Determinants of Green Packaging and their Impact on Consumer Buying Behaviour "The Mediating Role of Consumer Attitude" An Applied Study on the Egyptian Petrochemicals Sector

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Abstract

This research focuses on green packaging serving as a key initiative to reduce packaging waste, greenhouse gas emissions, and carbon footprints , the main research target to test the impact of key determinants toward ecofriendly packaging included price, design, knowledge, and quality on consumer behaviour with the mediating effect of consumer attitude, while awareness of environmental issues is growing, a gap still remains in understanding how these determinants influence consumer behaviour additionally, a value-action gap exists between consumers' attitudes toward eco-friendly packaging and their actual purchasing behaviour, a conceptual model was proposed, and a mixed-methods methodology approach was employed, collecting quantitative data through an online questionnaire distributed to employees among companies in the Egyptian petrochemical sector, while qualitative data was gathered through structured face-to-face interviews with managers from these companies, total of 391 responses were analysed using SPSS and AMOS, the findings confirmed a positive significant relation between the identified determinants toward green packaging and consumer buying behaviour, with consumer attitude playing a partial mediating role, strengthening the relation between these determinants and green packaging adoption These finding contributes to the literature by establishing a foundation model for further research on green consumer behaviour in Egypt, particularly within the petrochemical sector, furthermore, It also guides businesses and policymakers in boosting consumer awareness ,optimizing production costs, integrating sustainability into business strategies to support the transition to green packaging and offer a framework for fostering sustainable consumer behaviour in Egypt.

***Keywords**: Green Packaging, Consumer Behavior, Sustainability, Egyptian Petrochemicals Sector.*

Introduction

Environmental challenges such as global warming, abnormal climate patterns, and health-related risks have motivated consumers to engage in environmentally friendly purchasing practices. (Do Paco & Raposo, 2009; Barber, 2010; Okada & Mais, 2010). Furthermore, the idea of being "eco-friendly" or "green" has expanded considerably, shaping consumer purchasing behavior. To appeal to these environmentally conscious buyers, many companies now promote their products as sustainable (Munasinghe & Shantha, 2021). According to Bhalerao (2014), green marketing involves a variety of strategies, including product modifications, changes in production processes, packaging improvements, and adjustments in advertising. Among these strategies, packaging has become a key focus, as packaging waste especially non-biodegradable plastic

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waste leading to significant environmental challenges (Mahmoud et al., 2022). As a result, the concept of 'Sustainable packaging' or 'Green packaging' is gaining importance across all levels of the value chain due to the harmful environmental impact of plastics packaging (Lavelle et al., 2015).

Green packaging minimizes natural resource consumption, promotes sustainable lifestyle changes, and prioritizes the use of eco-friendly materials to protect both the environment and public health while preserving product quality. It aims to meet current needs while ensuring sustainability for future generations (Biswas & Roy, 2015; Ackaah, Kanton, & Osei, 2021; Kararia, 2023). The use of reusable or biodegradable packaging material is crucial, as it helps reduce waste and supports environmental preservation (Halim et al., 2022). The consumers expect packaging to not only safeguard products but also be environmentally friendly to reduce packaging waste (Auliandri et al., 2018). Based on the importance of eco-friendly packaging in decreasing emissions and improving waste management, there is a need for a deeper understanding of consumer behavior toward sustainable packaging solutions. Despite the increasing awareness of environmental issues and the availability of green packaging options, there remains a gap in understanding how factors such as price, design, knowledge, and quality influence consumer buying behaviour.

Literature Review

Previous research has highlighted the significant effect of key determinants, such as price, design, knowledge, and quality, in shaping consumer behaviour toward green packaging. For green packaging price a study by Trudel and Cotte (2009) revealed that demand for green packaging products decreases sharply when the price premium is significant, highlighting a turning point beyond which consumers revert to cheaper, non-sustainable alternatives. The study emphasizes that companies can charge a small premium for green products but must be cautious about substantial price increases, which could alienate price-sensitive customers.

Rajendran et al. (2019) highlighted that for Malaysian Gen-Y consumers, determinants such as price, knowledge, product quality, and design significantly affect their decisions to purchase items with green packaging. In addition, other studies have emphasized that brand reputation, quality, and pricing (Agyeman, 2014; Kaygisiz et al., 2019), as well as sociocultural and psychological factors (Imbambi & Kinoti, 2018), substantially influence consumer buying behavior. In their most recent research, Juwaheer et al. (2012) explored how green marketing strategies affect consumer decisions and proposed a theoretical model that includes five key elements: willingness to pay, price, knowledge, quality, and design.

Furthermore , for green packaging design Al Adawy, Aboud, and Abdel Raouf (2024) highlighted that a key challenge for packaging designers is creating sustainable packaging that consumers accept, as perceived durability doesn't always reflect actual strength. The rise of the green trend, adopting sustainable practices has become crucial for maintaining consumer support and satisfaction (Bhalerao, 2014). Magnier and Schoormans (2015, 2016) demonstrate that green packaging features, such as recyclable materials and sustainability-focused visual cues, positively influence consumer behaviour by enhancing perceptions of product quality and environmental responsibility (Orzan et al., 2018).

