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Promoting the Diffusion of Sustainable Innovations through Customer Education—A Case of the Cosmetic Industry

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Abstract: This article investigates whether customer education about the sustainability advantage of a sustainable innovation helps promote the diffusion of such innovation using a survey and an experimental study in the cosmetic industry. Educating customers to equip them with awareness, know-how, and principal knowledge about sustainability promotes their motivation toward adoption and thus facilitates the diffusion of sustainable innovation. Specifically, results show that educating customers about cosmetic product ingredients, sustainability definition, and green certification increases the customers' intention towards checking cosmetic products for ingredients, avoiding products that contain harmful ingredients, and purchasing a sustainable product in the next two years. Customers will also have more trust and intention to adopt certified sustainable products, and they will regard whether a product is truly sustainable as a factor more important than its price in their purchase decisions. Finally, a comprehensive list of factors that contribute to a customer's perception and adoption of a sustainable product, as well as the ranking given by the study participants, are discussed.

Keywords: sustainable innovation; innovation diffusion; customer education; cosmetic industry

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1. Introduction

Sustainability is an action to create and maintain the conditions under which humans and nature can exist in productive harmony. It permits fulfilling the social, economic, and other requirements of present and future generations [1]. Sustainability represents an important consumer need and is now an integral aspect of product quality and brand value [2]. A product can be called sustainable if: (1) it has no short- and long-term potential hazardous impact on the users; and (2) it is produced from a sustainable production process that is environmentally friendly, sources raw materials, formulates, manufactures, packs, distributes, and markets the products in an ethical way [3]. With the expectation for all companies to be more socially and environmentally responsible, industries, including the cosmetics industry, face an increasing need for sustainable solutions. Furthermore, how a company greens up and becomes successful with sustainable innovations is a valuable topic.

Innovation, considered the key business strategy to drive economic growth, plays a significant role in tackling social and environmental issues such as chemical abuse, environmental pollution, and natural resource shortages. Traditionally, innovations focused on profit creation and business growth. However, more innovations have been called for to address urgent environmental and societal issues in recent decades [4–7]. A sustainable innovation is one that couples "environmentalism's protection of natural systems with the notion of business innovation while delivering essential goods and services that serve social goals of human health, equity, and environmental justice" [8]. Key factors for a company to develop successful sustainable innovations include the company's innovation-oriented learning, law and regulation knowledge, research and development investments, green

motivational strategies, green ability, and inter-functional collaboration [7,9]. Unlike other innovations that require an isolated process and need to be conducted with considerable secrecy, sustainable innovations need to be more open to the public. Companies must leverage the insights, capabilities, and support of others without compromising legitimate corporate secrets [10]. Business collaborators can strategically engage in processes and activities to collectively build a favorable environment for their sustainable innovations to thrive [11]. Outside of the companies, the market, cost, infrastructure, trust, the legitimization process, and proper policy and policy mix are all important factors for sustainable innovations to succeed [12–14]. Challenges faced by the sustainable transition of society and business imply increasing needs for wider adoption and better diffusion of sustainable innovations.

The importance of understanding how the diffusion of an innovation can be facilitated is well acknowledged in literature with a long research trajectory [14–17]. Since the introduction of the innovation diffusion theory in the seminal works of Rogers [18] and Bass [19], the diffusion of innovations (DoI) has been extensively investigated with different perspectives and methodologies [16,20] and applied in different industries [15]. The original DoI model views diffusion as a result of the interplays between the innovation, the innovation company, the potential market, and adopters through interpersonal and mass media communication channels over time [18]. It assumes that people adopt an innovation at distinct stages based on the individual's characteristics that categorize them into different adopter groups (i.e., innovators, early adopters, early majority, late majority, and laggards) in response to advertisements and word-of-mouth. This model has since been enriched as researchers investigate factors both inside and outside of the original framework. For example, the sociotechnical systems approach (e.g., [21,22]) and the innovation system approach (e.g., [23]) emerged with an emphasis on factors beyond those of the diffusing innovation and the adopters. Literature in this group focuses on the relationships among actors in the broad macro environment, usually to inform policy-making [12,13,16]. In addition, the roles that agencies such as the technology transfer office can play in facilitating the DoI are noted [5]. Focusing on players in the original DoI model, the other group of literature studies the characteristics of the adopters and their social networks, as well as the innovation itself (e.g., [15,24,25]). For example, competition and the process of substitution were added to the diffusion model [26]; innovations in certain industries, such as the information technology industry, were pointed out to contribute to their diffusion by facilitating communication [27]. In terms of applications, the DoI model and its modified versions have been widely used to predict the diffusion of various technological innovations in technology forecasting (e.g., [13]) and foresight (e.g., [27]) exercises.

Traditionally, the majority of innovation diffusion literature focuses on technological innovations, whether incremental, radical, sustaining, or disruptive, that are not featured as sustainable. Success factors and barriers studied do not capture the unique features that differentiate sustainable innovations from non-sustainable ones. Among the recent innovation diffusion studies that use sustainable innovations as their research subjects, the focus is mostly on assessing the contextual factors that constrain the diffusion of sustainable innovation. The importance of co-development of infrastructure, value chain formation, and institutional alignment for rules and regulations is emphasized [16]. Policies that encourage the new and destabilize the old are suggested to be included in the policy mix to facilitate sustainable transitions [12]. The study that relates the most to ours is [28]. Using the Adoption and Diffusion Outcome Prediction Tool (ADOPT), the relative advantages as well as the learnability of the diffusing innovation and the potential adopters were analyzed to predict the diffusion of a solar photovoltaic system [29] and green roofs [28]. However, the factors identified as the barriers in those cases are general (i.e., profit benefits, risk exposure, ease, and convenience of use) and applicable to non-sustainable innovations as well. In addition, though the learnability of the adopters and innovation are two key variables used in the model, only existing skills and knowledge, as well as the availability of advisory help, were used to predict the diffusion curve. The possible effect of learn-

ability enhancement that can be brought by proper education to increase adoption was not considered.

