example, Shiri and

Jafari-Sadeghi (2023) indicate that gender moderates the relationship between CSR activities and related perceptions or behaviors.

Research suggests that women generally respond more favorably to CSR initiatives than men, particularly regarding ethical and social aspects, leading to a better perception of brand equity (Min et al., 2023). These differences indicate that women tend to view the relationship between PCSR and brand equity more positively. Conversely, some studies argue that the positive effect of PCSR on corporate brand equity is stronger among men than women (Hur et al., 2016). This challenges the notion that women always have a better perception of CSR actions. Men's evaluation of CSR tends to focus more on corporate performance, often tied to economic factors. In summary, gender may moderate the effects of PCSR on brand equity, supporting the hypothesis that follows

H10. The gender of Generation Z has a moderating effect on the relationship between PCSR and brand equity for technology companies.

2.9.2. PCSR, brand loyalty, and gender moderation

The gender of Generation Z could moderate the perception of brand loyalty influenced by PCSR, which will establish effects both in the short and long term. In the landscape of consumer behavior, the moderating variable of gender allows for a better understanding of the nuances behind brand loyalty (Gao & Shen, 2024; Kaur et al., 2022). In this regard, Han et al. (2019a) indicate that gender would have a significant impact on an individual's behavior and attitudes. This implies that both genders within Generation Z would have diverse brand perceptions, regardless of the CSR actions projected by technology companies.

In the technology sector, men and women may perceive brand loyalty differently. For example, Kanwal et al. (2022) found that men exhibited greater loyalty than women in a retail market, particularly in terms of purchase and repurchase behaviors. Conversely, another study showed that women are more likely than men to remain loyal to a brand based on its commitment to CSR (O'Fallon & Butterfield, 2005). This suggests that women's brand loyalty may be more closely linked to a company's CSR efforts, indicating that stronger CSR commitments could lead to greater brand loyalty among female consumers. Therefore, the following hypothesis was proposed

H11. The gender of Generation Z has a moderating effect on the relationship between PCSR and brand loyalty for technology companies.

2.10. Mediating effects in the model

2.10.1. PCSR, brand reputation, and brand equity

For technology companies, brand reputation is considered a relevant mediator between PCSR and brand equity. Rasoolimanesh et al. (2023) suggest building a socially responsible brand reputation that reflects strong and genuine CSR actions, generating brand equity among Generation Z consumers. In this regard, brand reputation plays an important mediating role that impacts not only brand equity but also other key consumer perceptions. For example, Dangaiso et al. (2024) found that the mediation of reputation in the relationship between CSR and brand equity can influence purchase intentions. Thus, a favorable increase in reputation stems from effective practices in environmental and social initiatives, which ultimately impacts brand equity (Ahmad et al., 2022). Furthermore, Vuong and Bui (2023) argue that for reputation to achieve an effective mediating effect, it must be rooted in behaviors of generosity and ethics, thereby elevating brand equity. In this sense, the following hypothesis was proposed

H12. The relationship between PCSR and brand equity is mediated by brand reputation for technology companies among Generation Z.

2.10.2. PCSR, brand reputation, and brand loyalty

In the technology sector, companies leverage PCSR as a robust strategy to build their reputation. By utilizing CSR, they promote actions that align with customer expectations, fostering loyalty. Gli et al.

(2023) indicate that a higher level of CSR, focused on brand reputation, incorporates social and environmental initiatives into business processes, positively impacting consumer loyalty.

Various studies have established the importance of mediation between PCSR and loyalty through reputation, highlighting the significance of understanding the underlying mechanisms. For instance, Rasoolimanesh et al. (2023) indicate that CSR is a management strategy that enhances brand reputation, helping to retain current customers and attract new ones. In addition, Islam et al. (2021) suggest that corporate capabilities are crucial for the relationship between CSR initiatives and customer loyalty, mediated by a strong reputation. This led to the following hypothesis:

H13. The relationship between CSR and brand loyalty is mediated by brand reputation for technology companies among Generation Z.

2.10.3. PCSR, brand image, and brand equity

Within the technology sector, PCSR could influence brand equity through their image. It is essential to understand the CSR factors that enable companies to strengthen their ties with other organizations, thereby increasing brand visibility (Huang, 2023). Mahmood and Bashir (2020) indicate that PCSR builds brand equity through a positive symbolic image in the minds of consumers. Above all, a positive image impacts brand equity, leading consumers to be willing to accept higher prices. Therefore, a strong brand image is a crucial determinant of brand equity, as consumers are willing to pay more for it (Manansala et al., 2024). Consequently, brand image serves as a mediating element that integrates PCSR and brand equity. For example, if technology companies implement PCSR across all operational phases, it will enhance brand equity by creating a distinction from the competitors (Singh & Verma, 2018). This led to the following hypothesis:

H14. The relationship between PCSR and brand equity is mediated by the brand image of technology companies among Generation Z.

2.10.4. PCSR, brand image, and brand loyalty

For Generation Z, the relationship between responsible corporate social responsibility (PCSR) activities and brand loyalty will feature brand image as a relevant mediator. A symbolic brand image can foster long-term loyalty. According to Mai et al. (2022), PCSR activities influence loyalty through brand image. When analyzing brand image, various factors are identified that facilitate its mediation between PCSR activities and brand loyalty. For example, a study by Latif et al. (2020) highlights that the mediation of brand image enhances consumer perceptions, particularly regarding loyalty. Furthermore, Mai et al. (2022) argue that the mediation of brand image is strengthened when organizations increase the transparency of their CSR programs through platforms such as digital media. Additionally, brand image is improved with an understanding of CSR environmental policies (Watson et al., 2024).

On the other hand, it can be indicated that brand image presents itself as a crucial element for the efforts of CSR actions to translate into greater brand loyalty. In fact, when CSR is implemented, particularly in philanthropic and environmental aspects, brand image is directly elevated, which translates into an increase in brand loyalty (Lee et al., 2019). This led to propose the following hypothesis:

H15. The relationship between PCSR and brand loyalty is mediated by brand image among technology companies in Generation Z.

3. Methodology

The research followed the positivist paradigm (Rahi et al., 2023) and employed a quantitative approach (Arumugam et al., 2023; Soomro et al., 2024). The target population consisted of Generation Z individuals aged 18 to 28 years residing in Lima, which has a population of 1.8 million inhabitants. This city is the most populous and influential in Peru, representing 45% of the country's GDP. Between November and December 2023, cross-sectional data were collected through 462 face-to-face questionnaires administered at four accredited universities, selected for their diverse socioeconomic profiles. Participant

selection was conducted through stratified random sampling based on gender within Generation Z, ensuring equal representation for moderation analysis. Additionally, the age distribution of the population was approximated. This cohort was chosen due to its expected emergence as the most significant consumer group in the next decade, emphasizing the importance of ongoing research in this area. For the final analysis, 420 valid questionnaires were considered, with 42 excluded due to incomplete responses or missing demographic information.