Green Packaging Price

According to Hossain and Khan (2018), green price refers to the cost associated with environmentally focused products. Due to their sustainable attributes, these products are often sold at a premium compared to conventional alternatives. Additionally , Chitra (2007) highlights that environmental considerations can be affected by price, as consumers sometimes prioritize cost over sustainability when making purchasing decisions. Green products are generally expensive than traditional alternatives due to higher raw material costs and donations to environmental initiatives (Sharma & Iyer, 2012; Padhy & Vishnoi, 2015; Singh et al., 2016; Papadas et al., 2017; Shi & Yang, 2018). Green packaging is considered an expensive item

in the market due to several key criteria such as its eco-friendliness, safety, high quality, and reduced environmental impact. as clearly pointed out (Jaafar, 2012). Furthermore, the consumers are highly sensitive to the prices of sustainable packaging products. When the perceived costs are higher than the perceived benefits, consumers behaviour not to take environmentally friendly actions, even if they feel sympathetic toward the environment (Radulescu & Radulescu, 2012). Innovations in packaging technology, including advanced recycling methods like chemical recycling, enable the breakdown of mixed or contaminated plastics that were once challenging to recycle. These advancements increase recycling rates and make recycled plastics more competitive than virgin plastics in both price and performance. Consequently, companies can reduce costs related to waste management and raw material procurement, boosting the overall competitiveness of green plastic packaging (Ragaert, Delva & Van Geem, 2017).

Green Packaging Design

The key design element of any product is its packaging (Lee, 2008), which serves as a crucial marketing tool (Abidin et al., 2015). Additionally, Al Adawy, Aboud, and Abdel Raouf (2024) indicated that the packaging design structural blend with three-dimensional approach creativity, functionality, and industrial design to enhance consumer experience a well-crafted package capture consumer attention on shelves, enhance brand perception, and deliver a memorable unboxing moment. Product packaging design should consider environmental factors and promote eco-friendliness. Kararia (2023) highlights that the "reduce" concept in green packaging focuses on creating compact designs, using lighter materials, and eliminating unnecessary components, while maintaining the packaging's functionality and product protection

Green packaging can boost consumer purchases (Barber, 2010) by adding value through elements like colors, fonts, text, and visuals, with images of desirable lifestyles influence consumer behaviour toward the product (Rundh, 2009). Its main purpose at the point of purchase is to capture attention and differentiate products from competitors (Polyakova, 2013). Additionally, eco-friendly packaging with attractive designs can further engage customers (Biswas & Roy, 2015; McCarthy & Liu, 2017; Yang & Zhao, 2019).

Green Packaging Knowledge

Fryxell and Lo (2003, p. 45), highlighted that "Environmental knowledge involves an understanding of the key facts, principles, and interconnections related to the natural environment and its primary ecosystems.". It involves recognizing environmental impacts, comprehending all-inclusive systems, and embracing collective responsibilities for sustainable development. As noted by Priscillia and Indriyani (2020), consumers with more knowledge tend to make more realistic choices, selecting products that align with their needs and improving their decision-making process. Moreover, consumers are more inclined to purchase products with green packaging when they have the ability to reach environmental information, such as certifications and eco-labels Biswas & Roy (2015a). Influencing consumer behaviour is a complex process that requires an understanding of its key determinants (Wandosell et al., 2021). Packaging information on green or organic products plays an important role in enhancing consumer knowledge and guiding their preferences and selection (Hyder & Amir, 2023).

Green Packaging Quality

Green packaging must consist of higher quality materials that are not radiative, environmentally friendly, and not toxic, while remaining cost-effective (Huang, 2017). According to Sonderskov and Daugbjerg (2011) , consumers perceive green packaging products as being of high taste quality. As indicated by Ramme and Heimann (2015), companies recognize that consumers prioritize green packaging that maintains product quality. Using recycled plastics for packaging provides notable environmental advantages, but several challenges must be addressed to enhance packaging quality. Different types of

plastics are often mixed, and non-plastic materials can contaminate the waste stream. This complicates the recycling process and can lead to lower-quality recycled materials that are unsuitable for certain packaging applications (Hopewell, Dvorak, & Kosior, 2009). Contaminants such as food residues or dyes can render recycled plastics unsuitable for food packaging due to safety concerns and stringent regulatory standards (Franz & Welle, 2022).

Consumer Buying Behaviours

Consumer behaviour is dynamic and complex, influenced by significant shifts in how and where consumers access information, the sources they trust, and how they use that information considering the intricacies of the shopping process and the importance of context (Elraffee, 2024). Sustainable consumer behaviour can be understood through two key models.

The Theory of Planned Behaviour (TPB) explains that consumer behaviour is influenced by attitude (personal views), subjective norms (social pressure), and perceived control (ease or difficulty of the action) (Ajzen , 2011). This theory is widely used by researchers to predict actions and explain behaviors like recycling and sustainable consumption (Chan & Bishop, 2013).

The Values-Beliefs-Norms (VBN) theory builds on this by adding moral aspects, suggesting that personal values, beliefs about environmental impact, and a sense of moral responsibility also shape behaviour (Aguilar-Luzón et al., 2012). Kararia (2023) emphasized the Value-Belief-Norm (VBN) Theory's suggestion that values influence actions, motivating consumers to choose sustainably packaged products due to the belief that these choices benefit the environment. Enhancing consumers' self-regulation abilities by strengthening their green consumption self-efficacy is key to influencing green consumer behavior. Without strong self-efficacy, consumers may not follow through on their green purchase intentions (Lin & Hsu, 2015).