As suggested by [16,30], environmental concerns and values are the primary drivers for the earliest adopters to purchase a sustainable product. Policymakers and companies are encouraged to nurture and develop the green tendency through environmental education [31,32]. Nowadays, customer education is given more importance because it is believed to be a potential element to improve companies' performance [33–35]. However, research on the impact of customer education on companies' performance is quite limited [36]. An early definition of customer education was proposed by Meer as "any purposeful, sustained, and organized learning activity that is designed to impart attitudes, knowledge, or skills to customers or potential customers by a business or industry" [37]. Aubert refers to customer education as the extent to which firms provide customers with product knowledge and skills [35]. Andreas indicates that customer education involves the information and explanation services firms provide to their customers [36]. Regardless of how customer education is defined, it is always related to helping customers gain a deep understanding of the kind of product or service they purchase or will purchase. Companies that implement customer education usually have three objectives: (1) to provide product usage-related knowledge and skills to customers [38]; (2) to positively impact customer product usage and buying decisions [38]; and (3) to improve customer satisfaction and brand loyalty, and then build long-term customer-firm relationships [35].

For companies to promote the diffusion of their sustainable innovations, it is important to support their customers' intrinsic needs that drive their behavior. A potential customer's intention to adopt a sustainable innovation depends on their attitude toward sustainable behaviors, subjective norms, and perceived behavioral control [39–41]. Particularly, companies must support the customer's needs for (1) competence by educating them about the importance of sustainable behaviors and sustainable products, (2) relatedness by making them feel a part of the community or that their actions are beneficial to society, and (3) autonomy by providing tools to help them make their own decisions [42,43]. Effective customer education is one important way to help achieve these goals.

Customer education is different from expecting customers to learn through tools like the manual, user guide, or technical support online or by phone. According to Aubert, to achieve better customer education, the company should first prepare customers for the product or service process by teaching them the necessary skills to experience it [35]. Then, the company should provide customers with the necessary knowledge to evaluate the quality of the product or service. Customers should also be taught the conditions under which the product or service can be best consumed. The more customers perceive themselves to be knowledgeable and skilled in the usage of a product, the higher the usage situation and frequency of the product will be. The higher the level of knowledge and skills customers have about product usage, the higher the level of customer satisfaction with the product [35], and thus positively reinforce the feedback from word-of-mouth to increase the adoption rate.

A company can provide educational experiences throughout the company's relationship with customers [38]. Two stages of purchasing behavior—the pre-purchase stage and the post-purchase stage—were identified to help companies develop different strategies for implementing customer education [35]. At the pre-purchase stage, customer education should give potential customers self-confidence in deciding to adopt sustainable products. At the post-purchase stage, the main objective is to support customers in their use of the products and help customers build long-term sustainable purchasing behavior to reinforce the customer relationship. One of the most effective practices is to engage consumers through campaigns, forums, and education centers to establish membership with the company and communicate with the company or other members to obtain a further understanding of the products. For example, Nikon, a Japanese multinational corporation specializing in optics and imaging products, created the "Nikonschool" training center to organize and sell lectures, seminars, and workshops on a wide variety of topics to help

its customers obtain the most use out of their products [35]. Companies can also set up a company-specific app to stay connected with their customers by frequently updating sustainable product knowledge, industry regulation information, and the socially responsible activities that the company has been involved in.

Although customer education has its advantages, established firms are hesitant to implement it because of foreseeable risks. Firstly, customer education needs time, money, and energy investment to change the existing product image and service process, with the concern of whether such investment would pay off [36]. Secondly, firms fear that once customers are equipped with knowledge, skill, and expertise from education, they will have the ability to identify better products and may switch to competitors, resulting in decreased customer loyalty [44]. However, other research believes that those risks become less important compared to the trust built between customers and the company through customer education [45]. A recent study on customer education looks at how in-store education on the negative consequences of impulsive purchases drives more customers towards healthy food choices [46]. Another study tests the role of customer participation in mediating the relationship between customer education and customer satisfaction towards service innovation [47]. However, no study in customer education investigates the role that pre-purchase customer education on the differentiating characteristics of an innovation can play in facilitating the diffusion of such innovation. To bridge the research gaps in the fields of DoI and customer education, we investigate how customer education on the sustainability advantage of sustainable innovation in the pre-purchase stage can increase potential customers' adoption intentions and facilitate the diffusion of such innovation.

2. Hypotheses Development and Research Method

In the diffusion theory, the adoption process starts from the "awareness" stage, where a potential adopter is "exposed to the innovation but lacks complete information about it". Then, through the stages of "interest", "evaluation", and "trial", the final stage of "adoption" will be reached when a potential adopter becomes an adopter. At the interest stage, a potential adopter becomes interested and seeks additional information to learn about the diffusing innovation. Then, going to the evaluation stage, the customer "mentally applies the innovation to their present and anticipated future situation and decides whether or not to try it" [18]. Awareness, "know-how", and principle are the three types of knowledge essential for adopters to pass the decision stages [18]. As a result, raising awareness, improving the "know-how", and providing principal knowledge to potential adopters should help them cross the different adoption stages, especially from "awareness" to "evaluation". When a potential adopter is at the "evaluation" stage, overcoming "green skepticism"—a phenomenon in which "customers doubt or disbelieve environmental claims made by firms"—is the main challenge to overcome [15,48]. Implementing customer education to make potential adopters aware of the company's initiatives in sustainability and enhance their trust in green certification can help dispel this skepticism.

In addition, as noted by [49], the relative advantage is a key contributor to the adoption of innovations. This makes it critical to advocate for and communicate to potential adopters that sustainability is a key relative advantage of a sustainable innovation over its non-sustainable competitors. As noted by [16,50], the early adopters' decisions are primarily driven by sustainability concerns, while the later adopters are driven by economic concerns. Adoption will occur in markets where the innovation is perceived to have a larger value relative to its cost [38]. The more important the sustainability concern is to a potential adopter, the more likely that individual will make the adoption decision and pay more for the sustainability advantage. Health consciousness and environmental awareness amongst consumers on their purchasing intentions will result in actual purchases [51]. Customer education on sustainability is expected to help people realize the importance of using sustainable solutions to gain long-term benefits to their bodies and the environment, thus increasing the perceived value of sustainable innovations and moving more people into the early adopter group.

