



Packaging communication and QR codes: A study on information, quality, involvement and purchase intention for the spice market

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ABSTRACT

Packaging has come a long way since the days when it served a fully functional purpose. Throughout time, it has been developed as a fundamental tool for communicating directly with consumers. This study dives into packaging as a communication tool considering the informative elements of packaging and QR code applications for the spice market. The goal is to understand how applying QR codes on packaging as an information provider can build quality perceptions and influence purchase intentions over traditional packaging. The level of involvement is also taken into consideration as a moderator to understand the potential interest of involved consumers in a category often considered low involvement. A survey was developed in the form of A/B testing to proceed to the confirmatory approach. Research hypotheses were tested using linear regression, independent samples t-test, and Prof. Andrew Hayes's process models 1, 4 and 5 procedures. Results identify informative packaging elements as non-significant predictors of purchase intention in both types (Printed and QR). Furthermore, only a high level of involvement is significant in the moderation between informative packaging elements and purchase intention. Lastly, perceived quality does not mediate the relationship between informative packaging elements and purchase intentions. Among the implications of these results are possible limitations on the measurement of the variables ending up contrasting with the insights from the literature.

Keywords: Marketing, Communication, Packaging, QR Code, Information, Involvement, Quality, Purchase Intention

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SUMÁRIO

As embalagens têm vindo a evoluir desde os dias em que serviam um propósito unicamente funcional. Ao longo do tempo, foram desenvolvidas como uma ferramenta fundamental para comunicar diretamente com os consumidores. Este estudo foca-se nas embalagens como uma ferramenta de comunicação considerando os elementos informativos das embalagens e as aplicações dos códigos QR para o mercado das especiarias. O objetivo é perceber como ao aplicar QR Codes nas embalagens como fonte de informação pode construir perceções de qualidade e influenciar intenções de compra superiores às embalagens tradicionais. O nível de envolvimento é tido em consideração como um moderador para compreender o potencial interesse de consumidores envolvidos numa categoria normalmente considerada como baixo envolvimento. Um inquérito foi desenvolvido em formato A/B para proceder à abordagem confirmatória. Hipóteses de pesquisa foram testadas utilizando regressões lineares, um t-test de amostras independentes, e os modelos 1, 2 e 5 do Prof. Andrew Hayes. Os resultados identificaram os elementos informativos como indicadores não significativos da intenção de compra em ambos os tipos (Impressos e QR). Além disso, apenas um nível de envolvimento alto é significativo na moderação entre elementos informativos e intenção de compra. Por último, perceção de qualidade não medeia a relação entre elementos informativos e intenção de compra. Entre as implicações nestes resultados estão possíveis limitações na forma como as variáveis foram medidas, contribuindo para um contraste com as informações obtidas na literatura.

Palavras-chave: Marketing, Comunicação, Embalagens, Código QR, Informação, Envolvimento, Qualidade, Intenção de compra

Título: Comunicação em embalagens e códigos QR: um estudo sobre informação, qualidade, envolvimento e intenção de compra para o mercado de especiarias

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GLOSSARY

FMCG 3 Fast Moving Consumer Goods

QR 3 Quick Response

SPSS 3 Statistical Package for the Social Sciences

IP 3 Internet Protocol

PQ 3 Perceived Quality

LI 3 Level of Involvement

PI 3 Purchase Intention

VIF 3 Variance Inflation Factor

IPE 3 Informative Packaging Elements

CHAPTER 1: INTRODUCTION

1.1 Background

Packaging used to be a single element that essentially served the functional purpose of containing the product from the store to the consumer's home in a practical and convenient way according to the consumption needs of each consumer. When most products were sold in a counter style one-to-one buyer seller interaction, the task of communicating all the relevant product information was fully in charge of the seller. Once products began to be widely available and ready to buy in-store straight from the shelves, the integration of promotional elements with the functional attributes of packaging started to become an increasingly relevant matter (Twedt, 1968). Today, terms such as shelf-life, the silent salesman or the brand representative are commonly attributed to signify the relevance of packaging. In the FMCG's market, a successful optimization of communication for food products is rooted in the approach that aims at understanding consumer's perceptions of packaging. (Silayoi & Speece, 2007). Such perceptions are built in increasingly fast paced environments where packaging elements play a crucial role in bridging between the product and the consumer (Rettie, 1996). With a common distinction between visual and informative elements, impacting consumer's quality perceptions of the product at various levels depending on the nature of the product or how involved a consumer is (Silayoi & Speece, 2004; 2007). Despite the common notation of FMCG's being regarded as low involvement products, not every consumer acts the same way (Kumar et al., 2012). Therefore, providing accurate and attractive product information can be key to reaching consumer's purchase interest (Wyra & Barska, 2017). However, a challenge arises with the integration of information on packaging due to the limited space, making marketers look at new opportunities to integrate technologies such as QR codes as a connection between the product and an unlimited source of information (Huda et al., 2022) to enhance packaging with extended product related features (Rotsios et al., 2022).

1.2 Problem Statement

Exploring the role of packaging as a communication tool, this research will aim to understand the application of informative packaging elements in the fast-paced world consumers live in and build their purchase decisions. Given the current limitation with physical packaging, a new interactive form of receiving product-related information through QR codes is being accessed.

Integrating the perceptions of quality and the unique involvement that consumers have with the information on food products, the following research questions are formed:

RQ1: How differently do QR-Code and Printed product information display impact purchase intentions?

RQ2: Is perceived quality a driver of purchase intentions in the relationship with product information?

RQ3: Can the level of involvement play a significant role in a low-involvement product category?

1.3 Relevance

Research on packaging has been developed for a long time proving the ability of this element to adapt to new developments and thrive in the market as a major strategic element for products and brand's success. Most approaches to packaging communication see it as a vehicle for brand communication but in a world where consumers are cluttered with advertising messages, in an already highly competitive market, the development of packaging is beyond essential (Underwood, 2002), as consumer's perceptions directly at the point of purchase represent about 70% of purchase decisions where packaging can be <the only marketing communication the consumer may receive while evaluating the product= (Poturak, 2014). Recent studies have explored QR code usage on food products reaching the conclusion that this technology is able to help consumers understand product characteristics when provided with relevant usage information even if the consumer is already used to that product (Rotsios et al., 2022). Spice products are among the most popular in the world. The industry is attractive and can be looked at for consistent growth and a variety of applications (García-Casal) however, research is extremely limited for these products and it is a personal belief that linking the potential to provide unlimited information through QR Codes to the unlimited possibilities of recipes in spice products could be a strong foundation for an information centered strategy that attracts the more involved consumers, builds loyalty with the brand and ultimately is recommended to an unlimited network of consumers.

1.4 Research methods

A mixed approach was applied to answer the research questions. A review of the literature provided insights into the variables considered for the study which then allowed for the hypothesis to be developed and tested to combine confirmatory analysis with what has been explored in the literature. Statistical analysis with linear regressions among the variables, t-test and the use of Prof. Andrew Hayes's process models for moderation (1), mediation (4) and a full model test (5) (Hayes, 2013) were applied to the data and produced the results to verify the hypothesis.

1.5 Dissertation outline

The following dissertation is segmented into five major chapters. The introduction provides an overview of the field of study, the problem and the relevance of investigating it. It is followed by a second chapter where the collection of a literature review explores the concepts, research already developed and the relationship between those so the research hypothesis can be created. Furthermore, a methodology section underlines the process of exploration and confirmation methods of investigation that enable the collection of data using a survey for the confirmatory analysis. The results chapter includes the findings from the survey and discusses those with the literature review. The fifth and final chapter presents the conclusions of the study, answers the research questions, and acknowledges the limitations and future research guidelines for those who are interested in further developing the study developed in this dissertation.

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

The following chapter presents a review of the available literature in the field of this research. The chapter includes the definitions and relevant studies on purchase intention, packaging as a communication tool, informative packaging elements, QR usage in packaging, perceived quality as a mediator and the level of involvement as a moderator. The information collected allows for the hypothesis to be developed, culminating in the conceptual model that represents the structure of this research.

2.1 Purchase Intention

Consumer purchasing decisions are often considered challenging to measure due to the variety of factors that play a role in each different consumer (Lemon & Verhoef, 2016). The construct known as Purchase Intention provides a measurable outcome focused on the probability of a purchase decision taking place in a determined context (Morrison, 1979). This measure of intention is based on perceptions built under the research environment (Chandon et al., 2005), where, in the case of marketing research, potential consumers access their decision to buy a certain product or service under the <assumption of a pending transaction= (Chang & Wildt, 1994), enabling the development of a valuable indicator for an actual purchase to occur in the future from the consumer (Armstrong et al., 2000).

2.2 Packaging as a Communication Tool

In the nature of the FMCGs market where all the products are positioned side by side on a shelf, packaging has a pivotal role to communicate to the consumer at the time and place the decision is being made (Silayoi & Speece, 2007). Communication is regarded as one of the basic functions of packaging alongside containment, protection and convenience (Kumar et al., 2012), with the particular role of informing and educating the consumer while also promoting the product inside (Wyra & Barska, 2017).