Consumer Attitude

The word attitude refers to how an individual's negative or positive response when asked to evaluate a particular action (Ajzen, 1991).The definition of attitude as indicated by Bodur et al., 2000 is a personal subjective assessment of a product or brand. Self-Perception Theory (Bem, 1967) suggests that people's attitudes and values shown in one behaviour often influence their actions in other areas. Consumers generally have positive attitudes toward environmentally sustainable green products, as environmental concerns continue to grow (Cheah & Phau, 2011). (Ares, Besio, Giménez & Deliza, 2010).

Furthermore, Kararia (2023) emphasized that individuals who choose biodegradable cups due to a positive attitude toward environmental concerns are likely to adopt eco-friendly practices in other aspects of their lives. This theory was applied by Van Birgelen, Semeijn, and Keicher (2009) conducted a study on beverage packaging in Germany, revealing a strong connection between purchasing and disposal behaviors. The findings show that consumers whose attitudes and values align with ecological packaging are more likely to properly dispose of used packages, and vice versa.

Conceptual Framework

The main target of this research paper is to investigate the effect of Determinants of Green Packaging (price, design, knowledge and quality) on Consumer Buying Behavior with mediating role of Consumer Attitude in Egyptian petrochemicals Sector. "An operational definition of a variable refers to the precise method used to measure it within a study." (Sekaran and Bougie, 2016).

The variables Green Packaging Price, Design, Knowledge, and Quality original measurement based on questionnaire was adapted from scales originally developed by Mohd Suki (2013) and Mohd Isa & Xin Yao (2013), with further refinement by Singh et al. (2018).

The measurement for the variable Attitude toward Green Packaging is originally based on scales developed by Auliandri et al. (2018).The variable Consumer Buying Behaviors is originally derived from scales developed by Khare (2019).

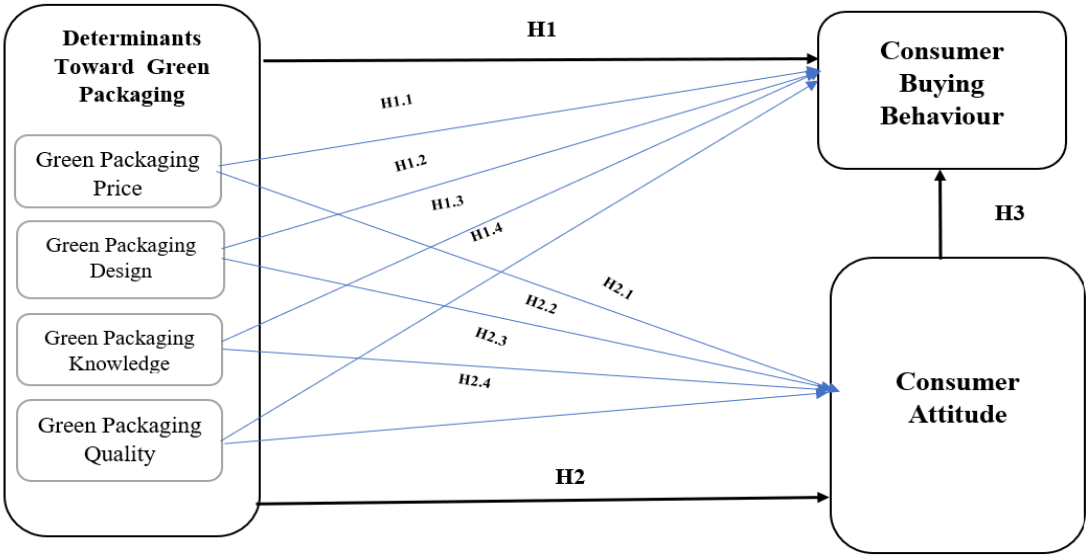

Figure 1 Conceptual Framework

Problem of the Study

Although environmental awareness is growing and green packaging options are increasingly accessible, there is still a gap in understanding of how factors like price, design, knowledge, and quality influence consumer purchasing behavior. A persistent value-action gap exists between consumers' positive attitudes toward eco-friendly packaging and their actual purchasing decisions.

This study seeks to investigate the interaction of these determents in shaping consumer behaviour toward green packaging. The core issue lies in examining how, and to what extent, organizations in Egypt are addressing this gap, which poses a challenge to effectively promoting green packaging and may hinder widespread consumer adoption of sustainable practices. Consequently, research is needed to fill these gaps and offer valuable insights to support Egyptian marketing strategies and policy initiatives focused on encouraging the use of environmentally friendly packaging.

Objectives of the Study

These research objectives aim to evaluate the effect of Determinants of Green Packaging (price , design, knowledge and quality) on Consumer Buying Behavior with mediating role of Consumer Attitude. The study is guided by the following objectives:

1- To investigate how Determinants of Green Packaging affects Consumer Buying Behavior.
2- Identify Pricing Impact of green packaging on Consumer Buying Behavior
3- Examine the Relationship between green packaging design and Consumer Buying Behaviour
4- Evaluate green packaging Knowledge Impact on the Consumer Buying Behaviour
5- Discuss the significance of green packaging quality in enhancing consumer purchasing behavior.
6- Examine the impact of determinants of green packaging (price, design, knowledge, and quality) on consumer attitude.
7- To identify how Consumer Attitude affects Consumer Buying Behavior.