The sample of 420 valid surveys was determined using the finite population sampling formula, with a confidence level of 95% and a margin of error of 5%, thereby ensuring the desired statistical power (Jackson, 2003; Kline, 2023). The sample comprised 46% men and 54% women. Ethical approval for the study was granted by the Ethics Committee for Research in the Social Sciences, Humanities, and Arts of the Pontificia Universidad Católica del Perú, under opinion 131-2023-CEI-CCSSHAA/PUCP. In addition, the protocol required obtaining written informed consent, ensuring the voluntary participation of participants, their right to discontinue participation at any time, and the protection of their anonymity. The consent form detailed the purpose of the study, the procedures to be followed, the potential risks, and the rights of the participants.

A 21-item questionnaire was utilized, which had been validated and verified through previous research (Appendix), employing a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree) as described by Bianchi et al. (2019). Additionally, the double translation method was employed to ensure that the measurement instrument maintained its equivalence in meaning and semantics (Fekih-Romdhane et al., 2023). Before administering the questionnaire, it was reviewed by a panel of six experts, and a pilot test was conducted with 30 participants to ensure face validity and item comprehension.

To address non-response bias, a response rate of 90.9% was achieved and most of those selected for the study participated, reducing the likelihood of non-response bias. Subsequently, to detect common variance bias (CMV) of the method, Harman's one-factor test was performed, which yielded 32%, indicating that the first factor explained less than 50% of the variance, suggesting that CMV bias is not a significant threat (Podsakoff et al., 2003). Furthermore, the preventive aspects to address CMV bias were the anonymity and confidentiality of the participants, the wide range of responses on the Likert scale.

Several measures were taken to ensure the validity of the results. First, the FAANGs were chosen for their global leadership in technology, excellence in the stock market, and innovation and customer-centric strategies. Although they are highly visible global benchmarks in CSR, the survey excluded people who had no previous experience with these brands. Second, while the technology sector as a whole was considered in an effort to capture how Gen Z perceives brands, there may be variability in how different FAANG brands are perceived by respondents. To address this, participants were pre-instructed to base their responses on the brand they identified with when completing the questionnaire. This allowed for consistent responses that reflected the level of perceptions toward a single brand, rather than a conglomerate of companies with varying perceptions. Third, to ensure that responses to the questionnaire were based on perceptions rather than knowledge, participants were given a brief description of what PCSR means and the perceptions being assessed. This confirmed understanding of the constructs regardless of the level of knowledge about each technology company's CSR practices, and consequently respondents reflected their overall brand perceptions.

The multivariate structural equation modeling technique PLS-SEM was used to estimate the effects between constructs, as it is appropriate for complex and predictive models (Hair et al., 2017; Legate et al., 2023a). In addition, PLS-SEM was used with an external and internal measurement model to empirically validate the proposed theoretical model (Becker et al., 2023; Li et al., 2020).

4. Analysis and results

4.1. Preliminary data analysis

Table 3 shows the means (M), standard deviations (S.D.) and normality test for the study variables. The Kolmogorov-Smirnov (K-S) test was applied and the results indicate a non-normal distribution, which is consistent with the nature of the perceptual data and confirms the relevance of using PLS-SEM, which is robust to non-normality (Hair et al., 2022). In addition, the Spearman correlations were positive and

Table 3. Descriptive statistics, normality and correlations for the variables of the study.

Variable	M	S.D	K-S	1	2	3	4	5
PCSR	5.7	0.8	$p < 0.001$	–				
BREP	5.9	0.8	$p < 0.001$	0.59**	–			
BIMA	6	0.8	$p < 0.001$	0.58**	0.65**	–		
BEQ	5.5	0.9	$p < 0.001$	0.62**	0.57**	0.56**	–	
BLOY	5.7	0.9	$p < 0.001$	0.67**	0.65**	0.63**	0.62**	–

Note: Significance level: **0.01; standardized coefficients.

statistically significant ($p < 0.01$), indicating moderate relationships between the variables. Thus, the variables are interrelated, suggesting consistency and possible interdependence between them in the context of the study.

4.2. Evaluation of the structural equation model with PLS-SEM

For PLS-SEM, Smart PLS 4 software was used (Amer et al., 2023) due to improvements in the model's evaluation capabilities (Cheah et al., 2023). First, the external model determined how the items measured the latent variable that grouped them (Hair et al., 2022; Sun et al., 2006); thus, evaluation of the measurement models ensured the validity and reliability of the conceptual measures (Oubrahim et al., 2023; Singh, 2024). Second, the internal or structural model, as shown in Figure 1, was used to test the hypotheses and research implications of the study (Fileri et al., 2023; Vishwakarma et al., 2023). The collinearity of the model (Hair et al., 2022) and its explanatory and predictive power were also evaluated (Legate et al., 2023a).

4.3. Evaluation of the measurement model or external model

The proposed theoretical model included five reflective constructs: PCSR, brand reputation, brand image, brand equity and brand loyalty. Furthermore, the measurement model allowed for the operationalization of these theoretical constructs into observable and quantifiable measures (Mueller, 2023). The reliability of each item, internal consistency reliability, and convergent and discriminant validity were considered for evaluation (Hair et al., 2022).

For the reliability of each item, the reflective measurement model was considered to have a direct effect from the construct to the item (Sarstedt & Cheah, 2019). In addition, items in the same conceptual domain capture the same idea and are highly correlated (MacKenzie et al., 2011), usually with a suggested threshold of 0.708 or higher (Ghasemy et al., 2020; Hair et al., 2022). Furthermore, an attempt was made to explain at least 50% of the variance of an item and to overcome the measurement error (Mohd Dzin & Lay, 2021). Therefore, evidence of satisfactory reliability was obtained for a specific construct based on the items presented. The items in columns 2 through 6 of Table 4 and Figure 2 have reliability values between 0.737 and 0.906.

For the reliability of the internal consistency, a limitation of the Cronbach's alpha is that the external loadings of the individual items have to be equivalent (Van den Eijnden et al., 2016). In contrast, PLS-SEM uses Composite Reliability (CR) (Dash & Paul, 2021) to analyze the reliability of the external loadings of the items (Ali et al., 2021), with corresponding coefficients ranging from 0.70 to 0.90 on a scale of 0 to 1 (Gyamera et al., 2023). Also, values below 0.60 indicate a lack of internal consistency reliability (Nadimi et al., 2021), and values above 0.95 indicate semantically redundant items (Fauzi, 2022). In Table 4, the internal consistency coefficients for the constructs exceed the 0.70 limit in the CR and Alpha columns, indicating consistency across all reflective constructs.