The importance of developing packaging with a communication function came into play when retail shifted towards a mass appealing self-service configuration where consumers rely on packaging to understand how a certain product can meet their consumption goals straight from the shelf (Twedt, 1968). According to Prendergast & Pitt (1996), packaging has two different

functional purposes, the logistical purpose where the goal is to protect and contain the product until the moment of consumption, and the marketing purpose where communication regarding product attributes is key to selling the product by attracting consumer's attention at the point of purchase.

The communicative capabilities of packaging fall under different dimensions in research regarding the way it sells and attracts the consumer, which ultimately impacts the decision at the point of purchase. Underwood (2003) defines packaging as a product-related attribute that communicates brand identity. The packaging itself holds a communicative role that represents the identity of the brand through design elements that give meaning to the product, which can be favorable or unfavorable (Silaroy & Speece, 2004), ultimately influences consumer's self-identity with the brand, impacts the purchase decision and enhances the relationship between the brand and the consumer. Kumar et al. (2012), extend the role of packaging within the brand activity, implying that when the consumer has been exposed to prior brand communications, packaging acts as an activation touchpoint between the brand and the product inside. However, brand communications and proposed identity may not always be perceived by consumers. The exponential rise in advertising exposure contributes to a cluttered environment that finds consumers filtering through the messages and being more present at the point of purchase pushing the final decision to be based on the perceptions built upon observing and interacting with the packaging (Underwood, 2002), increasing the probability to be the one and only marketing communication consumers are exposed to (Poturak, 2014).

During the consumer's exposure to the product at the point-of-purchase, packaging must assume the role of a "silent salesman" (Pilditch, 1961), communicating with the consumer as if it was performing a sales pitch with the goal of being acquired from the shelf, leading to an increasingly challenging task to stand out with highly attractive, positive, yet non-deceiving, effective packaging communication (Underwood & Ozanne, 1998). To respond to this challenge, research has explored the development of packaging elements that should be considered when evaluating the communicative power of packaging in influencing purchase decisions (Silaroy & Speece, 2004).

2.2.1 Informative Packaging Elements

On the elements of packaging, Kotler (2003), underlines six elements that must be carefully evaluated to comprise an effective packaging: size, form, material, color, text and brand. Within this general approach, several researchers conceptualized the segmentation between two distinct types, the visual and informative packaging elements (Underwood, 2003; Silayoi & Speece, 2007; Kumar et al., 2012), the latter being the focus of this study.

Visual elements englobe the design aspect of packaging including colors, typeface, logos, graphics (Underwood, 2003), packaging size, shape / form (Silayoi & Speece, 2007) and materials, producing a visual appeal (Kumar et al., 2012). In contrast, informative elements are related to the verbal role of packaging providing an identification (Underwood, 2003), through product-specific information using labels including origin, production and usage instructions (Kumar et al., 2012), font style and innovative solutions enhancing the capabilities of packaging with technology (Silayoi & Speece, 2007; Poturak, 2014).

Aligning the core offering of the product with the necessary information is particularly crucial in products that are sold in a form that requires preparation to be consumed (Underwood, 2002; 2003), as is the typical case for food products. The specificity within the use of information on packaging is the cognitive aspect of consumption (Wyra & Barska, 2017), assisting the consumer in the identification of product attributes while carefully forming a purchasing decision (Silayoi & Speece, 2004). These product attributes can be distinguished between intrinsic and extrinsic (Metha et al., 2024). Intrinsic attributes are related to the core offering regarding properties such as texture, flavor or smell of the product itself (Acebrón & Dopico, 2000; Brečić et al., 2017;). Extrinsic attributes are those that do not constitute the physical properties of the product despite being regarded as product related characteristics (Olson, 1977, as cited in Acebrón & Dopico, 2000), such as price, country of origin, brand and labeling (Hoffman et al., 2020). These extrinsic attributes reflect analogous properties with informative packaging elements, such as labels, with consumers relying on product characteristics found in product packaging to develop an informative purchase decision (Silayoi & Speece, 2004).

2.1.2 QR Codes and Packaging Applications

Quick Response Code, commonly abbreviated to <QR Code=, is a matrix barcode technology developed in 1994 by the Japanese company Denso Wave, a Toyota subsidiary, with the original purpose of providing a tool for tracking inventory during production in a vehicle manufacturing plant (Tiwari, 2016).

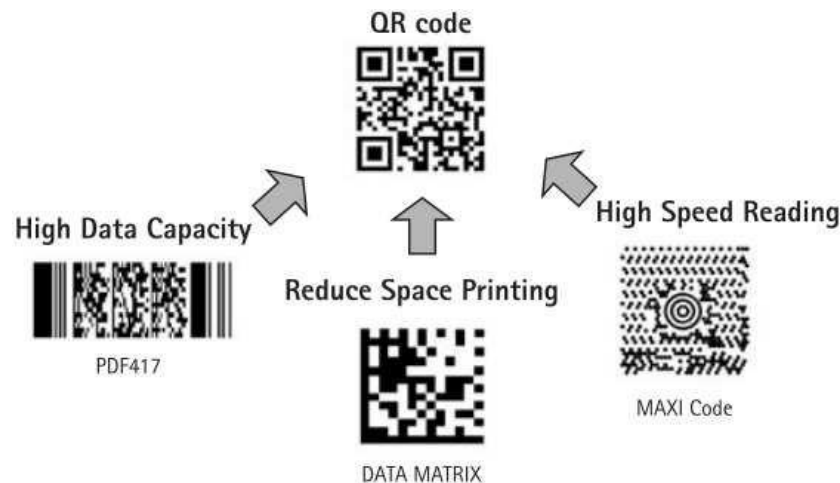


Figure 1: The development of QR Code (Soon, 2008)

The QR Code is a two-dimensional barcode aggregating the high data capacity of a PDF417 barcode, the small size and density within a Data Matrix and the enhanced readability provided with a MAXI Code, allowing for a quick and convenient accessibility to data (Soon, 2008) such as URLs, text, pictures and videos using either a dedicated scanner or a mobile device camera (Lo et al., 2013). QR codes are able to provide much higher data capacity and readability than a one-dimensional barcode typically applied as a product label used to scan consumer goods at the point-of-sale, known as Universal Product Code (UPC) in the United States of America and Canada, or European Article Number (EAN) in the rest of the world (Tiwari, 2016; Amrutkar et al., 2017). Such characteristics paired with the rising adoption of smartphones equipped with cameras, internet connection and processors with QR code scanning capabilities, enabled QR code usage in a much broader range of applications than originally intended (Lo et al., 2013), as seen in logistics, education, tourism, transportation, social media, trade, marketing and entertainment industries (Hedvall L., 2023; Rotsios et al., 2022; Amrutkar et al., 2017; Lo et al., 2013). Some examples are commercial tracking, ticketing for transport and entertainment, in-store labeling and product/loyalty marketing (Lo et al., 2013; Soon 2008).

QR codes can be applied to several product and advertising platforms for marketing purposes including product packaging, point-of-purchase display and advertising media (Ryu & Murdok, 2013). Several studies have explored the potential applications of QR codes in marketing. Ryu & Murdok (2013) signal QR codes as a retail innovation aligning the surge in smartphone usage to the potential to develop mobile marketing communications verifying that consumers perceive a positive QR code usage intention finding it useful in experiential retail settings. Cata et al. (2013) adds to the potential of this tool as one that cannot be replicated with any sort of physical printed page or billboard, highlighting the ability to build a connection to any sort of digital resource from which QR codes build value in a much more interactive way than any traditional physical advertising supports used by marketers.

Focusing on packaging applications, QR codes are considered connected packaging, a subset of smart packaging (Ales, 2019). According to Rotsios et al. (2012), the QR code usage in product packaging can complement the communicative function of packaging as a means to provide product information that successfully enhances comprehension of product characteristics mitigating any doubts the consumer might have regarding the consumption of that product. Beyond accommodating more information, any updates to the content of a QR code previously placed on a product packaging will automatically apply without the need for a reprint allowing for optimal maintenance of the external information attributed to the product such as usage instructions (Huda et al., 2022). Some of the already existing applications of QR codes on packaging explore the potential to share extended product information with consumers, as seen in Table 1.

One of the major issues when developing the physical product packaging as a communication tool is the limited space that greatly reduces the possibilities to offer all the information that managers might be interested in applying to the product and that greatly assists the consumer when considering the purchase of a designated product (Silayoi & Speece, 2004; 2007), thus looking at new ways to display information such as the use of QR Codes that provide unlimited information, could theoretically be a valuable tool to enhance packaging communication capabilities.

Packaging	QR Application	Information
		<i>Iglo</i> <Douradinhos= <Where does my fish come from?= - The consumer is able to acquire knowledge on the origin of the fish used to prepare the final product included inside that specific packaging.
		<i>Manteigaria</i> <Pastéis de Nata= <Our Factories=, The consumer is able to retrieve information regarding the location of the stores, named as <factories= in major cities such as Lisbon.

Table 1: QR applications on existing brands <Iglo= and <Manteigaria= packaging

Furthermore, consumers look for more information when product characteristics require transformation to be consumed (Underwood, 2002; 2003), such as in the case of spice products. Finding this information can then play a decisive role in the decision making of consumers ultimately impacting the final purchase decision (Wyra & Barska, 2017). Thus, the following hypotheses are developed:

Hypothesis 1:

- Hypothesis 1a: Informative packaging elements have a positive impact on purchase intentions.
- Hypothesis 1b: Informative packaging elements via QR Code display have a higher impact on purchase intention than through printed display

2.3 Perceived Quality

The assessment of quality is widely subjective being based on the judgment of each consumer to perceive a product as a superior quality one, over another potential choice (Tsotsou, 2006). Perceived quality provides insights into the quality assessment of a product even when no usage experience occurs, such as <actual consumption= (Ophuis & Van Trijp, 1995).