The cosmetic industry was selected as the case industry due to its special characteristics. Firstly, customer education is a current practice in this industry to help promote the adoption of its products, especially the new and innovative ones. As a result, the means of customer education are already available. Those potential risks of customer education that are considered to threaten the customer-firm relationship in some products may represent opportunities for an emerging innovative product in this very saturated market. Secondly, people are usually more sensitive to and care more about the sustainability of products that are directly inhaled or applied to their skin. This makes customer education about sustainability in cosmetic products less culture-dependent. Next, unlike other sustainable innovations that can be hard to learn—with learnability dependent on the potential customers' prior knowledge, experiences, and cognitive levels—customer education for sustainable cosmetic products to enhance the "awareness" and "know-how" of customers can be simple.

To achieve the same or better quality than their non-sustainable competitors, technological breakthroughs and innovations are needed for sustainable cosmetic companies. The functionality or effectiveness of a cosmetic innovation depends on the product ingredients and the manufacturing process, which determines if such innovation is sustainable or not. It is law in the United States to provide a list of ingredients on labeling for all cosmetics marketed in the States, regardless of whether they are manufactured here or imported from abroad. Since the ingredient list is always available to customers, education about the product can focus on training customers to identify hazardous ingredients, like synthetic chemical preservatives that are believed to cause hormonal disruption. In addition, positive information can be transferred to customers to help them identify natural and sustainable ingredients. The customers can be taught that not all the natural ingredients are safe for the skin, and not all the synthetic ingredients are bad. Truly sustainable cosmetic products are those that can bring benefits to the skin or treat certain skin problems while not causing additional problems to the human body or long-term problems to the environment.

As a result, we developed the following hypotheses to investigate if customer education on the sustainability advantage of a sustainable innovation can promote the diffusion of such innovation:

H1: *Educating potential adopters about sustainable cosmetic product knowledge facilitates the stage crossing from awareness to the trial stage in the adoption process by increasing the knowledge needed to facilitate such a move.*

H2: *Educating potential adopters about sustainable certification for cosmetic products facilitates the stage crossing from the evaluation to the trial stage for the adoption of certified cosmetic products by increasing their trust in them.*

H3: *Educating potential adopters about sustainable cosmetic products increases the importance of the sustainability advantage to the potential adopters' adoption decision, making it more important than the price factor, so more adoptions will occur earlier.*

Figure 1 shows the research framework diagram—each hypothesis statement contains two parts and is represented by components connected by arrows of the same color. Employing an experimental study in the cosmetic industry, survey questions and customer education interventions were developed and administered.

To evaluate the three research hypotheses, variables in the framework were adopted from the literature. Instead of measuring "learnability" statically using the participants' existing knowledge and the availability of help [37], the study focused on testing if an increase in the knowledge provided by customer education would lead to changes in participants' adoption intentions [51,52] and related behaviors. The three types of knowledge needed to facilitate the stage crossing include awareness, know-how, and principal knowledge about the innovation itself (e.g., ingredients [46,47]), the company (e.g., material sourcing, manufacturing process, packaging, etc. [2,3]), and the industry (e.g., regulations,

certifications, etc. [2,3]). The key behavior changes that signal the crossing from "awareness" to "interest" and then to the "evaluation" stage are that potential adopters seek more important information about the product by checking ingredients [18], a decision to avoid non-sustainable products, an adoption intention for a sustainable product, increased trust in certified sustainable products, and an adoption intention for certified sustainable innovation. The factors used to measure the relative advantage in the ADOPT model [28,29] were grouped into four, as shown in Figure 1. Among them, three factors—quality/effectiveness, cost (price), and sustainability (being sustainable)—were used directly in the survey and presented to the participants. The brand was used in place of risk as it works as an endorsement of quality and an indicator of minimal risk [48]. In addition, we were also interested in knowing if potential adopters regard certain factors as more important than others when considering a cosmetic product as sustainable to adopt after the participants are educated. The list of fourteen factors was generated based on an extensive literature review.

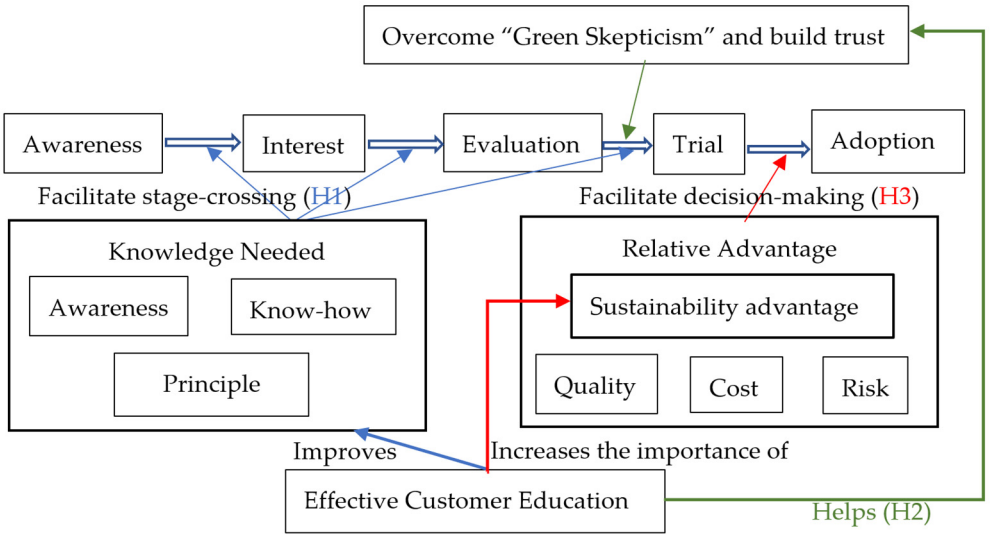

Figure 1. Research framework with relationships between the research question and variables evaluated in the experimental study. Arrows of the same color connect the two parts of a hypothesis stated earlier.