Convergent validity is the degree to which a measure is positively correlated with other alternative measures of the same construct (Hair & Alamer, 2022; Mohd Dzin & Lay, 2021; Saihi et al., 2023). In PLS-SEM, items of a reflective construct reflect different ways of measuring the same construct (Sarstedt et al., 2016) and share a high proportion of variance (Zeng et al., 2021). In terms of average variance extracted (AVE), it represents the commonality of a construct (Hair et al., 2011). An AVE value of 0.50 or greater was expected, indicating that the construct explains more than 50% of the variance of its items (Guenther et al., 2023), whereas a value of less than 0.50 indicates that, on average, more variance

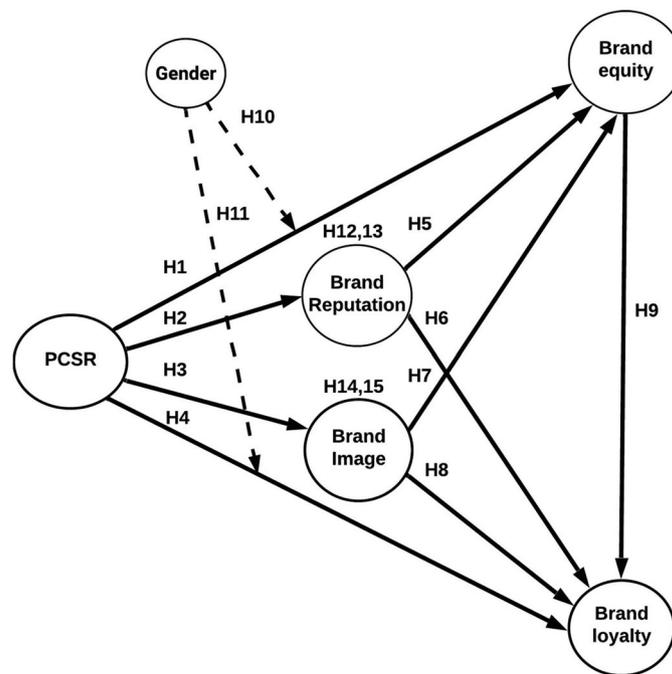


Figure 1. Hypothetical conceptual model.

Table 4. External loads of the measurement model.

Item	PCSR	BREP	BIMA	BEQ	BLOY	CR	Cronbach's alpha	AVE
PCSR						0.911	0.908	0.646
PCSR1	0.787							
PCSR2	0.788							
PCSR3	0.791							
PCSR4	0.837							
PCSR5	0.813							
PCSR6	0.776							
PCSR7	0.835							
Reputation						0.819	0.813	0.728
BREP1		0.857						
BREP2		0.884						
BREP3		0.817						
Image						0.825	0.815	0.644
BIMA1			0.737					
BIMA2			0.821					
BIMA3			0.858					
BIMA4			0.789					
Equity						0.816	0.811	0.638
BEQ1				0.811				
BEQ2				0.834				
BEQ3				0.778				
BEQ4				0.771				
Loyalty						0.885	0.885	0.813
BLOY1					0.905			
BLOY2					0.906			
BLOY3					0.894			

remains in the item error than in the variance explained by the construct (Kassem et al., 2020). Table 4 shows that the five constructs have AVE values greater than 0.50, between 0.638 and 0.813, confirming convergent validity and that the constructs explain more than half of the variance of their indicators.

Discriminant validity is the degree to which a construct is empirically distinct from the other constructs in the model (Hair et al., 2017); that is, a construct is unique (Kumar et al., 2023). The Fornell-Larcker and Heterotrait-Monotrait (HTMT) criteria were used to assess this validity. On one hand, the Fornell-Larcker criterion, considered the most conservative (Çiki & Tanriverdi, 2024), requires that the AVE for each construct must be greater than its correlation with any other construct in the model (Hair et al., 2022). Table 5 shows an acceptable level of discriminant validity for all of the constructs used in the model.

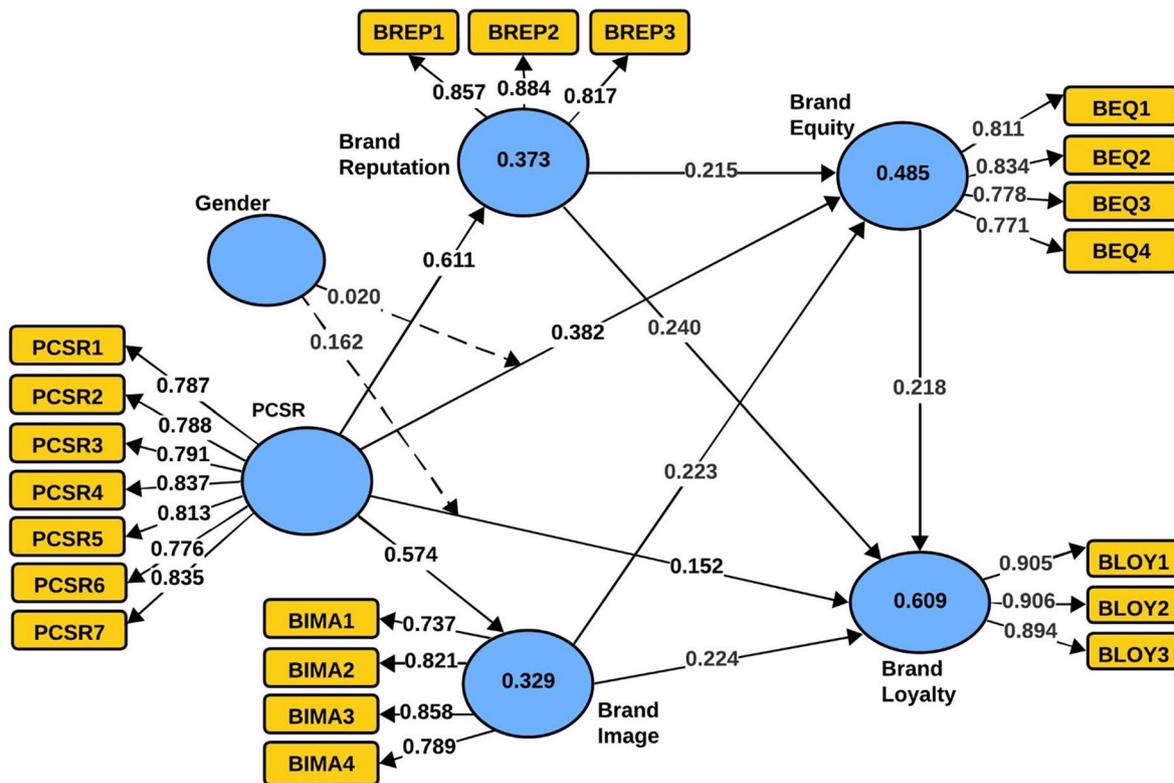


Figure 2. Measurement model.