Poturak (2014), highlights the importance of packaging in providing the consumer with information, and communicating the quality of the product. In the eyes of the consumer, the integration of product information on packaging is an increasingly important determinant of perceptions of product quality (W. Verbeke et al. as cited by Wyr & Barska, 2017), providing extrinsic driven quality cues that crucially enable product quality expectations at the point of purchase (Acebrón & Dopico, 2000). Consumers are evaluating the product through concrete information rather than building those perceptions only through images (Silayoi & Speece, 2007). Perceived quality driven by product attribute information is a major indicator that managers need to allocate efforts to effectively communicate the product attribute information through packaging so that when facing a decision between a competitor product, consumers perceive the product as superior over other potential choices (Chang & Wildt, 1994).

Perceived quality is commonly used as a connection between variables (Tsotsou, 2006), further connecting with products or services. Perceived quality is a response to an observation and is able to determine perceptions such as the purchase intention of that product (Asshidin et al., 2016). Perceived quality responds to an observation and translates into an action, making it a very suitable concept to measure intentions built from previous observation, working as a solid mediator in the fast-paced decision-making process at the point of purchase: Based on these findings and conclusion, the following hypothesis are developed:

- Hypothesis 2: Perceived quality, driven by informative packaging elements, positively impacts purchase intention
- Hypothesis 3: Perceived Quality mediates the relationship between informative packaging elements and purchase intentions

2.4 Level of Involvement

The level of involvement has been approached by consumer behavior research as a measure classified by high and low involvement levels reflecting the importance one gives to the consumption activity (Michaelidou et al. 2008).

Despite the well-recognized distinction between high and low, involvement can be understood across different dimensions. Babin et al. (2023), refer to product and shopping involvement where product involvement dictates the personal relevance a consumer gives to a product category, a level <above= are the product enthusiasts who are characterized by their very high involvement within the product category, and lastly, the shopping involvement dictated by the personal relevance of the shopping activity. The situational and enduring involvement is a more complex approach to the concept. Situational involvement refers to a short-term interest in a product on a special occasion or formed directly at the point of purchase, in contrast, enduring involvement refers to a consistent, long-term involvement such as a habit of engaging with a particular product / category. (Michaelidou et al. 2008).

In low involvement product categories, the experience with product packaging is especially able to meet consumer's self-identity and enhance consumer relationships (Underwood, 2003). However, it is important to understand that consumers evaluate packaging in different ways (Silayoi & Speece, 2007). According to Kumar et al. (2012), even though food products tend to be considered low involvement, some consumers can express high levels of involvement with these products, indicating personal involvement, and further concluding that the verbal elements of packaging (where product information can be found) have a stronger effect on those high involved consumers than the visual elements. Furthermore, curiosity, experience and level of attention towards food information are among the cognitive contributors to involvement with food products (Castellini & Graffigna, 2022). These characteristics and definitions align with similar observations on the impact of packaging information in the cognitive process within the purchase decision (Wyra & Barska, 2017), therefore the following hypothesis is developed:

- Hypothesis 4: Level of involvement moderates the relationship between informative packaging elements and purchase intention. A high level of involvement affects the relationship between informative packaging elements and purchase intention more strongly than a low level of involvement.

2.5 Conceptual Framework

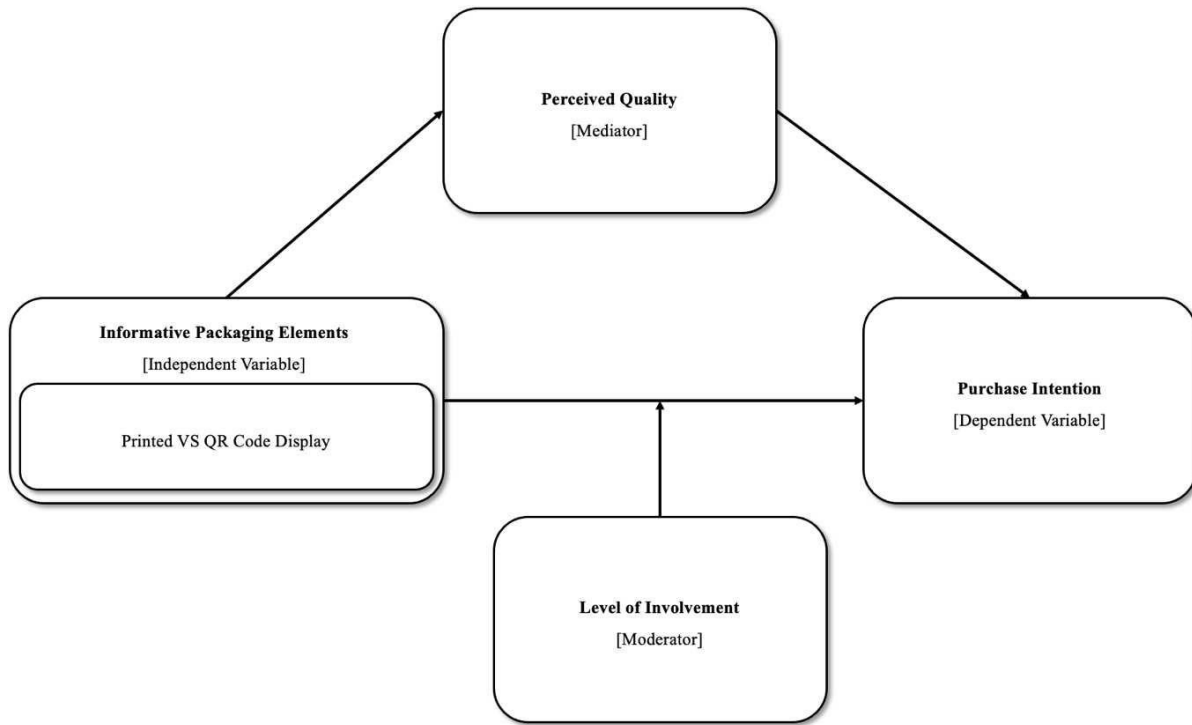


Figure 2: Conceptual Model

The conceptual model built from the insights obtained in the literature review has the goal of testing the impact of informative packaging elements, considering two distinct ways of displaying the information, on purchase intention considering the mediator role of perceived quality and the moderator level of involvement, with the following hypotheses to be tested:

H1a: Informative packaging elements have a positive impact on purchase intentions

H1b: Informative packaging elements via QR Code display have a higher impact on purchase intention than through printed display

H2: Perceived quality, driven by informative packaging elements, positively impacts purchase intention

H3: Perceived quality mediates the relationship between informative packaging elements and purchase intentions

H4: Level of involvement moderates the relationship between informative packaging elements and purchase intention. A high level of involvement affects the relationship between informative packaging elements and purchase intention more strongly than a low level of involvement.

CHAPTER 3: METHODOLOGY

This chapter presents the methodology taken to the overall research assessing the approach considered for the study and the procedure to test the hypothesis formulated in Chapter 2, including the development of primary data source, sampling, stimuli creation, measurement items and the data analysis procedures for the results section.

3.1 Research Approach

The research follows a mixed approach with an exploratory and confirmatory approach. The literature review represented the exploratory approach where all the variables were analyzed with the literature from books, articles and research papers as a basis to understand the core concepts meaning, the type studies on them and the commonalities observed between each other allowing for the development of relationships culminating in the conceptual model. This model and the relationship between the variables built from previous research, need to be tested and analyzed to confirm the research hypothesis built on the literature review chapter. These tests are performed and discussed in the results chapter, representing the confirmatory approach. While the exploratory is qualitative and based on the existing literature to provide the essential research hypothesis, the confirmatory is quantitative and responds to the hypothesis with data generated for that purpose.

3.2 Primary Data

An online survey was developed to collect the necessary data to confirm the relationship between the variables. Following the logic of the conceptual model built from the literature, the independent variable <Informative Packaging Elements= is segmented between two possible <display= types, a <Printed= and a <QR Code=, driving the research to an A/B test structure to collect and compare the impact of those two distinct observations with the outcome variables. The survey was designed with a total of six distinct sections. The first section of the survey consisted of the filtering of relevant samples with a screening question, the second section collected the respondent9s level of involvement with product information, and then a stimulus was presented to the respondents, where the sample was evenly distributed to one of the possible two stimuli. Then, the survey proceeds to the fourth section regarding perceived quality and the

fifth section regarding purchase intention, both perceived from the stimulus observation. The sixth and final section collected the demographic data of respondents.

3.2.1 Data Collection

Data collection took place between July 30th and August 21st, 2024, gathering a total of 128 responses. The sample was collected following a non-probability sampling subject to a screening question, and with close to equal allocation within two possible scenarios. The sample is representative on a small scale and is subject to potential bias due to the snowball effect or direct contact with the researcher during distribution due to the survey being shared through online distribution channels such as social media and private communication platforms.