The experimental study consisted of three parts. Part one collected data on participant demographics, the factors that influence their purchasing decisions, and their purchasing habits surrounding sustainable cosmetic products. Part two provided four interventions that educated participants on hazardous ingredients, what a sustainable cosmetic product is, and regulations on organic and natural product certifications before more survey questions were asked. These interventions were used to evaluate hypotheses one and two (H1 and H2). Hypothesis three (H3) determines whether all the interventions increase the importance of the factor "being sustainable" in a customer's purchase decision. Finally, Part Three asked for additional information regarding other factors that contribute to a potential adopter's perception of a sustainable product.

The study was internet-based, using the online survey program Qualtrics to collect data and administer the intervention. The sample population was made up of students, faculty, and staff at a university in the United States Midwest and cosmetic forum members in the Associated Skin Care Professionals (ASCP) and the Cosmetics and Toiletries Magazine. Distributed via email, cosmetic forums, and social networks, the survey asked for participants' experience with and opinions on sustainable cosmetic products before and after the education intervention. The snowball method was used to distribute the survey via email. People who received the email were encouraged to forward the email to friends, colleagues, and others who might be interested in participating.

3. Results

Among the 109 participants, eighty-three completed the survey, giving a response rate of 76%. As shown in Table 1, there was a significantly higher representation of females (83.1%) compared to males (14.5%), with 2.4% choosing not to say. Table 1 also shows the age distribution of the participants, from 15 years old to above 55.

Table 1. Participant demographics.

Gender	Male	12
	Female	69
	Choose not to say	2
Age	15 to 25	22
	26 to 35	37
	36 to 45	10
	46 to 55	12
	55	2
Sample Size		83

Two questions were used to evaluate the impact of education on whether participants would check ingredients before purchasing a cosmetic product. In part one of the survey, participants were asked, "While choosing a cosmetic product, do you check to see its ingredients?". Participants were then shown Intervention One. Intervention one educated the survey participant about different ingredients present in cosmetic products, their hazardous levels rated on a 0–10 scale, and the possible impact on human health from certain hazardous ingredients. Immediately following this intervention, the following question was posed to participants: "Next time when you are purchasing a cosmetic product, will you check to see its ingredients?". Figure 2 shows the participants' responses before and after the intervention.

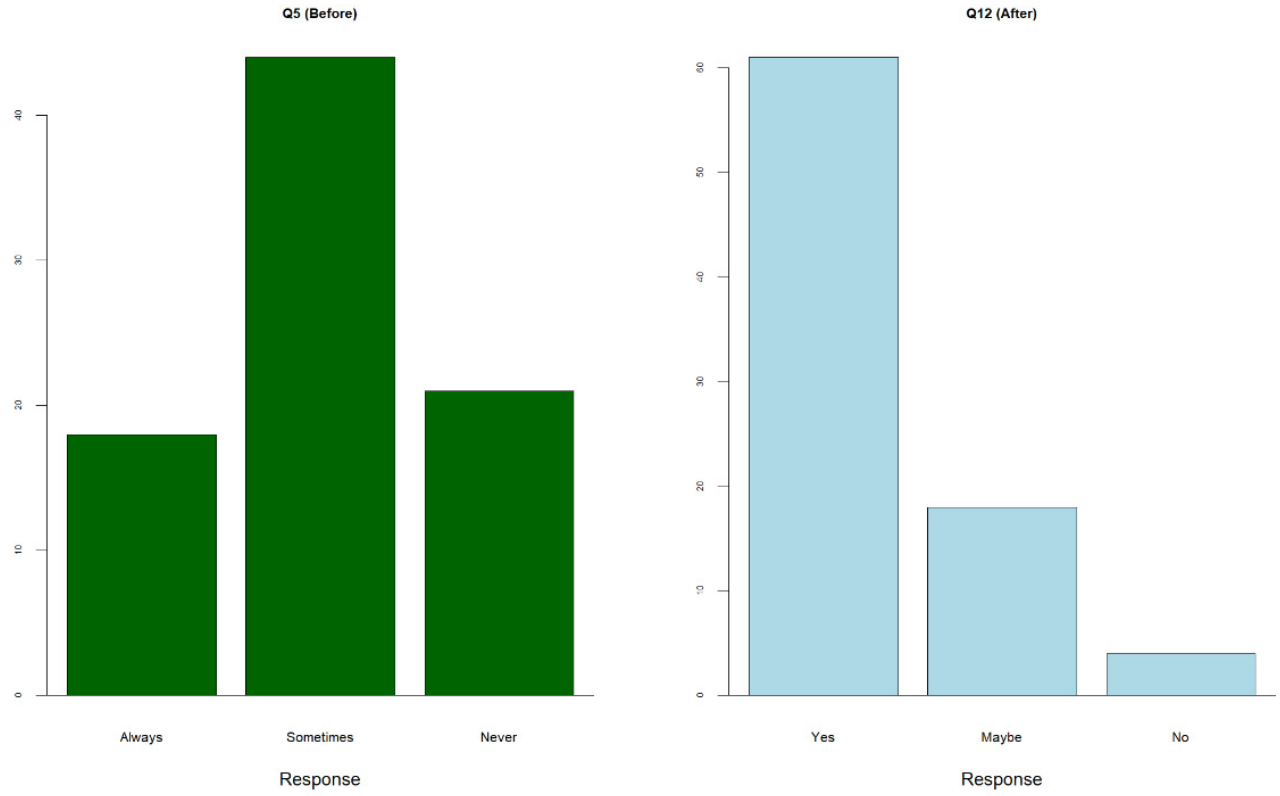

Figure 2. Participants' attitudes toward checking cosmetic ingredients before and after education.

Before receiving the intervention, 53% of respondents said they sometimes check cosmetic ingredients before purchasing. After receiving the intervention, 73.5% of respondents said "yes" to checking ingredients before purchasing a cosmetic product. The results show evidence that educating customers about harmful ingredients encourages customers to check ingredients before their adoption decision.