On the other hand, the heterotrait-monotrait (HTMT) measure was proposed, where a value of less than 0.85 was expected to ensure discriminant validity (Cheung et al., 2023a). The correlations between the study constructs ranged from 0.666 to 0.797, staying below the 0.85 threshold, as shown in Table 6. This indicates that there is discriminant validity between the constructs.

4.4. Evaluation of the structural model or internal model

The path coefficients of the research hypotheses were estimated through structural modeling (Hair et al., 2019; Purwanto, 2021) to understand how the variables are related (Ali et al., 2018). In addition, collinearity, explanatory and predictive power of the model, and significance were the criteria for evaluation of the structural model (Hair et al., 2022).

4.4.1. Collinearity

PLS-SEM collinearity showed a high relationship between the explanatory constructs of the structural model (Hair et al., 2022; Legate et al., 2023b), for such an effect the variance inflation factor (VIF) was used as a collinearity measure to evaluate this assumption (Guenther et al., 2023). In this sense, to ensure that collinearity does not significantly affect the estimation of the structural model, VIF values should be less than 5 and preferably less than 3 (Al Issa & Abdelsalam, 2021; Hair et al., 2022). The VIF values in Table 7 are well below 3. This indicates that there is no collinearity between the constructs evaluated.

4.4.2. Path coefficients

In the structural model, path coefficients are statistically significant if they range from -1 to +1; close to -1 indicates strong negative relationships and close to +1 indicates strong positive relationships (Becker et al., 2023; Faraz et al., 2021). Theoretical foundations are critical at this point; omitting them may affect model results (Zhou & Li, 2023). As a non-parametric method, bootstrapping was used in the PLS-SEM

Table 5. Evidence of discriminant validity using the Fornell-Larcker criterion.

Constructs	PCSR	BREP	BIMA	BEQ	BLOY
PCSR	0.804				
BREP	0.611	0.853			
BIMA	0.574	0.645	0.803		
BEQ	0.623	0.583	0.571	0.799	
BLOY	0.655	0.661	0.645	0.636	0.901

Table 6. HTMT Discriminant validity evidence.

Constructs	PCSR	BREP	BIMA	BEQ	BLOY
PCSR					
BREP	0.709				
BIMA	0.666	0.797			
BEQ	0.723	0.712	0.689		
BLOY	0.731	0.778	0.755	0.745	

Table 7. Structural model results.

Hypothesis	VIF	Coefficient	T-value	CI (95%)	p-Value	f ²	Support
H1: PCSR -> BEQ	2.830	0.383	6.375	[0.263 - 0.499]	<0.001	0.144	YES
H2: PCSR -> BREP	1.000	0.611	16.454	[0.535 - 0.682]	<0.001	0.596	YES
H3: PCSR -> BIMA	1.000	0.574	1.752	[0.502 - 0.647]	<0.001	0.495	YES
H4: PCSR -> BLOY	2.113	0.152	2.227	[0.034 - 0.279]	<0.001	0.076	YES
H5: BREP -> BEQ	2.013	0.215	3.924	[0.108 - 0.320]	<0.001	0.049	YES
H6: BREP -> BLOY	2.103	0.240	4.085	[0.126 - 0.356]	<0.001	0.069	YES
H7: BIMA -> BEQ	1.878	0.223	4.331	[0.121 - 0.326]	<0.001	0.050	YES
H8: BIMA -> BLOY	1.974	0.224	4.392	[0.126 - 0.324]	<0.001	0.066	YES
H9: BEQ -> BLOY	1.954	0.218	4.637	[0.125 - 0.310]	<0.001	0.059	YES
H10: Gender x PCSR-> BEQ	1.954	0.020	0.490	[-0.131 - 0.169]	0.624		NO
H11: Gender x PCSR-> BLOY	1.954	0.162	2.439	[0.032 - 0.290]	0.015		YES
H12: PCSR -> BREP -> BEQ		0.132	3.436	[0.094 - 0.210]	0.019		YES
H13: PCSR -> BREP -> BLOY		0.146	3.963	[0.077 - 0.222]	<0.001		YES
H14: PCSR -> BIMA -> BEQ		0.134	4.039	[0.010 - 0.181]	<0.001		YES
H15: PCSR -> BIMA -> BLOY		0.129	4.138	[0.071 - 0.193]	<0.001		YES

Note: Significance level: ***0.001; standardized coefficients.

in order to achieve statistical significance (Nisar et al., 2024). Likewise, confidence intervals were estimated by bootstrapping using the percentile method with bias correction at 95% confidence (Tibbe & Montoya, 2022; Zhang et al., 2020). These confidence intervals made it possible to assess the significance of the effects between constructs.

The β coefficients of the structural model were obtained using the bootstrapping technique with 10,000 subsamples for greater precision in estimation (Cheung et al., 2023b). The hypotheses of the model were shown to be statistically significant, and it was determined that PCSR has a significant positive impact on the brand equity, reputation, image, and loyalty of technology companies in Gen Z, as shown in Table 7 and Figure 2.

First, the direct effects of PCSR on brand equity (H1), brand reputation (H2), brand image (H3), and brand loyalty (H4) are positive and significant, with stronger effects on reputation ($\beta=0.611$) and image ($\beta=0.574$). In addition, other direct effects show that reputation has a positive effect on brand equity (H5) and brand loyalty (H6), with a stronger effect on loyalty ($\beta=0.240$). Brand image also had a positive effect on brand equity (H7) and loyalty (H8), with a stronger effect on loyalty ($\beta=0.224$). Finally, brand equity had a positive impact on loyalty (H9) with a β coefficient of 0.218.

On the one hand, in the analysis of moderating effects, no significant evidence was found that Gen Z gender moderates the relationship between PCSR and brand equity in technology companies (H10). However, the results support the notion that Gen Z gender moderates the relationship between PCSR and brand loyalty in technology companies (H11). This relationship was found to be stronger for Gen Z women than men, with a β coefficient of 0.162.