3.2.2 Stimuli Development

Two stimuli were developed based on the A/B test approach to the survey. The spice market is vast making it difficult to choose a product that is good for general data collection. Due to its widely regarded popularity, and importance throughout the history of the spice trade and for the large representation of 20% of the world's spice trade (Dodds, 2024), Black Pepper was selected. The stimuli design was developed with a focus on information, similar to Silayoi & Speece (2007), where neither brand nor logo is referenced in the stimuli, as those are not elements to be considered in this study. Precisely, the extended information was the focus and hence suggestions for a recipe (Frost, 2024) are the element to be seen on either a printed or QR code version:



Figure 3: Printed display stimuli

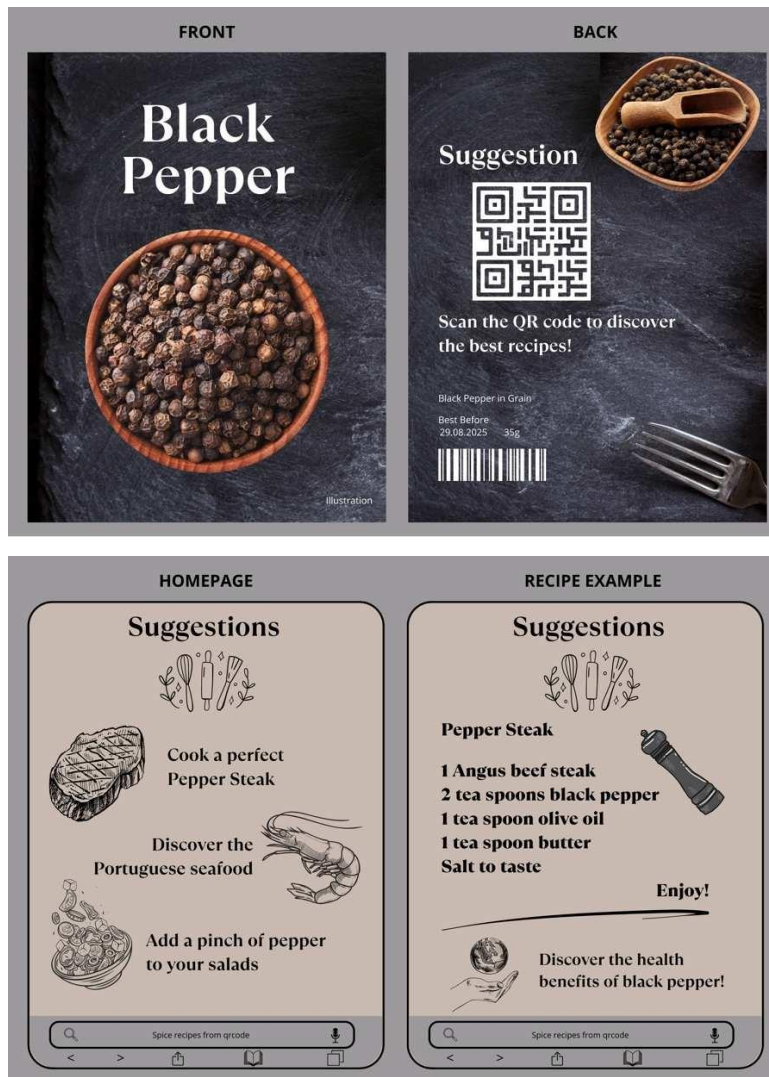


Figure 4: QR code display stimuli

As precepted through Figure 3 the printed stimuli only offer the possibility to observe limited product information, on the other hand, Figure 4 shows the QR stimuli offering a variety of suggestions beyond the printed one, with a concept of the information being displayed on a smartphone with the homepage and the recipe suggestion example. The recipe example is the same across stimuli to maintain the consistency of the observations.

3.2.3 Measurement / Indicators

The items chosen for the measurement of the variables were a result of an extensive literature review searching the relevant items that properly identified the meaning and purpose of the variables in the context of this research. Each construct's number of items and measurement scale can be seen in the operational model (Table 2):

Framework	Measure	Items	Scale	Reference	Cronbach α
Independent Variable	Informative Packaging Elements	Stimuli	--	--	--
Mediator	Perceived Quality	3	5-Point Likert Scale	(Konuk, 2018)	0.89
Moderator	Level of Involvement	4	5-Point Likert Scale	(Li et al., 2020)	n/a
Dependent Variable	Purchase Intention	4	5-Point Likert Scale	(Vilnai-Yavetz & Koren, 2013)	0.84

Table 2: Operational Model

All items were applied to the survey in their original form, measured through 5-point Likert scales (Table 2), with the model construct questions (Table 3) segmented to each section of the survey comprising the variable being measured, as previously indicated, allowing for the development of the full survey (Appendix 1)

Perceived Quality	Level of Involvement	Purchase Intention
- This product is of high quality - This is a superior product - This product is of very good quality	- I usually read ingredients on food labels - I check the country-of-origin on food - I check the dates printed on products - I seek information on new packaging	- I believe that most people would like to buy this product - I would be glad to try the food in this package - I would recommend this product to my friends - I would purchase this product

Table 3: Model Construct Questions

3.3 Data Analysis

Data analysis was conducted using the SPSS (Statistical Package for the Social Science) software version 29.0.2.0. The data went through several data cleaning processes, filtering out non-relevant observations from the screening question, failed identifications of the stimuli and analyzing multivariate outliers. A measure9s reliability analysis was conducted to assess the validity of the constructs. Then, a descriptive analysis was conducted to characterize the sample, and their answer9s means, min, max and standard deviation. A multicollinearity diagnostic was run, followed by hypothesis testing. Here linear regression, independent samples t-test and Prof. Andrew F. Hayes process macro for models 1 and 4 were computed for hypothesis testing. The analysis culminates in a full model test representative of process model 5 (Hayes, 2013). All inferential statistics tests were taken at a 95% confidence interval and a 5% reference significance level.

CHAPTER 4: RESULTS AND DISCUSSION

This chapter presents the process of cleaning the data through the elimination of missing data, outliers and checks, verifies the consistency of the data through the variable9s creation and reliability analysis of the constructs presented in the operational model and provides multicollinearity diagnostics allowing for the hypothesis testing through regression analysis, t-test, and process model with mediated, moderated, and full model test to be performed and interpreted relating with the findings of the literature chapter.

4.1 Results

The database obtained from the online survey registered a total of 128 respondents. A pre-programmed function on Qualtrics certified that none of these were incomplete submissions or repeated entries through controlled IP addresses. However, on SPSS, where all analysis from this point forward will be conducted, missing data was identified creating a filter variable to identify those who answered <no= to the screening question <Have you ever bought a spice product from the supermarket?=. With 4 respondents identified, meaning they have never bought a spice product from the supermarket, the sample is reduced to 124 observations.

As mentioned in the methodology section, the survey was then segmented into two stimuli. 65 respondents proceeded the survey according to the observation of a stimuli with <Printed= information and 59 respondents to a stimuli with <QR Code= information. Here, 10 observations were not effectively manipulated. Creating a filter variable for question 7: <Looking at this specific packaging, where can you get suggestions on how to use this product?=. 6 observations from the <Printed= stimuli and 4 observations from the <QR Code= stimuli, failed to identify the source of information in the stimuli observed. Selecting the option <reading the back= regarding the <Printed= stimuli, or <scanning a QR code= regarding the <QR Code= stimuli would enable the respondent to proceed, which was the case for the valid 59 observations on the <Printed= stimuli and the valid 55 observations on the <QR Code= stimuli, for a total of 114 valid observations.

To proceed with the data cleaning procedures, the reliability of the constructs <Level of Involvement=, <Perceived Quality= and <Purchase Intention= was verified to guarantee the validity and the items to include in the new variable9s creation. The construct9s survey items

were inserted in a reliability analysis to verify the internal consistency and validate the reliability of each construct through the coefficients obtained with the Cronbach alpha. During this procedure, no item was deleted. According to Ursachi et al. (2015), the coefficients should achieve a value in a range between 0 and 1, with an acceptable level of reliability starting at 0.70, and a very good level at 0.80 or greater. The Cronbach alpha coefficients obtained for the constructs (Table 4) show an acceptable level for the <Level of Involvement= at 0.734, and a very good level for both <Perceived Quality= at 0.891 and <Purchase Intention= at 0.850. This indicates good internal consistency, meaning the items are measuring the respective construct as expected, providing the validity of the constructs.

Construct	Number of Items	Cronbach α
Level of Involvement	4	.734
Perceived Quality	3	.891
Purchase Intention	4	.850

Table 4: Construct's measure reliability – Cronbach α

With the number of items verified, the model construct questions applied to the survey were coded into new variables. According to the conceptual model, a total of four variables were created: The independent variable <Informative Packaging Elements=, coded as a new nominal variable named <Type=, using the answers to question 7 where, <1= identifies the observations from the <Printed= stimuli and <2= the observations from the <QR Code= stimuli. The dependent variable <Purchase Intention= is coded as <PI=, the mediator <Perceived Quality= as <PQ=, and the moderator <Level of Involvement= as <LI=, all three as scale variables computed for each construct with the mean obtained from the answers to the respective items seen in the <Table 3 Model Construct Questions= in the methodology.