Intervention two provided an in-depth description of the harmful effects of parabens as a hazardous ingredient, as well as products that contain them. Figure 3 shows the results from before (Q6) and after (Q14) the intervention. Before the intervention, when asked if they avoid cosmetic products that contain hazardous ingredients, the modal response from participants was "I do not know" (41%). Following the intervention, when asked if they would avoid cosmetic products that contain hazardous ingredients in the next two years, 68.7% of respondents said "yes". These results provide evidence that educating participants about products that contain parabens encourages them to avoid products that contain hazardous ingredients.

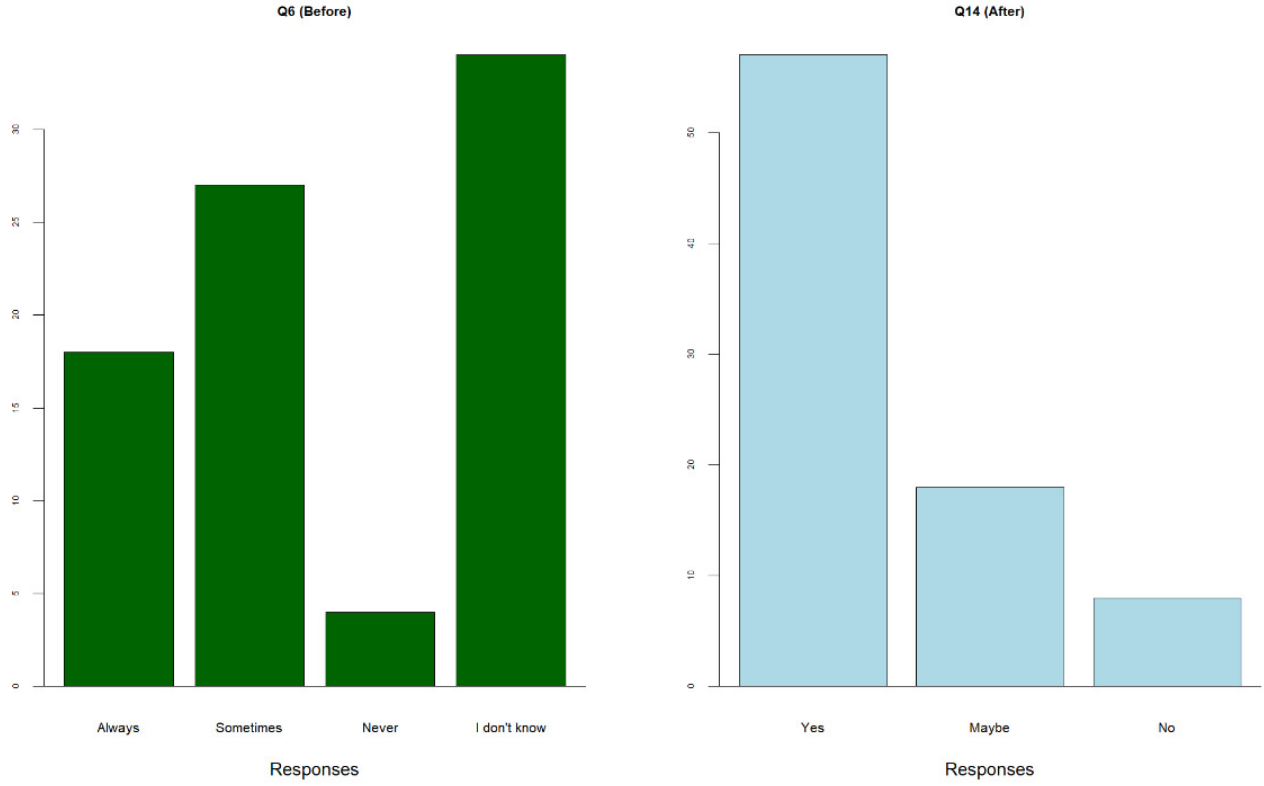

Figure 3. Participants' attitudes toward cosmetic products containing hazardous ingredients before and after education.

The results from these two pairs of comparisons (Figures 1 and 2) indicate that by educating participants about harmful ingredients and the harmful effects of parabens, participants are more likely to check ingredients before purchase and to avoid products that contain parabens. The implications of these findings suggest that sustainable cosmetic companies need to make their customers aware that not all the ingredients in cosmetic products for sale are safe. Educating customers about harmful products encourages them to purchase sustainable ones. Therefore, companies should educate their customers with proper ingredients and formulation knowledge when choosing sustainable cosmetics.

3.1. Impact of Education on Sustainable Cosmetic Products

Intervention three gives the following definition of a sustainable cosmetic product: A cosmetic product can be called sustainable if: (1) it is sustainable for the users—it has

no short- and long-term potential hazardous impact on the users; and (2) it is produced from a sustainable production process that is environmentally friendly and sources raw materials, formulates, manufactures, packs, distributes, and ethically markets the products. This intervention evaluated the impact of educating customers about what a sustainable cosmetic product is on their purchasing decisions. Questions 7, 8, and 9 collected their responses before this intervention, and questions 15, 16, and 17 collected their responses after the intervention. Table 2 shows the results of each question.

Table 2. Participants' experience with sustainable cosmetic products before and after they were educated on the definition of sustainable cosmetic products.

	Past Use of a Sustainable Product		**Currently Using a Sustainable Product**		**Willing to Purchase a Sustainable Product in the Next Two Years**	
Responses	**Before**	**After**	**Before**	**After**	**Before**	**After**
Yes	23 (27.7%)	29 (34.9%)	15 (18.1%)	22 (26.5%)	49 (59.0%)	64 (77.1%)
No	10 (12.0%)	10 (12.0%)	19 (22.9%)	19 (22.9%)	2 (2.41%)	3 (3.61%)
I am not sure	50 (60.2%)	44 (53.0%)	49 (59.0%)	42 (50.6%)	32 (38.6%)	16 (19.3%)

Approximately 60% of the participants responded with "I am not sure" for Q7 before the intervention, but the percentage dropped to 53% for Q15 after the intervention. The results indicate that the participants might not know what a sustainable cosmetic product is. Therefore, the need for education is important. Using a *t*-test, the difference between Q7 and Q15 had a *p*-value of 0.08978, between Q8 and Q16 the *p*-value is 0.05162, and between Q9 and Q17 the *p*-value is 0.0006454. At a 0.05 level of significance, the difference in responses between Q9 and Q17 was statistically significant, indicating an increase in the respondents' willingness to purchase a sustainable product in the next two years. This shows evidence that interventions 1, 2, and 3 were effective in increasing the intention of customers to adopt a sustainable product in the next two years.