Finally, in the mediation analysis, the findings supported that brand reputation positively mediated the effects of PCSR on both brand equity (H12) and loyalty (H13), with a stronger effect observed on loyalty ($\beta=0.146$). Brand image also significantly mediated the effects of PCSR on both brand equity (H14) and loyalty (H15), with a stronger impact on brand equity ($\beta=0.134$).

Table 8. Predictive power results with PLSpredict.

Items	Q ² predict	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE	(PLS-MAE)-(LM-MAE)
BLOY1	0.344	0.843	0.656	0.858	0.665	-0.009
BLOY2	0.351	0.827	0.643	0.840	0.655	-0.012
BLOY3	0.336	0.857	0.678	0.882	0.694	-0.016
BEQ1	0.286	0.936	0.748	0.934	0.759	-0.011
BEQ2	0.216	0.993	0.781	1.012	0.791	-0.010
BEQ3	0.238	0.936	0.833	0.947	0.838	-0.005
BEQ4	0.209	0.910	0.743	0.909	0.745	-0.002

4.4.3. Explanatory power of the model

The explanatory power of a model is its ability to fit the available data by quantifying the strength of the association between its constructs (Becker et al., 2023; Purwanto, 2021). On the one hand, the evaluation measure was the coefficient of determination (R^2), which ranges from 0 to 1 (Wang et al., 2023b), where higher levels of explanatory power indicate greater variance explained by each of its predictors (Zhang et al., 2024). No cut-off values for R^2 , but at least 10% would be appropriate if some or more of the predictor variables are statistically significant (Ozili, 2023). In the research, the obtained values of explained variance R^2 were 37.3% for brand reputation, 32.9% for brand image, 48.5% for brand equity and 60.9% for brand loyalty. These values exceeded the 10% threshold and were significant and sufficient to explain the model.

On the other hand, the value of f^2 evaluates the magnitude of the effect of a variable in the model (Hair et al., 2014). To measure f^2 , a small effect of 0.02, a medium effect of 0.15, and a large effect of 0.35 were considered (Gamil & Abd Rahman, 2023). According to the results shown in Table 7, the PCSR effect of 0.596 is the most relevant one in the composition of the model. Similarly, the Q^2 was used to evaluate the predictive relevance of the structural model (Ringle et al., 2020). Values of Q^2 of 0.02, 0.15, and 0.35 or greater are considered small, medium, and large predictive significance, respectively (Wang et al., 2023b). For this purpose, the Q^2 of the explanatory model was 0.526. This indicates a high predictive power.

4.4.4. Predictive power of the model

Evaluating the predictive power of the model is useful for decision making and for generating generalizable results (Hair et al., 2022). It evaluates whether the results are appropriate not only for the data used in the model estimation, but also for other data sets not included in the model estimation process (Poldrack et al., 2020). PLSpredict was used with rules of thumb such as mean absolute error (MAE), mean absolute percentage error (MAPE), and root mean square error (RMSE) (Shmueli et al., 2019). In addition, for items with Q^2 predict < 0, they do not contribute to the predictive power of PLS-SEM; Q^2 predict > 0 are important for predicting (Munerah et al., 2021). The RMSE (or MAE) values were then compared to the linear model (LM) benchmark (Markovics & Mayer, 2022). In Table 8, the results show that all brand loyalty and brand equity items have Q^2 predict > 0, with smaller RMSE and MAE for PLS than for LM, concluding a high predictive power of the model.

5. Discussion

First, the findings showed a direct and positive impact between PCSR and brand equity (H1). This suggests that ongoing interaction between technology brands and Generation Z consumers is crucial, as they tend to assign greater brand equity to companies that listen to and meet their expectations. Therefore, brand equity is likely to increase when companies promote CSR-related values such as good governance, diversity, and effective communication (Aggarwal & Saxena, 2023). The HEM framework views PCSR as a cognitive element, focusing not only on consumer perception but also on how environmental issues are addressed. These results align with previous research, such as that of Sung and Lee (2023), who assert that brand equity benefits from interactivity in CSR communication. Similarly, Zhao et al. (2021) found that in the banking sector, the impact of CSR on brand equity is linked to its effectiveness as a method of advertising to consumers.

Second, the results demonstrated a direct positive impact between PCSR and brand reputation (H2). Therefore, it can be argued that companies that effectively communicate their CSR actions will stand out

in the marketplace. A strong reputation can be established through the promotion of transparency policies and effective communication of CSR initiatives (Reid et al., 2024). The HEM theoretical model positions PCSR in the cognitive layer and brand reputation in the affective layer, considering that consumers develop affection for a product after gaining knowledge about it. The findings are consistent with studies such as Latif et al. (2020) in the hotel sector, which suggest that the communication of CSR initiatives in the social domain sends positive signals to consumers, thereby improving brand reputation. Moreover, they align with Tahssili and Shahhoseini (2023), who indicate that communicating socially and ethically responsible actions creates positive perceptions that enhance customer-based ethical reputation.

Third, the results demonstrated the direct impact of PCSR on brand image (H3). In this regard, companies benefit from CSR initiatives as a means to boost positive evaluations of their image through social communications. Understanding CSR in various social and cultural contexts can enhance publicity and facilitate broader recognition of the brand image (Dong et al., 2024). In the HEM, PCSR can be interpreted as a cognitive element, while brand image functions in the affective layer, serving as a symbol that reflects a company's attitudes and values, influencing consumer perception. The findings are consistent with Thomas (2022), who suggests that CSR communication creates noticeable impressions in the minds of consumers and fosters lasting emotional connections. Moreover, they align with the research of Belch et al. (2024), which indicates that companies should ensure authenticity in their communications to positively influence their brand image.

Fourth, the data analysis demonstrated the direct impact of PCSR on brand loyalty (H4). It can therefore be affirmed that positive actions related to a sustained CSR strategy influence loyalty intention, helping to build long-lasting relationships with consumers. Moreover, PCSR can be considered a cognitive component that precedes commitment, enabling customer loyalty (Ooi et al., 2022). However, due to the flexibility of the HEM, the relationship between PCSR and brand loyalty is viewed as linear. These findings align with studies such as Barlas et al. (2023) in the communications technology sector, which suggest that CSR's influence on customer loyalty is reflected in consumers' acceptance of price increases and their continued support for the brand. Moreover, Lu et al. (2020b) confirm that CSR actions positively impact brand loyalty, enhancing competitiveness through long-term market positioning in the communications technology sector.