To identify outliers, the three scale variables <PI=, <PQ= and <LI=, were inserted in a linear regression as independent variables to compute the Mahalanobis distance variable <MAH_1=. Then, a new variable <Prob_MD= was computed using a chi-square distribution with 3 degrees of freedom (Numeric Expression = 1 3 CDF.CHISQ(MAH_1,3)), providing the p-value of the distances with an observed minimum value of .006. With all values above .001, there is no indication of the presence of outliers. Furthermore, according to the Central Limit Theorem, with a sample that achieves a large size where $n > 30$, normality is achieved, therefore, a normal

distribution of the variables was assumed, given the final sample size with 114 valid observations.

	Stimuli 1 (Printed)	Stimuli 2 (QR)	Total
Initial respondents	-	-	128
Repeated IP9s	-	-	0
Failed screening question	-	-	4
Respondents per Stimuli	65	59	124
Failed Manipulation	6	4	10
Outliers	0	0	0
Valid Observations	59	55	114

Table 5: Missing Data Segmentation

The data cleaning procedures allow for the development of exploratory data analysis, conducting descriptive analysis on SPSS to obtain the sample characterization.

The sample descriptive data for gender indicates a majority of female respondents with 63 observations representing 55.3%, followed by the male respondents with 49 observations representing 43% of the sample, and a residual of respondents who preferred not to say their gender with 2 observations representing 1.8% of the sample.

Gender	Frequency (n)	Percentage (%)
Male	49	43.0%
Female	63	55.3%
Prefer not to say	2	1.8%
Total	114	100%

Table 6: Descriptive data for gender

Regarding age, within the gap of 18 through 65+ years, it is observable in <Table 7= that the sample is very diverse. The age gap of 45-54 represents the mode with 26 observations accounting for 22.8% of the sample; the 18-24 gap with 25 observations representing 21.9% comes just after the mode with the difference of a single observation. The observations from the gaps 65+, 55-64 and 25-34 are almost evenly divided with 19, 18 and 17 observations

accounting for 16.7%, 15.8% and 14.9% of the sample respectively. The 35-44 age gap is the least represented with 9 observations accounting for 7.9% of the sample.

Age	Frequency (n)	Percentage (%)
18-24	25	21.9%
25-34	17	14.9%
35-44	9	7.9%
45-54	26	22.8%
55-64	18	15.8%
65+	19	16.7%
Total	114	100%

Table 7: Descriptive data for age

Not surprisingly, considering the age of the respondents, the majority of the sample is currently employed with 43 observations accounting for 37.7% of the sample, and the second most represented occupation is students with 28 observations accounting for 24.6% of the sample. With 21 observations self-employed accounts for 18.4%, retired with 17 observations accounts for 14.9% and student workers with 5 observations accounting for 4.4% make up the remainder of the sample.

Occupation	Frequency (n)	Percentage (%)
Student	28	24.6%
Student Worker	5	4.4%
Employee	43	37.7%
Self-Employed	21	18.4%
Retired	17	14.9%
Total	114	100%

Table 8: Descriptive data for occupation

Comparing the means, minimum, maximum and standard deviation values, it is possible to perform an exploratory data analysis using descriptive statistics to compare the data collected in the sample observations item by item within each construct across the two survey scenarios.

The descriptive statistics for the items on Level of Involvement (Table 9) show a particular favorability towards the attention given to the dates printed on the products, being a key focus of the respondents when interacting with the packaging information. Furthermore, the higher standard deviation in information seeking on new packaging assumes a degree of individuality that contributes to each respondent's level of involvement.

Item	Stimuli	Count	Min	Max	Mean	ST. Dev.
I usually read the ingredients on food labels	Total	114	1	5	3.11	1.185
I check the country-of-origin on food	Total	114	1	5	2.93	1.295
I check the dates printed on products	Total	114	1	5	4.04	1.237
I seek information on new packaging	Total	114	1	5	3.04	1.385

Table 9: Descriptive statistics for Level of Involvement

Referring to Table 10, perceived quality perceptions show very similar means across the stimuli, although, the higher standard deviations from the QR stimuli suggest more varied reactions than the ones from the Printed stimuli across the items. Through the comparison of the means, the printed stimuli were perceived as a high-quality product. As for the QR code, it is verified that respondents perceived it as both a superior and very good quality product.

Item	Stimuli	Count	Min	Max	Mean	ST. Dev.
This product is of high quality	Printed	59	2	5	3.51	.796
	QR	55	1	5	3.47	1.103
	Total	114	1	5	3.49	.952
This product is a superior product	Printed	59	1	5	3.37	.889
	QR	55	1	5	3.60	1.047
	Total	114	1	5	3.48	.971
This product is of very good quality	Printed	59	1	5	3.36	.826
	QR	55	1	5	3.58	.937
	Total	114	1	5	3.46	.884

Table 10: Descriptive statistics for Perceived Quality

The results in Table 11 show an overall favorable purchase intention for both packaging options and very consistent responses across the observations with low standard deviations. The QR code packaging was more favorable in terms of overall purchase intentions, with respondents indicating they would purchase for themselves and believing most people would also like to buy the product. Respondents were close to perfectly aligned regarding favorability towards trying the food inside the packaging. Furthermore, in both packaging stimuli, the recommendation of the product to friends registered slightly lower perceptions in comparison with the other items.

Item	Stimuli	Count	Min	Max	Mean	ST. Dev.
I believe that most people would like to buy this product	Printed	59	1	5	3.58	.747
	QR	55	1	5	3.73	.912
	Total	114	1	5	3.65	.831
I would be glad to try the food in this package	Printed	59	2	5	3.86	.776
	QR	55	1	5	3.80	.989
	Total	114	1	5	3.83	.831
I would recommend this product to my friends	Printed	59	1	5	3.27	1.048
	QR	55	1	5	3.42	1.031
	Total	114	1	5	3.34	1.038
I would purchase this product	Printed	59	1	5	3.56	.896
	QR	55	1	5	3.71	1.149
	Total	114	1	5	3.63	1.024

Table 11: Descriptive statistics for Purchase Intention

Before proceeding to hypothesis testing, it is crucial to conduct a multicollinearity analysis to confirm the relationships between the variables are accurately estimated, ensuring accurate results. Thus, a linear regression with the scale variables developed for the independent variable represented as type, the mediator perceived quality and the moderator level of involvement was performed. The values obtained (Table 12) are within acceptable limits, VIF is all around 1, indicating no signs of multicollinearity, the Eugen values are close to zero but still above a recommended threshold of 0.010 suggesting no problematic variance concentration, and the condition index falling below 15 suggesting no multicollinearity, therefore, the data can be considered suitable to proceed for hypothesis testing.

	Type	Perceived Quality	Level of Involvement
VIF	1.008	1.056	1.051
Eugen Value	0.090	0.052	0.023
Condition Index	6.527	8.607	12.870

Table 12: Multicollinearity diagnostics

4.1.1. The Impact of Informative Packaging Elements on Purchase Intention

Hypothesis 1a: *Informative packaging elements have a positive impact on purchase intentions*

The following linear regression is designed:

$$PI_i = \beta_0 + \beta_1 IPE_i + \epsilon_i$$
$$i = 1, \dots, N$$

Where PI refers to the purchase intention, IPE stands for informative packaging elements and N represents the 114 sample observations.

Assumptions for the linear regression computed in SPSS (Appendix 2) were verified: The Durbin-Watson statistic (1.776) fit within the acceptable range indicating no autocorrelation. The residuals are approximately normally distributed and with a zero mean. There is also evidence of homoscedasticity, but the linearity could not be satisfied due to the nominal nature of the independent variable, nonetheless, the regression results are still presented:

The model obtained ($F(1;112) = .420$; $p > .05$) does not fit within the levels of statistical significance, with $R^2 = .004$ indicating that the model only explains 0.4% of the variance in purchase intention. Furthermore, the positive beta $\beta_1 = .096$ suggests that for each one-unit increase in IPE, purchase intention increases by 0.096 units. However, the p-value of .518 indicates a 51.8% probability that this increase is not explained by IPE. Therefore, considering the non-significant model at ($p > .05$), **Hypothesis 1a is rejected**, thus the null hypothesis indicating informative packaging elements do not impact purchase intention is accepted.

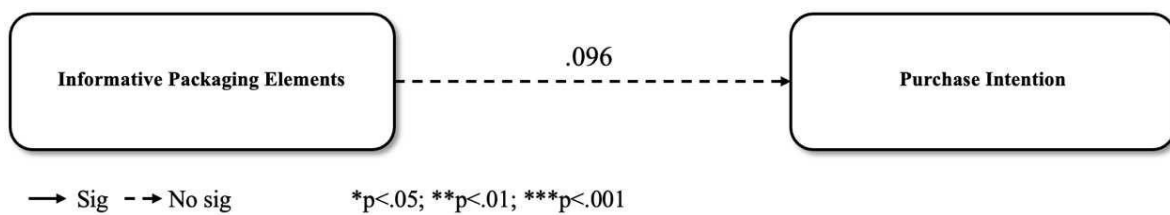


Figure 5: Linear regression for H1a

Hypothesis 1b: Informative packaging elements via QR Code display have a higher impact on purchase intention than through printed display

H1b suggests a difference between the two groups. Following the methodology of the study, where both Printed and QR code displays were observed by distinct parts of the sample with 55 observations on QR Code and 59 on Printed display measuring purchase intention with a 5-point Likert scale, the hypothesis is tested by conducting an independent samples t-test to provide a precise comparison of the means based on the answers for the construct.