3.2. Customers' Opinions and Purchasing Behavior on Certified Natural and Organic Cosmetic Products

Questions Q10, Q11, Q18, and Q19 were designed to evaluate the impact of customer education on the respondents' perception and purchasing behavior of a certified sustainable cosmetic product. Intervention four involved educating the participants on organizations that set standards for organic and natural cosmetic products, with an example of the Natural Product Association (NPA) certification definition. In addition to what a third-party certification means, the NPA criteria of "natural ingredients", "safety", "responsibility" and "sustainability" were explained.

Pre-intervention question Q10 asked participants about their perceived trust in cosmetic products certified by an independent party. Pre-intervention question Q11 asked that, if the participants were considering buying a sustainable cosmetic product, would they purchase a non-certified product or not. The two questions were repeated as Q18 and Q19 following the intervention. Tables 3 and 4 show the response result.

Table 3. Participants' perceived trust on sustainable cosmetic product certifications before and after customer education.

	More Trust	**No Difference**	**Less Trust**
Before	61 (73.5%)	20 (24.1%)	2 (2.4%)
After	71 (85.5%)	12 (14.45%)	0 (0%)

Table 4. Participants' attitude towards non-certified products in their sustainably cosmetic product purchase decision before and after customer education.

	Yes	Maybe	No
Before	14 (16.9%)	35 (42.2%)	34 (41%)
After	13 (15.7%)	29 (34.9%)	41 (49.4%)

As shown in Table 3, before the intervention, there were a couple of participants who stated that certifications made the products less trustworthy. However, following the intervention, no participants chose the "less trust" option. Further, following the intervention, the number of participants stating that certification makes the products more trustable increased. Using a paired *t*-test, a *p*-value of 0.001024 was recorded to evaluate the difference in responses before and after the intervention for Q10 and Q18.

For Q11 and Q19, an increase in choosing not to buy non-certified products in their sustainable cosmetic product purchase is seen after the intervention, as shown in Table 4. However, the *p*-value of 0.2191 indicates that the difference before education is not significantly different from after the intervention.

3.3. The Importance and Ranking of Cosmetic Products Being Sustainable among Other Adoption Decision Factors

Questions Q3, Q4, Q20, and Q21 were designed to understand the importance of the following four factors: "quality/effectiveness", "price", "brand", and "being sustainable" in the customers' adoption decisions towards a cosmetic product. Question 3 asked participants to rate each of the four factors from "7—extremely important" to "1—extremely unimportant". Question 4 asked participants to rank the four factors from "1—most important" to "4—least important".

After receiving the four educational interventions on various aspects of sustainable cosmetic products, participants were again asked to rate and rank the four factors in questions Q20 and Q21. At this point, different perceptions and changing attitudes are expected from the customers toward the importance of the four factors that influence the customers' purchase decisions. Table 5 shows the number of people giving ratings from "1—extremely unimportant" to "7—extremely important" to each of the four factors before (Q3) and after (Q20) the interventions. For example, before the intervention, forty respondents rated "effectiveness/quality" as "7—extremely important", while after the intervention, thirty-four rated the same factor as "7—extremely important". Before the intervention, only sixteen respondents rated "being sustainable" as "7—extremely important", but the number increased to twenty after the intervention. The weighted average rating of "being sustainable" increased from 5.28 to 5.60 after the intervention, while the weighted average rating of "price" decreased from 5.30 to 5.19 after the intervention.

Table 5. Number of people rating each of the four factors.

	Effectiveness/Quality		Price		Brand		Being Sustainable	
	Before	After	Before	After	Before	After	Before	After
7—Extremely Important	40	34	9	9	5	7	16	26
6—Very Important	30	37	28	31	7	9	21	28
5—Somewhat Important	7	9	35	37	43	41	27	20
4—Neither Important nor Unimportant	4	2	6	4	16	13	12	5
3—Somewhat Unimportant	0	0	2	0	8	8	5	1
2—Very Unimportant	1	0	1	0	1	1	0	3
1—Extremely Unimportant	1	1	2	7	3	4	2	3
Weighted Average	6.19	6.19	5.30	5.19	4.64	4.70	5.28	5.60

Before the intervention, "quality/effectiveness" was rated the highest with a weighted average of 6.19, followed by "price" with a weighted average of 5.90. Following the inter-

ventions, "quality/effectiveness" maintained the same high rating, but "being sustainable" moved to second place with a weighted average of 5.60. This shows evidence that customer education increased the importance of sustainability in the participants' adoption decisions of cosmetic products.

Table 6 shows the number of respondents giving rankings from 1 (most important) to 4 (least important) to the four decision factors towards their adoption decision of cosmetic products before and after the interventions. For example, fifty-five respondents ranked the "quality/effectiveness" of a cosmetic product as the number one contributing factor to their adoption decision before the education, but this number decreased to forty-five after the intervention. For "being sustainable", only seven respondents regarded it as the most important initially, but the number of respondents regarding the same factor as the number one contributing factor towards their adoption decision increased to nineteen after the education.

Table 6. Number of people ranking the four factors before and after education.