8- To investigate the mediation role of Consumer attitude between Determinants of Green Packaging and Consumer Buying Behavior.

9- Provide Strategic Insights and recommendations for businesses in the packaging industry to enhance their green packaging initiatives.

10- To develop a framework for the relationship between Determinants of Green Packaging Preferences and Consumer Buying Behavior using structural equation modelling.

Hypotheses of the Study

On the basis of the conceptual framework, the hypothesized model, and a review of relevant studies and theories, the following study hypotheses were developed:

- **H1: It's expected that Determinants of Green Packaging Preferences have a significant positive impact on Consumer Buying Behavior.**
  - **$H1._1$:** It's expected that Green Packaging Price has a positive significant impact on Consumer Buying Behavior.
  - **$H1._2$:** It's expected that Green Packaging Design has a positive significant impact on Consumer Buying Behavior.
  - **$H1._3$:** It's expected that Green Packaging Knowledge has a positive significant impact on Consumer Buying Behavior.
  - **$H1._4$:** It's expected that Green Packaging Quality has a positive significant impact on Consumer Buying Behavior.
- **H2: It's expected that Determinants of Green Packaging Preferences have a positive significant impact on Consumer Attitude.**
  - **$H2_{.1}$:** It's expected that Green Packaging Price has a positive significant impact on Consumer Attitude.
  - **$H2._2$:** It's expected that Green Packaging Design has a positive significant impact on Consumer Attitude.
  - **$H2._3$:** It's expected that Green Packaging Knowledge has a positive significant impact on Consumer Attitude.
  - **$H2._4$:** It's expected that Green Packaging Quality has a positive significant impact on Consumer Attitude.
- **H3: It's expected that Consumer Attitude has a positive significant impact on Consumer Buying Behavior.**
- **H4: It's expected that Consumer Attitude mediates the relation between Determinants of Green Packaging and Consumer Buying Behavior.**
  - **$H4._1$:** It's expected that Consumer Attitude mediates the relation between Green Packaging Price and Consumer Buying Behavior.
  - **$H4._2$:** It's expected that Consumer Attitude mediates the relationship between Green Packaging Design and Consumer Buying Behavior.
  - **$H4._3$:** It's expected that Consumer Attitude mediates the relation between Green Packaging Knowledge and Consumer Buying Behavior.
  - **$H4._4$:** It's expected that Consumer Attitude mediates the relation between Green Packaging Quality and Consumer Buying Behavior.

Research Methodology

The research approach adopted a deductive approach as it relied on concepts established by previous researchers to develop hypotheses. The methodological choice based on mixed-method approach, integrating quantitative surveys and qualitative interviews. The target population consisted of employees working in petrochemical companies with a total number of 3,452 employees inside this sector. The sample size was determined using an online calculator, based on a 95% confidence level and a 5% confidence interval, resulting in a minimum required sample size of 331 employees. To address potential non-responses or missing data, an additional 10% was added to the sample, resulting in a final sample size of 364 individuals for statistical analysis. Participants were asked to respond to the questionnaire items using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). A pilot study was conducted using 1% of the target population, as recommended by Saunders et al.(2023), to identify and correct potential issues before the main data collection. The instrument demonstrated high reliability, with a Cronbach's Alpha coefficient of.860 for the 28 items, exceeding the acceptable threshold of 0.7. Furthermore, a high, positive Spearman's rho value indicated strong validity, confirming that the questionnaire items effectively measured the intended constructs.

The research questionnaire was distributed to 700 participants. Of these, 434 were returned, representing a 62% return rate. However, 37 questionnaires (5.3%) were either incomplete, ineligible, or declined, and 266 (38%) were not retrieved. After excluding unusable responses, a total of 391 valid questionnaires were obtained, resulting in an effective response rate of 56.7%, which is considered highly satisfactory for the scope of this study.

Structural Equation Modeling (SEM) was utilized to examine the relationships among the constructs outlined in the proposed model. Upon completion of the confirmatory factor analysis (CFA), the structural model was evaluated by testing the hypotheses that underpin the research framework.

Results and Findings

Composite Reliability (CR) evaluates the reliability of a construct's measurement model, offering a more comprehensive indication of overall reliability by evaluating the internal consistency of the construct itself (Hair et al., 2019). The CR of (Green Packaging Price = 0.811, Green Packaging Design =0.757, Green Packaging Knowledge=0.921, Green Packaging Quality = 0.584, Consumer Attitude = 0.896 and Consumer Buying Behavior= 0.936). So, it is clearly evident from the measurement model that each construct shows strong reliability

According to Hair et al. (2019), the Average Variance Extracted (AVE) should exceed 0.50 to indicate adequate convergent validity. In this study, the AVE values for the individual constructs are as follows: Green Packaging Price = 0.586, Green Packaging Design = 0.549, Green Packaging Knowledge = 0.702, Green Packaging Quality = 0.534, Consumer Attitude = 0.743, and Consumer Buying Behavior = 0.747. Since all AVE values are above the recommended threshold of 0.50, the results confirm satisfactory convergent validity, supporting the appropriateness of proceeding with the structural model evaluation.