The results (Appendix 3) show a very small difference between the mean for Printed and QR observations (Figure 6):

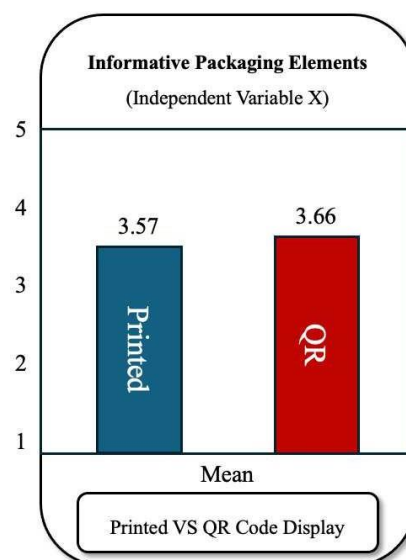


Figure 6: Means for Printed Vs QR purchase intention

At a descriptive level the difference is perceptible despite being very small. Statistically, referring to Levene's test at a significant p-value ($p = .020$), equal variances are not assumed. The two-sided p-value is non-significant ($p = .521$) indicating there's no statistically significant difference between Printed or QR Code display of informative packaging elements in purchase intention. A result that is further defended by Cohen's d indicates a small effect size at $(-.121)$. Therefore, **H1b is rejected**. The null hypothesis that the impact of informative packaging elements on purchase intention does not differ based on the type of display is accepted.

4.1.2. The Impact of Perceived Quality on Purchase Intention

Hypothesis 2: *Perceived quality, driven by informative packaging elements, positively impacts purchase intention*

The following linear regression is designed:

$$PI_i = \beta_0 + \beta_1 PQ_i + \epsilon_i,$$

$$i = 1, \&, N$$

Where PI refers to the purchase intention, PQ stands for perceived quality and N represents the 114 sample observations.

All assumptions for the linear regression computed in SPSS (Appendix 4) were verified: The Durbin-Watson statistic (1.809) fit within the acceptable range indicating no autocorrelation. Linearity is observed, there is evidence of homoscedasticity, and residuals are approximately normally distributed and with a zero mean.

The model obtained ($F(1;112) = 108.456$; $p < .001$) is statistically significant, with $R^2 = .492$ indicating that the model explains 49.2% of the variance in purchase intention. Furthermore, beta $\beta_1 = .651$ is positive suggesting that for each one-unit increase in perceived quality, purchase intention increases by 0.651 units with a p-value at $< .001$ indicating high statistical significance.

Therefore, considering the significant model at ($p < .001$), **Hypothesis 2 is accepted.**

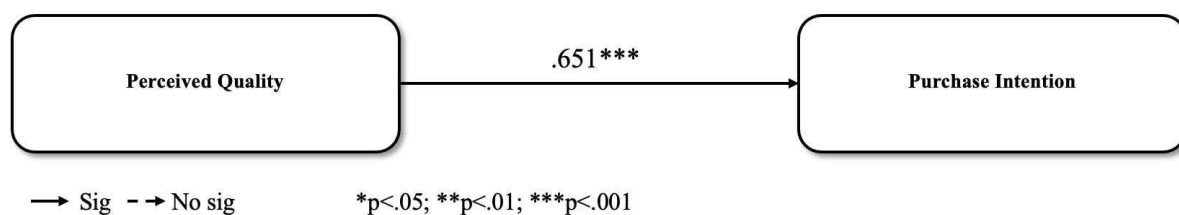


Figure 7: Linear regression for H2

4.1.3. The Mediator effect of Perceived Quality

Hypothesis 3: *Perceived Quality mediates the relationship between informative packaging elements and purchase intentions*

The mediation effect was computed through process model 4 (Appendix 5) and constitutes three key paths for the analysis: (a-path, b-path, c-path (with direct effect c9)).

The effect of informative packaging elements on perceived quality and the effect of perceived quality on purchase intention is estimated by a-path and b-path respectively. The a-path shows a positive coefficient ($a = .1391$) yet non-significant statistically ($p = .3841$) with a 95% confidence interval ($[-.1763; .4545]$). In contrast, the b-path shows a strong statistically significant effect ($b = .6565$; $p < .001$; 95% CI = $[.5257; .7753]$).

The direct effect, estimated by c9-path ($c9 = .0054$; $p = .9599$; 95% CI = $[-.2056; 0.2163]$) and the total effect estimated by c-path ($c = .0958$; $p = .5184$; 95% CI = $[-.1972; .3889]$) are both non-significant statistically, indicating that either directly or when mediated by perceived quality, a significant relationship between informative packaging elements and purchase intentions is not observed.

Furthermore, the indirect effect of informative packaging elements on purchase intentions through perceived quality is not significant considering the bootstrap confidence interval includes zero ($[-.1069; .3082]$), adding to the fact that the only significant relationship is through b-path, the mediation cannot be assumed. Thus, **Hypothesis 3 is rejected**.

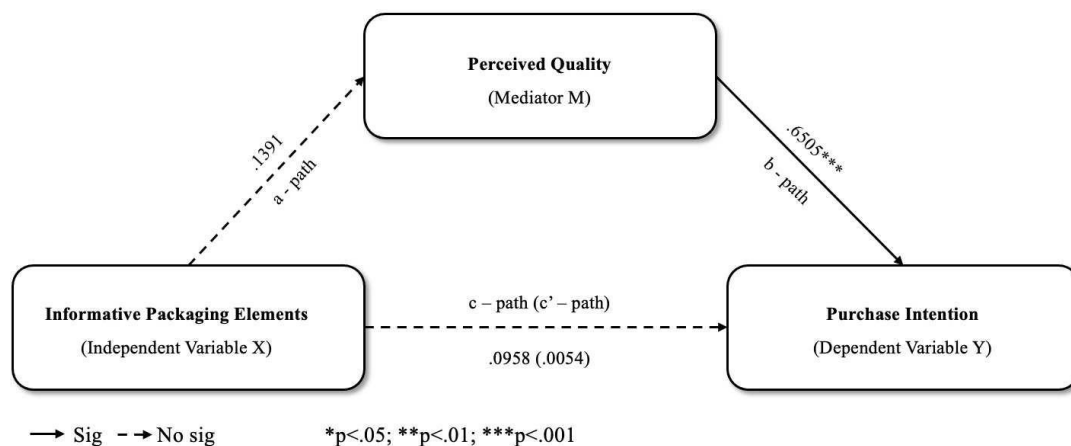


Figure 8: Mediation model for H3

4.1.4. The Moderator effect of Level of Involvement

Hypothesis 4: *Level of involvement moderates the relationship between informative packaging elements and purchase intention. A high level of involvement affects the relationship between informative packaging elements and purchase intention more strongly than a low level of involvement.*

A new dummy variable <Invol= was coded with the median point 3.25 from the ordinal values of the <LI= variable, where 1 (< 3.25) = low involvement and 2 (= > 3.25) = high involvement. The moderation was computed through a process model 1 (Appendix 6) with the main effects b_1 , b_2 and the interaction effect b_3 analyzed:

The effect of IPE on PI, represented by b_1 , is significant ($p = .0439$) at a negative coefficient ($b_1 = -.9615$) indicating that for every 1-unit increase in IPE at reference involvement level (1, low), PI decreases by .9615 units. Furthermore, by itself, the level of involvement does not have an effect on PI ($b_2 = -.6926$) at a non-significant level ($p = .1268$). However, the interaction effect is statistically significant at ($p = .0206$) with ($b_3 = .6763$) suggesting the relationship between IPE and PI depends on the level of involvement (Figure 9).

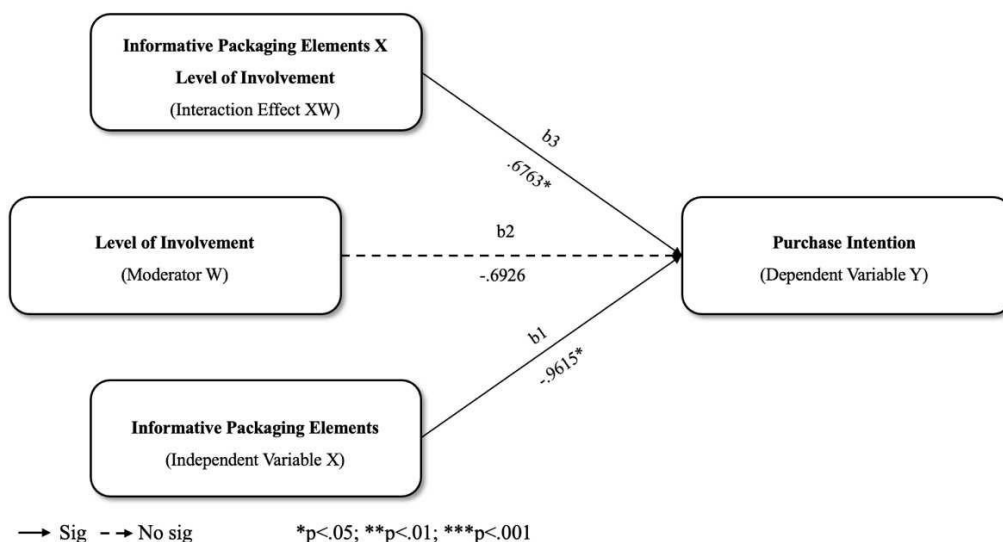


Figure 9: Direct and interaction effects for H4

With this data, H4 can be partially accepted as the moderation of the level of involvement between IPE and PI is verified.