Fifth, the results indicate that brand reputation has a direct impact on brand equity (H5). It can thus be affirmed that reputation enhances brand equity through legitimacy evaluations influenced by CSR visibility. In this context, Mahmood and Bashir (2020) suggest that brand reputation not only positively correlates with brand equity but may also increase consumers' purchase intentions in the financial sector. These factors align with the HEM, where reputation is positioned in the affective stage, reflecting perceptions of a company's socially responsible actions. The findings are consistent with Cowan and Guzman (2020), who assert that when reputation attributes are communicated to consumers, they build brand equity. In addition, Vuong and Bui (2023) support the notion that an enhanced reputation, driven by CSR, is reflected in both purchase intention and brand equity.

Sixth, the data analysis revealed that reputation has a direct impact on brand loyalty (H6). A strong brand reputation, integrated with emotional ties, significantly contributes to high consumer loyalty. In the HEM, brand reputation resides in the affective layer, while loyalty is considered a cognitive element. This means that brand reputation must engage emotionally with consumers to foster their loyalty (Rasoolimanesh et al., 2023). The study's findings align with Tran (2023), who notes that reputation promotes customer loyalty by reflecting a brand's ability to fulfill commitments. Moreover, the results are consistent with Islam et al. (2021), who argue that reputation not only builds profitable relationships with consumers but also enhances brand loyalty, particularly in the communications technology sector.

Seventh, the findings revealed that brand image has a direct impact on brand equity (H7). Projecting a symbolic brand image that focuses on consumers' social approval helps shape perceptions of brand equity, where an image rooted in CSR strengthens brand equity by fostering strong commitment (Sharma, 2023). In the HEM, brand image is situated in the affective layer, while brand equity resides in the cognitive layer. Therefore, brand image influences product purchase decisions driven by brand equity (Manansala et al., 2024). The results are also in line with Momen et al. (2019), who found that brand image is essential for building positive brand equity through marketing communications. Additionally, Peng et al. (2024) argue that brand image is a key driver of customers' consumption decisions and a source of competitive advantage in the technology sector.

Eighth, the results demonstrated that brand image has a direct impact on brand loyalty (H8). This indicates that both cognitive and rational aspects of brand image are relevant antecedents of perceived loyalty. A positive brand image that attracts new customers promotes positive word-of-mouth and fosters brand loyalty (Hanaysha, 2021). In the HEM, brand image is placed in the affective layer, while loyalty resides in the conative layer. Attitudinal loyalty, for consumers, translates into a commitment to purchase, repurchase, and recommend a brand's products (Trail et al., 2024). These findings are consistent with Chang (2020), who argues that for Generation Z, brand image—whether rational or emotional—is a significant antecedent of brand loyalty and examines image as a construct with two dimensions: behavioral and attitudinal. Watson et al. (2024) also concluded that brand image creates a distinction from competitors and fosters positive perceptions, leading consumers to consistently choose a specific brand.

Ninth, the data analysis revealed that brand equity has a direct impact on brand loyalty (H9). It is proposed that brand equity reflects the level of results achieved based on consumers' subjective opinions (Ren et al., 2023), with this value creating a competitive advantage that supports long-term purchase and repurchase intentions (Vukasovic, 2022). In the HEM, both brand equity and brand loyalty are situated in the conative phase, where consumer loyalty is attitudinal—leading to repeated purchases and product recommendations (Castañeda et al., 2009). These findings align with Ebrahim (2020), who demonstrated the link between brand equity and loyalty, where consumers are willing to pay higher prices for brands they perceive as valuable, resulting in attitudinal loyalty in the technology sector. However, the results contrast with Yoo et al. (2000), who focused on behavioral loyalty and suggested that loyalty contributes to global brand equity. Nevertheless, attitudinal loyalty allows for the analysis of both repurchase behavior and recommendations to other consumers.

Tenth, the data analysis shows no significant evidence to support that Generation Z gender moderates the relationship between PCSR and brand equity (H10). In fact, previous studies, such as de Calabrese et al. (2016), indicate that in the CSR field, gender differences do not have a significant impact. However, this contradicts other studies that suggest gender does play a moderating role. For instance, Hur et al. (2016) found that the perception of CSR on brand equity is more significant for men than women, with this perception being linked to corporate performance, particularly in relation to economic performance within the technology sector. Similarly, Rudeloff and Bruns (2024) argue that CSR initiatives involving philanthropy are associated with brand equity and show gender moderation, particularly among women.

Eleventh, the results revealed that Generation Z gender moderates the relationship between PCSR and brand loyalty, with the effect being more pronounced among women than men (H11). In the context of consumer behavior, gender moderation helps to better understand the factors behind brand loyalty (Gao & Shen, 2024; Kaur et al., 2022). These findings align with Moisesescu and Gică (2017), who suggests that CSR, with its multiple dimensions, moderates the relationship with loyalty, particularly among women, especially in environmental aspects. Similarly, Kim and Kim (2016) reported that while PCSR moderates customer loyalty in both genders, women are more likely than men to remain loyal to a brand based on its involvement in CSR.

Twelfth, the results indicated that the relationship between PCSR and brand equity is mediated by brand reputation (H12). This suggests that building a socially responsible brand reputation should be grounded in authentic CSR actions that enhance brand equity (Rasoolimanesh et al., 2023). In the HEM, socially responsible brand reputation is positioned in the affective layer, playing a crucial mediating role that influences not only brand equity but also other consumer perceptions. Consequently, the mediation of reputation in the CSR relationship impacts purchase intentions (Dangaiso et al., 2024; Wang et al., 2021). These findings are consistent with Aggarwal and Saxena (2023), who found that PCSR enhances stakeholder satisfaction and builds a reputation that is essential for developing brand equity. Similarly, Ahmad et al. (2022) reported that positive reputation growth, driven by effective environmental and societal practices, ultimately strengthens brand equity in the technology sector.

Thirteenth, the data analysis also revealed that the relationship between PCSR and brand loyalty is mediated by brand reputation (H13). This suggests that companies with robust CSR initiatives will enhance their brand reputation by integrating social and environmental efforts into their advertising and consumer interactions. These CSR-driven organizations fulfill customer desires, fostering brand loyalty (Gli et al., 2023; Latif et al., 2020). In the affective layer of the HEM, brand reputation functions as a mediating element, with a social focus committed to meeting buyers' expectations (Ijbadeniyyi & Govender,

2024). Attitudinal loyalty, positioned in the conative layer of the HEM, is rooted in customer satisfaction (Tan et al., 2022). The findings are consistent with Rasoolimanesh et al. (2023), who argue that CSR serves as a management strategy that enhances reputation, helping to retain and attract new customers. Similarly, Islam et al. (2021) suggest that corporate competencies play a crucial role in improving the connection between PCSR and consumer loyalty by boosting brand reputation, particularly in the technology sector.