A Confirmatory Factor Analysis (CFA) was conducted on the six-factor model using AMOS software. The Degrees of Freedom (DF) were 332, satisfying the requirement of being greater than zero. The chi-square to degrees of freedom ratio (χ^2/DF) was 2.540, which falls below the recommended maximum value of 3.0. The Root Mean Square Error of Approximation (RMSEA) was 0.057, which is within the acceptable limit of less than 0.08. The Tucker-Lewis Index (TLI) was 0.937, and the Comparative Fit Index (CFI) was 0.945-both values close to the ideal score of 1.0, indicating a strong model fit. Overall, these fit indices suggest that the measurement model provides solid support for the underlying factor structure identified through CFA.

Structural Model

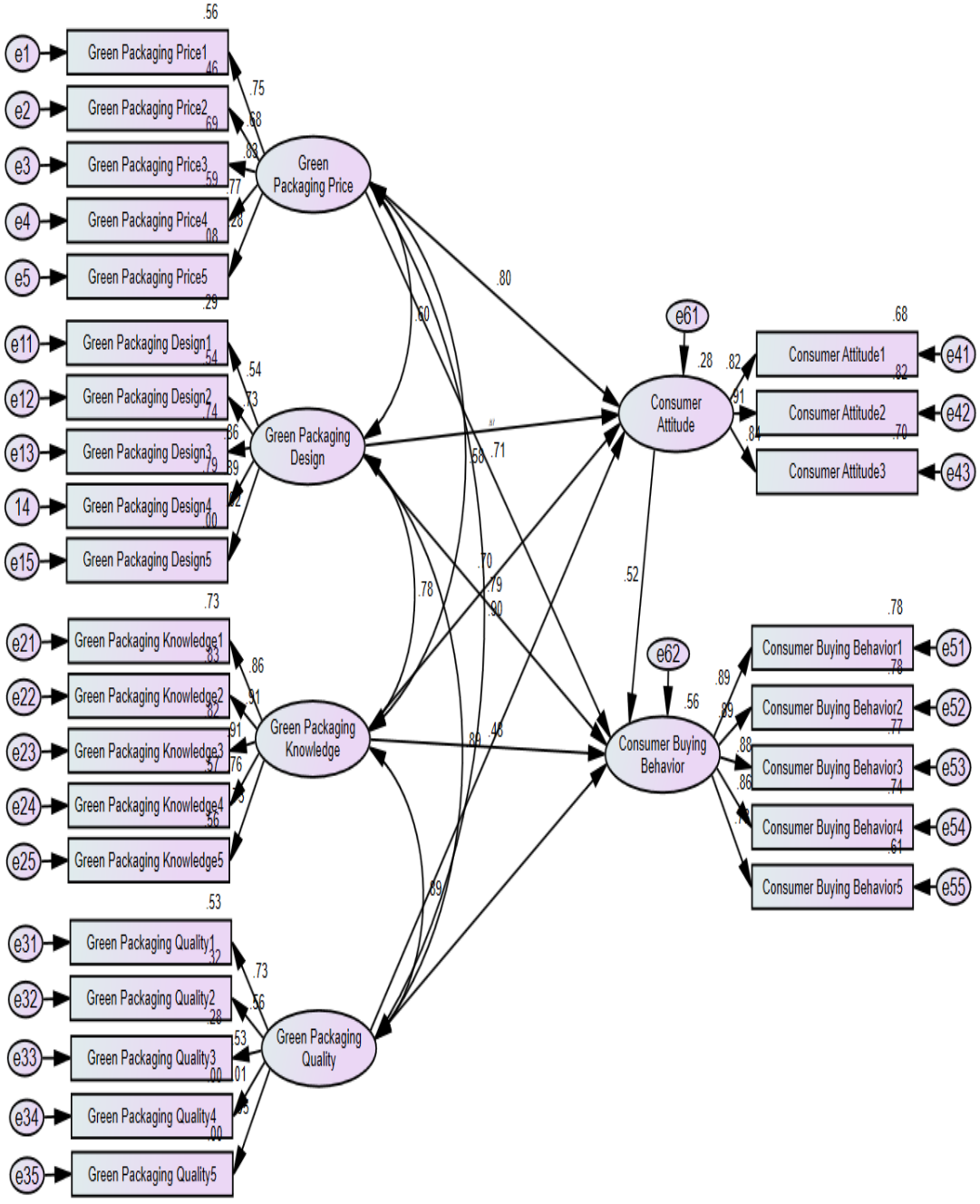

Figure (2) Structural Model

Structural Model Summary

The structural model results, analyzed using AMOS software, indicate that the degrees of freedom (DF) were 337, which meets the required condition of being greater than 0. The chi-square to degrees of freedom ratio (χ^2/DF) was 2.799, falling below the acceptable threshold of 3.0. The RMSEA value was 0.061, remaining under the recommended limit of 0.08. The Tucker-Lewis Index (TLI) was 0.926, approaching the ideal value of 1.0, which signifies a perfect fit. Similarly, the Comparative Fit Index (CFI) was 0.934. These values, being close to 1.0, suggest that the measurement models offer strong support for the factor structure established through the confirmatory factor analysis (CFA).