However, to verify if the hypothesis can be fully accepted, the conditional effects are analyzed allowing for an understanding of the difference between a low and high involvement level on purchase intentions:

When a low level of involvement is considered (W1), the relationship between IPE and PI has a negative effect and is non-significant ($b_{1g1} = .2853$; $p = .1887$; 95% CI: $[-.7127; .1422]$). On the other hand, when a high level of involvement is considered (W2), the relationship between IPE and PI is significant with a positive effect ($b_{1g2} = .3910$; $p = .0426$; 95% CI: $[-.0133; .7687]$), (Figure 10)

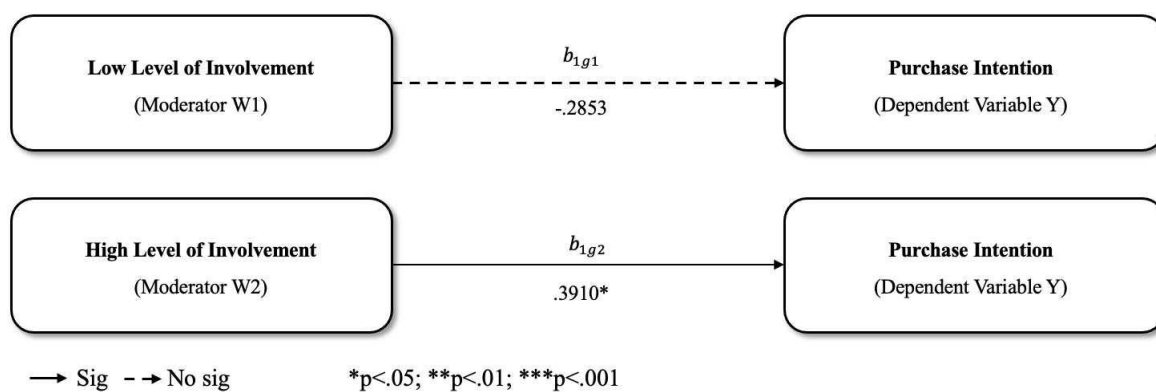


Figure 10: Conditional effects for low and high involvement levels

Furthermore, the difference in the slopes ($b_{1g1} - b_{1g2} = .6763$) confirms the observed value in the interaction term (b_3) that suggests the relationship between IPE and PI changes significantly with different levels of involvement, confirming the moderation. Adding to that, only a high level of involvement is showing a positive effect ($b_{1g1} = .3910$) and a significant relationship ($p < .05$). Therefore reaching the conclusion that **Hypothesis 4 can be fully accepted**.

4.1.5. Full Model Test

The conceptual model developed for this study, aligns with the structure of Prof. Andrew F. Hayes process model 5 (Hayes, 2013). Therefore all variables were imputed on SPSS to perform the full model test using the process model 5. For consistency in the analysis, the dummy variable created in the previous hypothesis (H4) for the level of involvement was kept with that same coding for this test. The results (Appendix 7) provided the following effects for each of the five paths within the statistical model (Figure 11).

The effect of the independent variable, informative packaging elements, is assessed in three paths. Path a_1 shows that informative packaging elements do not significantly impact perceived quality considering the non-significant effect at ($p = .3841$). Path c_{21} , is also non-significant ($p = .0979$), showing that informative packaging elements are not a significant predictor of purchase intention. Furthermore, path c_{23} , tests the integration of the level of involvement in the relationship tested in c_{21} but once again the effect is non-significant ($p = .0794$), indicating the interaction of informative packaging elements and level of involvement is not a significant predictor of purchase intention.

The remaining two paths test the effect of perceived quality and level of involvement on purchase intention singularly as these two variables never intersect in the model. Path b_1 is highly significant ($p < .001$) suggesting that perceived quality has a strong effect on purchase intentions. Regarding, Path c_2 , testing the effect of level of involvement on purchase intention has a non-significant ($p = .2343$) outcome. Furthermore, an analysis of the conditional effects of informative packaging elements on purchase intention confirms that neither level of involvement is significant in this model.

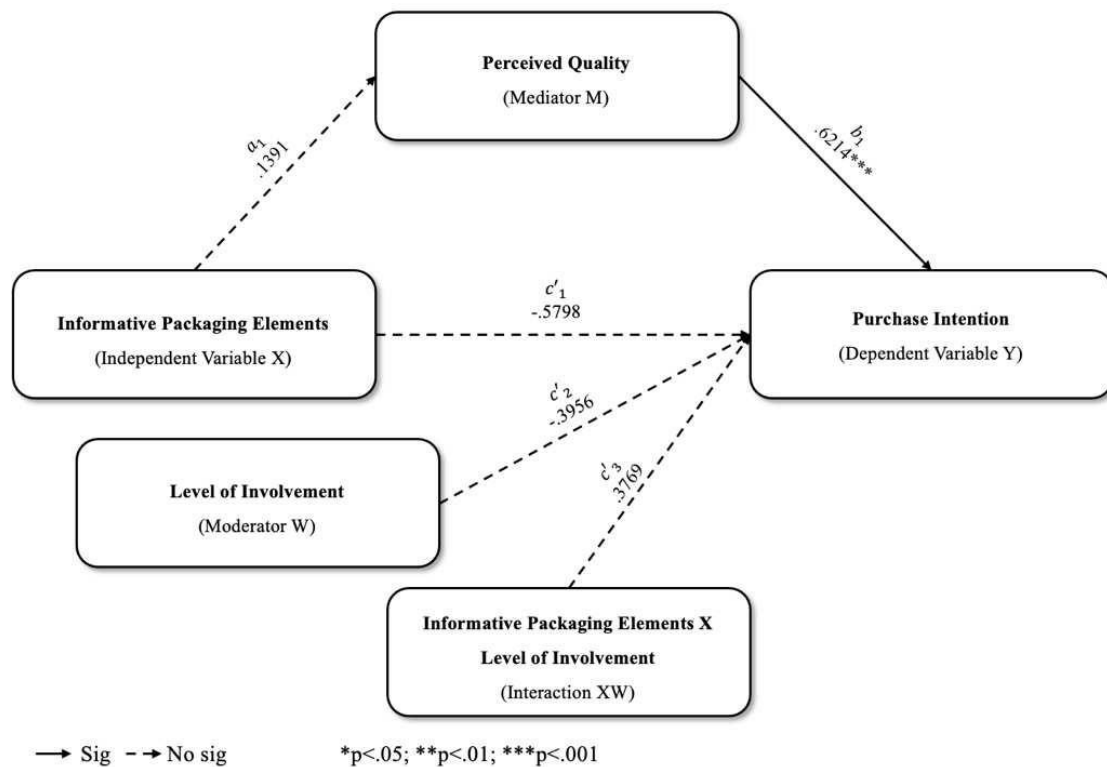


Figure 11: Statistical Diagram for Full Model Test

4.2 Discussion

Hypothesis H1a suggested the positive effect of the independent variable <Informative Packaging Elements= regardless of the information display type, on the dependent variable <Purchase Intention=, the result is non-significant, therefore rejecting H1a. Regarding H1b, testing the difference between both packaging types, the difference between the means of the sample is just too close to exist any statistical difference, thus the outcome is the same as H1a. Contrary to what was suggested based on the literature referring to the importance of information in forming a purchase decision and even underlining the specific importance of products that need to be transformed to be consumed, the data could not confirm the assumption. However, the categorical design of the independent variable assumes a value that identifies the type of IPE display the respondent saw, while PI is ordinal, therefore causing limitations to the linearity assumption and being the possible reason for this outcome.

Hypothesis	Result
H1a: Informative packaging elements have a positive impact on purchase intentions	Rejected
H1b: Informative packaging elements via QR code display have a higher impact on purchase intention than through printed display	Rejected

Table 13: Results from H1a and H1b

Hypothesis 2 suggests the positive impact of perceived quality on purchase intentions referring to the specific quality perception that was built upon observing the informative elements of packaging, though only testing the relationship between perceived quality and purchase intention. The result is accepted, therefore indicating that the purchase intention of spice products through the observation of informative elements on the packaging is positive. Thus, confirming the assumption taken from the literature review that described perceived quality as a strong determinant of purchase intention.

Hypothesis	Result
H2: Perceived quality, driven by informative packaging elements, positively impacts purchase intention	Accepted

Table 14: Results from H2

Perceived quality was then accessed as a mediator of the relationship between informative packaging elements and purchase intention. The assumption built on the literature was expecting to see the potential of perceived quality as a connector between these variables, and even though the direct path to purchase intention was significant once again, the mediation including purchase intention was rejected.

Hypothesis	Result
H3: Perceived Quality mediates the relationship between informative packaging elements and purchase intention	Rejected

Table 15: Results from H3

The final hypothesis set in the literature was H4, suggesting the moderation of the level of involvement between informative packaging elements and purchase intentions. This hypothesis was accepted and offered two outcomes. First, the level of involvement was a significant moderator between the variables mentioned, and second it further deepened the insights to understand that only a high level of involvement is impacting this relationship, confirming the assumptions taken from the literature review that involvement differs based on the personal importance each consumer, in this case respondent, gives to the information provided on packaging.