Fourteenth, the findings reveal that the relationship between PCSR and brand equity is mediated by brand image (H14). This suggests that technology companies should seek to understand CSR mechanisms to strengthen their ties with other organizations, thereby increasing their visibility and enhancing their brand equity. It is essential to comprehend the brand image reflected by a company's CSR initiatives. PCSR facilitates the development of brand equity by generating a positive symbolic image in the consumer's mind (Mahmood & Bashir, 2020). In the HEM, a positive image is situated in the affective layer, influencing brand equity by encouraging consumers to accept higher prices. The results align with Hafez (2018), who indicates that PCSR can directly create significant value; however, brand awareness and brand image partially mediate the relationship between CSR and brand equity. This supports the findings of Ramesh et al. (2019), which suggest that consumers perceive greater value from brands that engage in CSR activities and maintain a strong image.

Finally, the data analysis demonstrated the mediation of brand image in the relationship between PCSR and brand loyalty. This indicates that technology companies that project a symbolic brand image through authentic CSR initiatives will foster brand loyalty over time. Consequently, the mediation of brand image could enhance perceptions related to consumer loyalty (Latif et al., 2020). In the HEM, attitudinal brand loyalty interacts within the conative layer, encompassing both repurchase behavior and recommendations to other consumers. Thus, customer loyalty may increase when consumers are convinced of the integrity of a company's CSR actions (Liu et al., 2019). The findings are consistent with He and Lai (2014), who identified two types of brand images—symbolic and functional—and highlighted that adherence to ethical and legal aspects of CSR better explains brand loyalty. In addition, they align with Phan Thanh and Hoang Anh (2023), who evaluated CSR in a multidimensional framework, emphasizing the significant impact of environmental and social factors on brand image and customer loyalty.

6. Conclusion

6.1. Theoretical contribution

The theoretical contributions of this study to the CSR literature are diverse. First, it addresses the theoretical gap regarding the need to examine relevant mediators to better understand the underlying mechanisms of PCSR effects on brand equity and brand loyalty. In this context, the study uniquely highlights the mediation of brand image for Generation Z in relation to technology companies. It also distinguishes the attributes of the joint mediation of brand image and brand reputation within these relationships.

Secondly, the findings demonstrate that the gender of Generation Z moderates the relationship between PCSR and brand loyalty to technology companies, with the effect being stronger among women than men. This suggests the potential for developing new CSR initiatives that specifically target gender-based engagement.

Third, the analysis of direct effects reveals that the path coefficients indicate a stronger influence of PCSR on brand equity compared to brand loyalty. This greater impact on brand equity may stem from the preference of Generation Z consumers for socially responsible brands that align with their values and expectations. Consequently, this study enhances our understanding of strategies that prioritize consumer satisfaction in technology companies through ethical and sustainable practices.

Fourth, the analysis of direct effects reveals a novel direction in the relationship between brand equity and brand loyalty within the context of technology brands. Here, brand equity is consumer-centric, while brand loyalty is attitudinal, manifested through repurchases and recommendations from Generation Z consumers.

Fifth, this study presents an analysis of brand image as a mediator between PCSR and both brand equity and loyalty in technology brands, marking a significant contribution to the literature. It reveals

that brand image exerts a greater influence on brand equity compared to brand loyalty. This enhanced effect on brand equity is rooted in a symbolic image that resonates positively with Generation Z consumers. Such a symbolic image is further reinforced by genuine CSR initiatives and adherence to an ethical code of conduct.

Sixth, this study expands the literature on brand reputation by highlighting its role as a mediator between PCSR and both brand equity and brand loyalty. The path coefficients indicate that brand reputation has a more significant effect on brand loyalty compared to brand equity. This stronger influence on attitudinal brand loyalty may be attributed to Generation Z's preference for authentic brands with a strong reputation linked to CSR initiatives.

Seventh, the relevance of the HEM theoretical model is reaffirmed, as it facilitates an exploration of the causal and linear effects in cognitive, affective, and conative processes, each evaluated individually. This approach uncovers specific aspects of customer buying behavior at different moments, where their responses reflect various brand perceptions. Due to its flexibility, the HEM allows for the organization of these perceptions, positioning PCSR in the cognitive layer, brand image alongside brand reputation in the affective layer, and brand equity and brand loyalty interacting within the conative layer.

Finally, this study reveals a pattern of ethical consumption behavior among Generation Z, which, while hedonistically motivated, tends to be realistic, tolerant, and open to dialogue. This cohort demonstrates preferences that promote ethical and responsible consumption, reflecting their appreciation for influencers and the social pressures that shape business conduct. Additionally, they exhibit a preference for affordable prices on green products.

6.2. Practical implications

There are significant practical implications for brand managers in technology companies, particularly those addressing social, environmental, and ethical issues. First, the findings reveal that PCSR and brand loyalty are mediated by brand image. This study suggests that brand managers promote brand image by increasing visibility among Generation Z consumers. This involves focusing on fostering positive word-of-mouth through effective marketing campaigns and technologies, contingent on the company having established consumer trust. Therefore, attitudinal consumer loyalty could improve if technology companies provide more information and compelling evidence of the authenticity of their CSR initiatives.

Second, this study highlights the significance of gender as a moderator in the PCSR relationship concerning loyalty, particularly among women. It underscores the contribution of attitudinal brand loyalty. In this context, brand managers aiming to influence women's ethical consumption decisions should prioritize transparency and commitment to CSR. This approach will not only encourage the repurchase of technology products but also foster long-term recommendations. The study also suggests developing technological products (such as digital platforms and e-commerce solutions) tailored to the specific needs of women. To further promote gender equality, technology companies could partner with organizations advocating for equality, thereby enhancing the impact of PCSR initiatives.

Third, the findings demonstrate the positive effect of PCSR on brand equity through perceived brand image. This suggests that brand managers in technology companies should cultivate a favorable image in the minds of Generation Z consumers by upholding an ethical code of conduct. In a global context, FAANG managers should leverage CSR as a strategic tool to enhance brand recognition by effectively communicating ethical actions related to social and environmental responsibilities, ultimately resulting in improved brand equity.

Fourth, the results indicate that PCSR can enhance the brand equity of technology companies by improving their reputation. Brand managers in these companies should recognize that CSR is one of the most cost-effective strategies for building a strong reputation among Generation Z. Therefore, it is essential to prioritize CSR initiatives to gain a competitive advantage in the technology sector. On a global scale, effective CSR practices will help ensure that FAANG technology companies remain recognized as industry leaders and continue to strengthen their brand equity.