Discussions

The discussion seeks to investigate the research objectives based on findings from the empirical data collected through questionnaire responses. The findings and hypotheses testing revealed that the independent variable Green Packaging Determinants (Price, Design, Knowledge, and Quality) had a significant effect on Consumer Buying Behaviour, with Attitude serving as a mediator in these relationships within the Egyptian petrochemical sector which consistent with the research main objectives. The first objective of these research achieved through the results analysis, which confirmed Hypothesis H1, indicating the significant positive impact of Determinants Towards Green Packaging on the Consumer Buying Behaviour in Egypt's petrochemical industry. This conclusion is based on the results of individual hypotheses indicated that significant positive impact of Green Packaging Price, Design, Knowledge, and Quality on Consumer Buying Behaviour. Collectively, $H1_{.1}$, $H1._{2}$, $H1._{3}$, $H1._{4}$.

The qualitative data gathered from interviews with general managers, including experts in production, human resources, and finance, support these findings. The managers confirmed that the key determinants of green packaging, across its four dimensions, play a role in shaping consumer buying behavior.

The second objective of this research is to examine the impact of green packaging pricing on consumer buying behavior which is supported by the findings $H1._{1}$, indicating that green packaging price has a significant positive impact on consumer buying behavior ($\beta = 0.712$, CR = 13.354, CR > 1.96, p = 0.000, p < 0.05). These results are consistent with previous research discussed as indicated by Agyeman, 2014 that the regression analysis shows that price significantly influences green product purchases $\beta = 0.725$, t-value (14.244) and p-value (0.000) confirm statistical significance. Thus, the null hypothesis is rejected, proving that price is a key factor in consumer buying behavior for green products.

Additionally, a study by Mahmoud et al. (2022) found that willingness to pay for green packaging has a significant impact on consumer purchase decisions ($\beta = 0.452$, t = 5.753, p < 0.05).The findings indicate that consumers are willing to pay more for eco-friendly packaging and take pride in owning such products despite higher costs.

Moreover, Ishak et al. (2023) found that price significantly influences consumers' purchasing intentions for reusable eco-friendly shopping bags. The study reported a significant positive relationship between price and Malaysian Gen-Y's intention to use these bags (B = 0.410, P = 0.0001).

The Third objective of these research to examine the relation between green packaging design and Consumer Buying Behaviour. The result finding confirmed $H1._{2}$ indicating that green packaging design has a positive significant impact on consumer buying behavior in Petrochemical Industry in Egypt. ($\beta = 0.789$, CR (Critical Ratio) = 21.962, CR > 1.96, p = 0.000, p<0.05). The analysis result from a study by (Tu & Halabi, 2024) emphasize that green packaging design impact on consumers' behaviour. The study explains that Packaging effectively communicates eco-friendly packaging design significantly influence purchasing behavior. Furthermore, a study by (Rajendran, Wahab & Kaur, 2019) highlighted that packaging design has a positive and significant impact on consumers' product choices, with $\beta = 0.793$ at a significance level of p = 0.000.

Experimental a study by Al Adawy, Aboud, and Abdel Raouf (2024) in Egypt found that graphic elements have the greatest influence on consumer choices regarding sustainable packaging. Consumers are more inclined toward packaging with an eco-friendly appearance, while logos, symbols, or sustainability-related text enhance attractiveness, purchase intent, recycling behavior, and overall awareness.

The Fourth objective of these research to evaluate green packaging Knowledge Impact on the Consumer Buying Behaviour.The result finding confirmed $H1._{3}$ Green Packaging Knowledge has a positive significant impact on Consumer Buying Behavior in Petrochemical Industry in Egypt ($\beta = 0.480$, CR (Critical Ratio) = 4.215, CR > 1.96, p = 0.000, p<0.05). The statistical finding results of a study

by (Rajendran, Wahab, & Kaur, 2019) revealed a positive and significant relationship between Green Packaging Knowledge and consumer choice toward green packaging ($\beta = 0.490$, $p = 0.009$), These findings align with previous studies by Mohammad and Zakersalehi (2012), Rokka and Uusitalo (2008), Barber (2010), and Koutsimanis et al. (2012). The research findings indicate that most consumers today are well-informed about environmental issues like pollution, ozone depletion, global warming, and waste as a result, they have shifted their purchasing habits toward green innovative products, including green packaging.

The Fifth objective of these research to discuss the significance of green packaging quality in enhancing consumer purchasing behavior. The findings address this objective by confirming $H1._4$ Green Packaging quality has a positive significant impact on Consumer Buying Behavior in Petrochemical Industry in Egypt. ($\beta = 0.292$, CR (Critical Ratio) = 8.895, CR > 1.96, $p = 0.000$, $p<0.05$). Rajendran, Wahab, and Kaur (2019) the finding from the statistical results of this study indicated a positive and significant relation between quality and consumers' purchase intention, with a standardized beta coefficient of ($\beta = 0.228$) at a significance level of $p = 0.02$. Rajendran, Wahab, and Kaur explained that respondents use their own judgment to assess the quality of packaging materials based on factors such as shape and durability. The higher the perceived quality of the packaging, the stronger the consumers' purchasing decision. Therefore, quality can be regarded as a crucial factor influencing consumers' desire to buy a product.