Factor	Ranking								Average	
	1		2		3		4			
	Before	After	Before	After	Before	After	Before	After	Before	After
Quality/Effectiveness	55	45	18	23	5	6	0	0	1.36	1.48
Price	13	8	28	31	28	25	9	10	2.42	2.50
Brand	3	2	14	5	24	17	37	50	3.22	3.55
Being Sustainable	7	19	18	15	21	26	32	14	3.00	2.47

Before the interventions, "quality/effectiveness" was ranked as the most important among the four factors concerning a customer's decision to adopt a cosmetic product. The second factor was "price", with a weighted average ranking of 2.42. The factors ranked third and fourth were "being sustainable" and "brand", with weighted average rankings of 3.00 and 3.22. This is in line with the results in Table 5. Following the interventions, "being sustainable" increased in rank from 3.00 to 2.47, replacing "price" as the second key factor. "Quality/effectiveness" ranks as the key factor, while "brand" is ranked the least important among the four factors, regardless of whether a customer is educated on sustainable cosmetic product knowledge. These results, again, show evidence that the interventions increased the importance of sustainability in the participants' purchase decisions for cosmetic products. However, the quality or effectiveness of a product is still the most important competitive advantage that sustainable cosmetic companies should strive to maintain while achieving their sustainability goals.

3.4. The Importance of Other Factors Contributing to a Cosmetic Product Being Adopted as Sustainable

Finally, participants were asked to indicate the importance of fourteen items to their decision towards adopting a cosmetic product that they regard as being sustainable, from "1" being "not important at all" to "7" being "extremely important". The fourteen items were generated based on our extensive literature review. For example, corporate social responsibility (CSR) is a concept that shows how companies respond to the demands of stakeholders [53]. In the banking industry, CSR was found to be a key determinant of the perceived attractiveness of a company's identity [54]. Table 7 summarizes the ranking of these factors from the most important to the least important, while Table 8 gives the details of the importance rating scores of each factor, listed by their final rank. The purpose of this question was to further assist sustainable cosmetic companies in considering additional details when planning for their customer education.

Table 7. The ranking of the fourteen factors in terms of their importance to customers' purchase decisions.

Ranking	Factors Identified as Crucial to a Cosmetic Product Being Adopted as Sustainable
1	The formulation and ingredients of the product are safe and non-toxic.
2	Raw materials are sourced in an environmentally friendly way.
3	Product manufacturing processes are environmentally friendly.
4	Raw materials are acquired at fair trade prices.
5	The product is certified by a third party.
6	Packaging materials are degradable and recyclable.
7	The company's corporate social responsibility (CSR) is well presented.
8	Packaging is designed in a creative way that reduces packaging material consumption and/or increases its repeatable use.
9	The company receives positive feedback and has a good reputation on social media sites such as Facebook and Twitter.
10	The company's website communicates its sustainable efforts.
11	The company actively collaborates with environmental groups or charity organizations to help resolve social and environmental issues.
12	Company employees show appropriate behaviors and provide effective communication.
13	Beauty bloggers highly recommend the product or company.
14	The company logo and name are perceived as environmentally friendly.

Table 8. The number of people choosing the importance scores for each factor.

Factor by Rank	Score							Weighted Mean
	7	**6**	**5**	**4**	**3**	**2**	**1**	
1	39	30	10	2	1	0	1	6.2
2	21	34	21	5	0	0	2	5.76
3	24	25	24	7	0	0	3	5.65
4	1	2	29	5	0	0	3	5.52
5	19	28	24	7	0	0	2	5.43
6	15	23	31	11	0	0	3	5.36
7	16	25	24	12	3	1	2	5.34
8	12	29	27	11	0	1	3	5.33
9	14	30	23	9	0	1	3	5.23
10	9	27	34	6	1	0	3	5.12
11	11	22	32	11	1	1	2	5.06
12	10	22	29	16	2	0	1	5.04
13	7	18	32	13	4	3	3	4.7
14	8	10	34	20	2	2	4	4.58

As shown in Tables 7 and 8, in terms of a potential customer's perception and thus adoption decision towards a cosmetic product being sustainable, the most important three factors are "the formulation and ingredients of the product are safe and non-toxic", "raw materials are sourced in an environmentally friendly manner", and "product manufacturing processes are environmentally friendly". The three least crucial factors are "company employees show appropriate behaviors and provide effective communications", "beauty bloggers highly recommend the product or company", and "the company logo and name are perceived as environmentally friendly". However, note that the weighted average values of the fourteen factors are quite close, from the highest value of 6.20 to the lowest value of 4.58. Even the least crucial factor has a rating of 4.58, which is higher than 4 (neither important nor unimportant), indicating that customers do care about those factors and think they are important, though not as important as the others if they had to make a choice.

4. Conclusions

This study evaluated the impact of customer education on the diffusion of sustainable innovation in the case of cosmetic products. Survey results show educating participants on non-sustainable and hazardous ingredients increased their intention toward checking product ingredients and avoiding hazardous ingredients. An increase in their willingness to adopt a sustainable cosmetic product in the next two years was observed following an additional intervention that educated them about the definition of sustainable cosmetic products. Before educating customers on standards and third-party certifications for sustainable cosmetic products, participants had less trust in green and organic certifications. However, following the education, their trust in certifications increased, and their intention to adopt a certified sustainable cosmetic product increased. Finally, when asked to rate and rank "quality/effectiveness", "price", "brand", and "being sustainable" as four factors important to the adoption decision of cosmetic products, "quality/effectiveness" maintained the highest rating and ranking before and after the interventions. However, following the interventions, "being sustainable" increased in importance, surpassing "price" and ranking second. When the participants were presented with fourteen factors that were identified as important to their perception and the adoption of sustainable cosmetic products, the most important three were "the formulation and ingredients of the product are safe and non-toxic", "raw materials are sourced in an environmentally friendly manner", and "product manufacturing processes are environmentally friendly". Interestingly, these three factors were the primary focus that the participants got educated on in the intervention. This again indicates the importance of customer education in raising awareness and improving the know-how of potential adopters. However, all factors listed in Table 7 received minor differences in their importance rating scores, indicating that the participants viewed the other factors as also important in their perception of an innovation being sustainable and worth adoption.