Fifth, the results indicate that reputation mediates the effect of PCSR on brand loyalty to technology companies. It is crucial for brand managers to understand that Generation Z values authentic brands with a positive CSR reputation, which fosters an emotional connection that leads to repeat purchases

and favorable opinions about these companies. In the global technology arena, FAANG companies should actively promote positive consumer perceptions of their CSR programs, ensuring that these initiatives are planned and implemented transparently, with a long-term commitment to societal well-being.

Sixth, for global FAANG technology companies, implementing CSR is essential, particularly in countries with stringent environmental protection regulations and equal opportunity standards. This approach will enhance their brand image by aligning with the expectations of Generation Z, underscoring the importance for brand managers to tailor their marketing strategies to address this cohort's ethical consumption habits. While Generation Z seeks ethical and sustainable products, they also expect affordability, as they are often reluctant to pay a premium. Therefore, brand managers must promote sustainability in their supply chains and ensure competitive pricing to strengthen their brand image. To achieve this, they should collaborate with online influencers whose values align with the brand image, as this generation is hyper-connected on social media and values authentic opinions about organizations.

Finally, on a global scale, FAANG technology companies have the opportunity to strengthen brand equity and brand loyalty among Generation Z. To achieve this, brand managers should integrate their CSR initiatives with the ethical consumption expectations of this cohort. For instance, Facebook could launch an online sustainable commerce platform to facilitate the sale of ethically produced retail products. Amazon could enhance transparency in its sourcing network by increasing the ethical certifications of its products and implementing a robust monitoring platform. Apple could bolster its commitment to using ethical materials and expand its recycling programs by offering special incentives to users. Netflix could promote eco-friendly filmmaking practices in collaboration with social organizations. Furthermore, Google could expand internet coverage to support online educational initiatives in underserved communities, thereby helping to reduce social inequalities.

6.3. Limitations and future research

First, the research analyzed the impact of PCSR on the value and loyalty of technology companies, identifying a partial mediation of both brand image and brand reputation among Generation Z. Future studies could explore and incorporate other key mediators, such as brand engagement through CSR actions, to assess their impact on brand loyalty. It would also be beneficial to consider brand credibility, as it is linked to both brand image and brand equity in the technology sector.

Second, while a random sample stratified by gender was used, it comprised only Generation Z university students, without considering other demographic strata. Future research should aim to extend the sample to include other subgroups, such as adolescents, young professionals, and Generation Z entrepreneurs. This broader scope will enable the development of CSR strategies that more accurately predict brand equity and brand loyalty while ensuring greater generational representativeness.

On the other hand, in developed countries, Generation Z exhibits greater diversity in gender identity. Therefore, future studies could consider subgroups such as conservatives, feminists, the LGBTQ+ community, and other representative groups. This approach will provide a deeper understanding of how diverse gender perspectives influence brand perceptions and responses to CSR-related marketing strategies.

Third, another limitation is the restriction of the HEM to non-linear purchasing behaviors, such as impulse purchases. Future research could adopt an alternative theoretical approach that captures the diverse purchasing behaviors arising from Generation Z's brand perceptions, focusing on the positive effects of PCSR on brand equity and brand loyalty in the dynamic technology sector. In this context, various theoretical approaches could be utilized to evaluate the evolving nature of consumer behavior, such as the Relationship Quality Model (Anderson & Mittal, 2000), and models based on the Theory of Planned Behavior (Ajzen, 1991), among others.

Fourth, while Generation Z in Lima exhibits strong technological proficiency, disparities in access to devices and connectivity in emerging countries may pose limitations. Therefore, future studies could benefit from being conducted in developed countries with robust technological infrastructure and a well-established CSR culture, where Generation Z engages extensively with technology brands. This shift could enhance understanding of their perceptions and yield deeper insights into brand equity and loyalty, particularly in the context of CSR.

Furthermore, conducting the study in a single city may limit the ability to capture the diverse opinions of different populations. Therefore, future research could apply the HEM model in cities with similar characteristics across various geographic locations. This approach would facilitate comparisons of brand perceptions related to PCSR in different contexts, enhancing the understanding of Generation Z's ethical purchasing behavior.

Finally, this research focused on the technology sector. Therefore, it would be beneficial to replicate the study in sectors that provide Generation Z with ethical consumption options, such as green technology, sustainable fashion, and socially responsible tourism. This approach would enable the development of sector-specific marketing strategies, providing a comprehensive understanding of brand perceptions regarding PCSR among Generation Z.

Author's contributions

Jorge Luis Canta Honores: Conceptualization, methodology, investigation, Smart PLS 4 software, data collection and analysis, visualization of results, writing: development of the original draft. Luciano Barcellos-Paula: Advice at each stage of manuscript development, critical review on conceptual aspects and approval of final manuscript. All authors have read and accepted the manuscript version submitted for publication.

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Data availability statement

The dataset supporting the research findings will be available upon request at jorge.canta@pucp.edu.pe.

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Appendix

Item	Variables and reflective items	Source
	PCSR	(Bianchi et al., 2019)
1	PCSR1: FAANG companies are socially responsible.	
2	PCSR2: FAANG companies help civil society organizations in the community.	
3	PCSR3: FAANG companies are committed to ecological issues.	
4	PCSR4: FAANG companies return some of what they have received to society.	
5	PCSR5: FAANG companies act thinking about society.	
6	PCSR6: FAANG companies integrate philanthropic contributions in their business activities.	
7	PCSR7: FAANG companies behave honestly with their customers.	
	Brand Reputation	(Bianchi et al., 2019)
8	BREP1: FAANG companies are among the best in the sector.	
9	BREP2: FAANG companies are well established.	
10	BREP3: FAANG companies are well respected.	
	Brand Image	(Bianchi et al., 2019)
11	BIMA1: FAANG companies have a powerful image.	
12	BIMA2: FAANG companies are very good.	
13	BIMA3: FAANG companies are very nice companies.	
14	BIMA4: FAANG companies are very attractive companies.	
	Brand Equity	(Araújo et al., 2023; Yoo et al., 2000)
15	BEQ1: It makes sense to buy from FAANG companies instead of any other brand, even if the product is the same.	
16	BEQ2: Even if another brand has same features as FAANG companies, I will prefer to buy from FAANG companies.	
17	BEQ3: If there is another brand as good as FAANG companies, I would prefer to buy from FAANG companies.	
18	BEQ4: If another brand is not different from FAANG companies in any way, it seems smarter to buy from FAANG companies.	
	Brand Loyalty	(Bianchi et al., 2019)
19	BLOY1: I say positive things about FAANG companies to other people.	
20	BLOY2: I recommend FAANG companies to others.	
21	BLOY3: I encourage friends and relatives to buy from FAANG companies.	