The sixth objective of these research to Examine the impact of determinants of green packaging (price, design, knowledge, and quality) on consumer. The findings address this objective by confirming $H2._1$ Green Packaging Price has a significant positive impact on Consumer Attitude in Petrochemical Industry in Egypt. ($\beta = 0.801$, CR = 14.796, , $p = 0.000$,). Confirmed $H2._2$ Green Packaging Design has a significant positive impact on Consumer Attitude in Petrochemical Industry in Egypt. ($\beta = 0.872$, CR = 18.848, $p = 0.000$). Confirmed $H2._3$ Green Packaging Knowledge has a significant positive impact on Consumer Attitude in Petrochemical Industry in Egypt. ($\beta = 0.699$, CR = 12.660, $p = 0.000$,). Confirmed $H2._4$ Green Packaging Quality has a positive significant impact on Consumer Attitude in Petrochemical Industry in Egypt. ($\beta = 0.442$, CR = 12.935, , $p = 0.000$). based on these results the finding from research supported H2 Determinants of Green Packaging has a significant positive impact on Consumer Attitude in the Petrochemical Industry in Egypt.

The study by Letchmanan et al. (2023), which collected data from 384 respondents, examined Knowledge , price and quality of green packaging toward consumer attitudes in Kota Bharu, Kelantan. The findings revealed that the largest proportion of respondents (34.6%) preferred purchasing green products stored in eco-friendly packaging, as it allows for easy recycling or composting. Conversely, the smallest proportion (32.1%) demonstrated knowledge about eco-packaged products available in the market. Additionally, 33.3% of respondents indicated a willingness to pay extra for green packaging that supports environmental protection.

Furthermore, analysis of $H2._1$ Green Packaging Price has a positive significant impact on Consumer Attitude aligned with the finding from Mishra et al. (2017) indicated a relationship between consumers' attitudes toward green packaging and their willingness to pay a premium price. Additionally, consumers' knowledge of environmental benefits of green packaging are more likely to develop positive attitudes and align their behavior with their beliefs supported by the present research finding for $H2._3$. However, the current research finding for $H2._1$ Contradict the previous study by Elraffee (2024) examined the relationship between price and attitudes toward eco-friendly products, particularly among Egyptian millennials. Based on an empirical analysis of 131 responses from a total of 150 distributed questionnaires, the results indicated that price had an insignificant correlation with attitudes toward sustainable products [$p = .17 > 0.05$], these findings also emphasized by Hansla et al. (2008) and Young et al. (2010).

Moreover, $H2._2$ Green Packaging Design has a positive significant impact on Consumer Attitude consistent with Magnier & Schoormans (2015) found that green packaging design elements, such as verbal claims and packaging color, have an impact positive on consumer attitudes. To be effective, packaging should visually align with consumers' expectations of sustainability. If there is a mismatch between design elements and sustainability claims, it can increase skepticism, reduce positive emotional responses toward the packaging and product, and ultimately weaken purchase intentions.

Also, the findings from Gaiser (2020) indicate that packaging design plays a crucial role in shaping product attitudes. Perceived packaging sustainability enhances positive perceptions of both the packaging and the product. Additionally, perceived product sustainability and improved product quality contribute to favorable attitudes, ultimately influencing consumers' purchase intentions.

In addition, $H2._4$ Green Packaging Quality has a positive significant impact on Consumer Attitude findings reinforced by Gaiser (2020) study on the impact of green packaging on consumer attitudes. As perceived product sustainability and quality improve product perceptions, influencing purchase intentions. Consumers may also link sustainable packaging to positive product attributes, indirectly affecting their buying decisions.

Furthermore, Morel and Kwakye (2012) conducted an empirical analysis consistent with our research finding $H2._4$ revealing that consumers generally perceive the quality of eco-friendly products positively. Respondents demonstrated a favorable attitude toward these products, acknowledging their environmental benefits ($\beta = 0.73$, $p = 0.000$). However, a significant distinction exists, as consumers view green products as having good quality rather than being superior to conventional alternatives.

Similar findings from the literature (Ajzen, 1985; Stutzman & Green, 1982; Stern, 1992) and studies on knowledge and ecological behavior (Simmons & Widmar, 1990; Rokicka, 2002; Mostafa, 2006) have indicated that green packaging knowledge has a significant positive impact on consumer attitude, aligning with the current research findings $H2._3$.

However, the current research findings for $H2._3$ contradict the previous study by Aleenajitpong (2013), which found that green packaging knowledge is not significantly correlated with all aspects of green packaging attitude. The study explains that individuals who are knowledgeable about green packaging materials can readily recognize their value but are not necessarily driven to participate in ecological activities related to green packaging.

The next research objective is to identify how Consumer Attitude affects Consumer Buying Behavior toward green packaging. The findings for H3 indicate that consumer attitude has a significant positive impact on consumer buying behavior in the petrochemical industry in Egypt ($\beta = 0.521$, $CR = 8.280$, $CR > 1.96$, $p = 0.000$). Alike outcome from a literature Kashif & Rani (2021) found a significant and strong relation between consumer attitude toward green packaging and green purchase behaviour intention. The results (t-statistic = 4.554, $P < 0.01$) indicate that consumers with a high attitude toward sustainable packaging are more likely to purchase green-packaged products, particularly those who exhibit greater environmental concern.