5. Study Implications

Using the cosmetic industry as an example, this study provides evidence that effective customer education on the sustainability advantage of a sustainable innovation can help facilitate the diffusion of the innovation. This contributes to the DoI theory by looking at the knowledge increase of potential adopters dynamically and introducing customer education as a means of increasing the knowledge needed for potential adopters to cross the adoption stages. Specifically, educating the potential adopters not only on the benefits a sustainable innovation brings but also on the harm that non-sustainable counterparts can impose on human bodies and the environment will increase the knowledge of potential adopters and help them move from the "awareness" to the "trial" stage of the adoption process [18]. Educating the potential adopters on the definition of a sustainable product and the industry regulations on green product certification will build trust towards certified green products and increase the adoption intention of sustainable innovations. While the effectiveness/quality of a product is deemed a key factor in a customer's purchase decision, being sustainable can increase its importance when customers realize the benefits that sustainable products can bring to them. As noted by previous studies, the main driving factor for early adopters is sustainability concerns, but the price for late adopters is higher [16,50]. The increase in importance of sustainability surpassing price as the second-ranked factor in the participants' adoption decisions after the intervention indicates that effective customer education can help move more individuals into the early adopters' group. Finally, the importance of factors that contribute to an innovation being perceived and adopted as sustainable by the participants after the education is reported. The result indicates that all factors have similar importance and should be considered by sustainable companies in their business strategy formulation.

Customer education is closely related to a company's customer knowledge management. A look at how knowledge transfers from the company to customers will help implement customer education. Such information is normally obtained by marketing tools,

especially in the planning of promotion decisions and product value descriptions. The content of customer education should focus on giving potential customers the knowledge and skills necessary to increase their awareness and understanding of sustainable products, including the potential toxic chemicals that the products are free from and the minimal impact on the environment from the product's usage, manufacturing process, and material sourcing. Since it is innovative, the product's uniqueness and new benefits that it can provide for customers should be unveiled, within which some professional concepts or words may occur. Therefore, educating customers also becomes necessary. The innovative product's basic concept should reach the customers easily and conspicuously, so customers can identify it quickly.

Another purpose of customer education at the pre-purchase stage is to give potential customers self-confidence in adopting and using the products. Data from the Natural Marketing Institute shows that one of the barriers to green purchases is that customers doubt the effectiveness of green products compared to traditional ones [34]. This is in line with the study results, where customers regard the quality/effectiveness of the product as the most important factor in their purchase decision. Therefore, maintaining high quality as a key competitive advantage is also critical for the diffusion of sustainable innovations. Clear messages should be sent to the potential adopters, assuring them of the high quality of the innovation as well as making the products and environmental benefits tangible to them through easily acceptable illustrations. This way, more people will be willing to pay more for products that bring them sustainability benefits. Effective customer education can reinforce the firm-customer relationship, build long-term customer loyalty [13,17], and stimulate effective communication between the company and its customers to improve the company's performance.

In the cosmetic industry, companies focus on the traditional benefits and special functions that their products are expected to provide, while seldom letting customers know the details of the product ingredients. As a result, customers do not pay attention to the composition of the products they use. Different from other cosmetic companies that only broadcast the active ingredients in their products, sustainable cosmetic companies can emphasize the non-sustainable and high-risk ingredients their products do not contain. For example, a considerable number of natural or organic cosmetics, including skincare, makeup, and hair care products, pronounce being free from parabens—a commonly used preservative in cosmetics that has been proven to cause hormonal disruption and is linked to breast cancer. Critical information about known harmful ingredients, including synthetic chemicals and toxic natural ingredients, should be transferred to the customers, which will enhance the level of customer knowledge in the sustainable cosmetic market. As suggested by the study results, making customers aware of this critical information equips them with the know-how knowledge and increases their intention toward checking and avoiding non-sustainable products with hazardous ingredients.

When customers are educated on the benefits to their bodies and the environment that a sustainable cosmetic product brings, their adoption intention will increase. The cosmetic industry is also an industry where green and organic certifications are available. For a cosmetic company that is green-certified or sells green-certified products, customer education on the green certification is important to help build trust among the potential customers and increase their purchase intention, especially since certification costs money and may lead to higher prices for the products. For cosmetic products, product quality or effectiveness is regarded as the most important factor, regardless of whether they are sustainable or not. To compete with non-sustainable products, sustainable cosmetic innovations need to focus on achieving the same, if not superior, effectiveness. With a competitive level of product quality, customer education on sustainability can motivate more adoptions, even at a higher price. Finally, after potential customers are exposed to basic sustainability education, like the interventions given in this study, the most important factors for them to perceive and adopt a cosmetic product as a sustainable choice are that the formulation and ingredients of the product are safe and non-toxic, raw materials are

sourced in an environmentally friendly manner, and product manufacturing processes are environmentally friendly. However, other factors, such as the sourcing of raw materials at fair trade prices, the product being third-party certified, the packaging being degradable, recyclable, or reusable, and the company's CSR being well presented, are also deemed important, with minor differences in their ratings.

6. Limitations and Future Work

The study recruited participants from a population in the Midwest of the United States. Future studies can recruit more participants to increase the sample size and compare responses from other areas of the United States. A simple before-and-after experimental study was employed, with a focus on identifying clear changes in the adoption decision. Though it serves the current purpose, the information it can provide is limited. Future work will include more factors and causal relationships in the diffusion model to build a more comprehensive pre-post study. For example, the impact of customer education interventions may differ depending on the regional culture and may be most effective in a culture that has a growing concern for sustainability. This was intentionally left out of the current model by using a less culture-dependent industry as the study subject. But future studies, conducted in other industries, can include this relationship. In addition, the relationship between the effectiveness of customer education and the adopter groups can be evaluated. Like all innovations, the diffusion of sustainable innovations starts within the innovator group and then expands to the other adopter groups [18]. Due to the distinct characteristics of the potential adopter groups and their learnability levels, companies may need to place different emphasis on and implement different customer education strategies. Also, the current study measured the likelihood of adoption based on the participants' adoption intentions and related behaviors. Though purchase intention will subsequently result in the actual purchase [51], future studies can follow up with the participants to see if their purchasing behavior matches their survey responses and provide data to calculate the actual adoption rate. While the current study looked at customer education in the pre-purchase stage, future studies can investigate the role of customer education and strategies to implement in the post-purchase stage to further reinforce the diffusion of sustainable innovation.

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