Additionally, the current research findings align with Wandosell (2021), who found that decisions regarding the disposal of product packaging and their choices to make eco-friendly purchases are influenced by their attitudes toward green packaging and their level of environmental concern. Vijayalakshmi & Raman (2022) suggest that attitude toward the environment is the most influential factor positively affecting purchase intention. Therefore, individuals with environmental concerns are more likely to prefer purchasing green products.

Furthermore, another objective of this research is to investigate the mediation role of Consumer attitude between Determinants of Green Packaging (price, design, knowledge, and quality) and Consumer Buying Be-

havior. The research result finding confirmed $H4._1$ Consumer Attitude mediates the relation between Green Packaging Price and Consumer Buying Behavior in Petrochemical Industry in Egypt. ($P = 0.004$, $P<0.05$). $H4._2$ Consumer Attitude mediates the relationship between Green Packaging Design and Consumer Buying Behavior in Petrochemical Industry in Egypt. ($P = 0.003$, $P<0.05$). $H4._3$ Consumer Attitude mediates the relation between Green Packaging Knowledge and Consumer Buying Behavior in Petrochemical Industry in Egypt ($\beta = 0.699$, $CR = 12.660$, , $p = 0.000$,). $H4._4$ Consumer Attitude mediates the relation between Green Packaging Quality and Consumer Buying Behavior in Petrochemical Industry in Egypt ($P = 0.003$, $P<0.05$), based on these results the finding from research supported H4 Consumer Attitude mediates the relation between Determinants of Green Packaging Preferences and Consumer Buying Behavior in Petrochemical Industry in Egypt is supported. (Hyder & Amir, 2023) Found that attitude acts as a mediating between green packaging Eco Labelling ($\beta = 0.7391$, $p < 0.001$), Willingness to Pay ($\beta = 0.5775$, $p < 0.001$), Environmental Concern ($\beta = 0.342$, p 95< 0.001) and Consumer Buying Behavior.

A similar study by Kingston and Paulraj (2023) confirms that attitude mediates the relation between consumers' environmental concerns, awareness of health risks linked to plastic packaging, and perceived values of green packaging in shaping their purchase decisions. Conversely, Jahanshahi and Jia (2018) and Zahan et al. (2020) did not find the mediating role in bridging the intention–attitude–behavior gap.

Authors Contributions

This thesis contributes to the exploration of a crucial dimension of sustainability in the Egyptian green packaging sector, drawing from academic studies on consumer behavior and sustainability. It establishes a foundation for further research on the relationship between key determinants of green packaging and consumer buying behavior, particularly with the mediating role of consumer attitude. Additionally, the study highlights the need for further research on green consumer behavior in the Egyptian market, addressing calls in the literature for more studies on corporate entrepreneurship. Furthermore, it enhances the shift towards green packaging in Egypt's petrochemical sector by offering insights into the adoption of eco-friendly practices among companies of these sector.

Study Recommendations

The study provides valuable understanding for future research. Accordingly, the subsequent topics are suggested for further exploration:

- **First,** this study was conducted in the petrochemical sector, a significant industry both globally and in Egypt. To enhance the generalizability of the findings, future research should examine the measured variables in other relevant sectors, such as the beverage and food sector, the pharmaceutical sector, and the consumer goods sector.
- **Second,** this study concentered only on the big organizations. However, future research involving medium enterprises , micro and small, is recommended, as they play a significant role in Egypt's gross domestic product.
- **Third,** the collection of data approach could transition from a cross-sectional study to a time-series analysis, which may yield different insights.
- **Fourth,** Future research should expand the geographical scope by covering a wider range of locations across Egypt. This would offer a more comprehensive understanding of the subject within diverse geographical contexts.
- **Fifth,** future research should explore additional determinants of green packaging, such as environmental concern, trust, and availability, as these factors may further explain consumer buying behavior.

Study Limitations

External validity refers to the extent to which conclusions can be generalized to a broader population, cases, or settings (Saunders et al., 2019). Therefore, this research cannot assume that the findings are applicable to other contexts, and as such, the study excludes:

- Geographical distribution limitation: The study focuses on Egypt's petrochemical sector, specifically the four main companies in Alexandria, strategically located near the main feed gas pipeline from the Western Desert, along with the holding company in Cairo. The study excludes other sectors and companies within the Egyptian petroleum ministry, which are distributed across various regions of the country.
- Variables Limitation: Other determinants for green packaging, such as environmental concern, trust, and availability, may also contribute to explaining consumer buying behavior to some extent.
- Industry Limitation: This study excludes other industries in Egypt, such as beverage and food cosmetics, agricultural, and organic food industries.
- Diverse Workforce limitation: due to the nature of the petrochemical industry, the majority of employees come from technical backgrounds, including engineering and other technical professions, with a predominantly male workforce. These factors potentially impact the generalizability of the study's findings across the sector.
- Social influences Limitation: The study's scope is limited as it does not fully consider key societal factors shape consumer toward green packaging , such as cultural norms , and personal beliefs.
- Study Design Limitation: The cross-sectional study design didn't cover long-term effects; a longitudinal study could provide deeper insights into consumers' buying behavior could change in future.

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