Hypothesis	Result
H4: Level of involvement moderates the relationship between informative packaging elements and purchase intention. A high level of involvement affects the relationship between informative packaging elements and purchase intention stronger than a low level of involvement	Accepted

Table 16: Results from H4

A final test was performed to assess the impact of all the variables together in a full model built from the conceptual model for this research. Here, the relationship between perceived quality and purchase intention was the only significant path. Perceived quality is such a strong predictor in both the mediation and full model analysis that evidences the decisive power of this variable in explaining the model. Respondents were able to effectively perceive quality as a motivator to purchase intention. Perceived quality could also be showing a strong effect due to it being the only ordinal variable interacting with another ordinal variable, the purchase intention.

Considering that the perception of quality was built from an informative packaging information display type, while that construct failed in every linearity assumption, might suggest that the measurement for informative packaging elements was not appropriate.

CHAPTER 5: CONCLUSIONS AND LIMITATIONS

This research was set with the purpose of exploring the impact of packaging information on purchase intentions and to do so exploring the potential that packaging offers to communicate either through printed elements or new digital solutions, in this case, the QR code, analyzing how they differ as well. Upon exploring the never ending FMCG market, two variables were selected to represent the fast-paced decision-making process consumers usually use in their decisions to buy FMCGs. With that in mind, perceived quality and level of involvement were studied and applied to the model of this research as a mediator and a moderator respectively. Perceived quality was built by observing one of two types of packaging: a printed one with limited access to information and a QR code concept with more opportunities to explore the product. The product in the study was a bag of black peppercorn as the market this research is aiming at is the spice market. The exploratory research through the literature review and the confirmatory analysis provided by the data generated from the survey, allowed for new findings to be discovered and are presented in the following chapter

5.1 Main Findings & Conclusions

RQ1: How differently do QR-Code and Printed product information display impact purchase intentions?

Despite the potential that QR codes have in expanding the packaging communication dimension to an unlimited digital level, the difference between the intention to purchase was very similar between the two product information display types, being that it could not be considered statistically significant and therefore it is not possible to say there is a relevant difference between the two. Although it is worth considering that the perception was not negative in any way, descriptive comparison of means showed a very slightly higher mean in the QR code packaging.

RQ2: Is perceived quality a driver of purchase intentions in the relationship with product information?

Perceived quality essentially measured the perceptions from the product information but only when assuming it as a direct predictor can it be considered as a driver of purchase intention,

because when measuring the relationship between the three variables, perceived quality could not support the role of mediator.

RQ3: Can the level of involvement play a significant role in a low involvement product category?

Findings from the literature suggested involvement as a personal measure of importance even in categories that are usually considered to be low involvement ones. Consumers don't look at packaging in the same ways, it is highly subjective and those who are more interested will translate into a highly involved consumer. The findings from the confirmatory research, indicate a high level of involvement plays a significant role in moderating the positive relationship between informative packaging elements and purchase intentions. However, when perceived quality is measured at the same time, involvement loses the power to moderate the purchase decision.

5.2 Managerial / Academic Implications

The study builds on the packaging research having explored a technological approach to packaging as a communication tool. It contributes to filling the gap currently existing in the studies on spice products and further explores the direct relationship between QR codes and purchase intention.

Despite some contradictions between the literature and findings from confirmatory analysis, the results show once more that involvement is a strong element in the purchase decision of consumers even in low involvement categories and perceived quality can drive strong purchase intentions, though some limitations on this study must be considered.

5.3 Limitations and Further Research

Limitations of this research include the small sample of 114 observations, and the perceptions built from one single product in an extensive market. Furthermore, the appropriateness of the information and stimuli as informative elements was not effectively tested; rather, it was represented by a comparison between the display of information in two distinct supports

(Printed or QR) considered informative packaging elements. The categorical property of the variable may be incorrect for the regression and model test between that variable and the other interveners.

For future research, the measure of <Informative Packaging Elements= must be revised and updated to provide a more appropriate test with the outcome variables. Furthermore, addressing QR code usage in online shopping, would be interesting to see if the packaging works the same when shopping online, and finally, understanding the QR code usage as intrinsic or extrinsic considering the added usability to the product that has the potential to greatly improve product experience could provide relevant insights into the future of product interactions promoted by packaging attributes.

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APPENDICES

Appendix 1 – Survey Structure

Information as a strategy?

Start of Block: Introduction

Dear Participant,

Welcome, the following survey will present you in a context where you will be asked to assess the information provided in the packaging of a spice product. Your response will provide valuable insights to this study and will remain strictly confidential being solely used for general academic data analysis purposes. Your participation is voluntary and should take around 3 minutes to complete, your time and honest input are deeply appreciated. When you are ready, click on the blue button down to the right to begin

End of Block: Introduction

Start of Block: Screening Questions

Q1 Have you ever bought a spice product from the supermarket? (Pepper, Garlic, Salt...)

☐ Yes (1)

☐ No (2)

Q2 Have you bought any spice product in the last 12 months?

☐ Yes (1)

☐ No (2)

End of Block: Screening Questions

Start of Block: Level of Involvement

Please select the frequency of the following behavior towards food packaging in your shopping habits

Q3 I usually read ingredients on food labels

- ☐ Never (1)
- ☐ Sometimes (2)
- ☐ About half the time (3)
- ☐ Most of the time (4)
- ☐ Always (5)

Q4 I check the country-of-origin on food

- ☐ Never (1)
- ☐ Sometimes (2)
- ☐ About half the time (3)
- ☐ Most of the time (4)
- ☐ Always (5)

Q5 I check the dates printed on products

- ☐ Never (1)
 - ☐ Sometimes (2)
 - ☐ About half the time (3)
 - ☐ Most of the time (4)
 - ☐ Always (5)
-

Q6 I seek information on new packaging

- ☐ Never (1)
- ☐ Sometimes (2)
- ☐ About half the time (3)
- ☐ Most of the time (4)
- ☐ Always (5)

End of Block: Level of Involvement

Start of Block: Stimuli Printed

S_P Please carefully read the information on the following packaging, then continue the survey

Q7 (P Manipulation) Looking at this specific packaging, where can you get suggestions on how to use this product?

- ☐ Only reading the back (2)
- ☐ Only scanning a QR code (3)

End of Block: Stimuli Printed

Start of Block: Stimuli QR

S_QR Please carefully read the information on the following packaging

Q7 (QR manipulation) Looking at this specific packaging, where can you get suggestions on how to use this product?

- ☐ Only reading the back (2)
- ☐ Only scanning a QR code (3)

Page Break

QR_Information When scanning the code, this is the information you would be able to see in your smartphone browser. Please read carefully and then continue the survey

End of Block: Stimuli QR

Start of Block: Perceived Quality

Considering the product and responding information you just saw, please select your level of agreement with the following sentences.

Q9 This product is of high quality

- ☐ Strongly disagree (1)
- ☐ Somewhat disagree (2)
- ☐ Neither agree nor disagree (3)
- ☐ Somewhat agree (4)
- ☐ Strongly agree (5)

Page Break

Q10 This product is a superior product

- ☐ Strongly disagree (1)
- ☐ Somewhat disagree (2)
- ☐ Neither agree nor disagree (3)
- ☐ Somewhat agree (4)
- ☐ Strongly agree (5)

Page Break

Q11 This product is of very good quality

- ☐ Strongly disagree (1)
- ☐ Somewhat disagree (2)
- ☐ Neither agree nor disagree (3)
- ☐ Somewhat agree (4)
- ☐ Strongly agree (5)

End of Block: Perceived Quality

Start of Block: Purchase Intention

Please select your level of agreement with the following sentences

Q12 I believe that most people would like to buy this product

- ☐ Strongly disagree (1)
- ☐ Somewhat disagree (2)
- ☐ Neither agree nor disagree (3)
- ☐ Somewhat agree (4)
- ☐ Strongly agree (5)

Page Break

Q13 I would be glad to try the food in this package

- ☐ Strongly disagree (1)
- ☐ Somewhat disagree (2)
- ☐ Neither agree nor disagree (3)
- ☐ Somewhat agree (4)
- ☐ Strongly agree (5)

Page Break

Q14 I would recommend this product to my friends

- ☐ Strongly disagree (1)
- ☐ Somewhat disagree (2)
- ☐ Neither agree nor disagree (3)
- ☐ Somewhat agree (4)
- ☐ Strongly agree (5)

Page Break

Q15 I would purchase this product

- ☐ Strongly disagree (1)
- ☐ Somewhat disagree (2)
- ☐ Neither agree nor disagree (3)
- ☐ Somewhat agree (4)
- ☐ Strongly agree (5)

End of Block: Purchase Intention

Start of Block: Demographics

Please fill in the following information

Q16 Gender

- ☐ Male (5)
- ☐ Female (6)
- ☐ Non-binary / third gender (7)
- ☐ Prefer not to say (8)

Page Break

Q17 Age

- ☐ 18-24 (1)
- ☐ 25-34 (2)
- ☐ 35-44 (3)
- ☐ 45-54 (4)
- ☐ 55-64 (5)
- ☐ 65+ (6)

Page Break

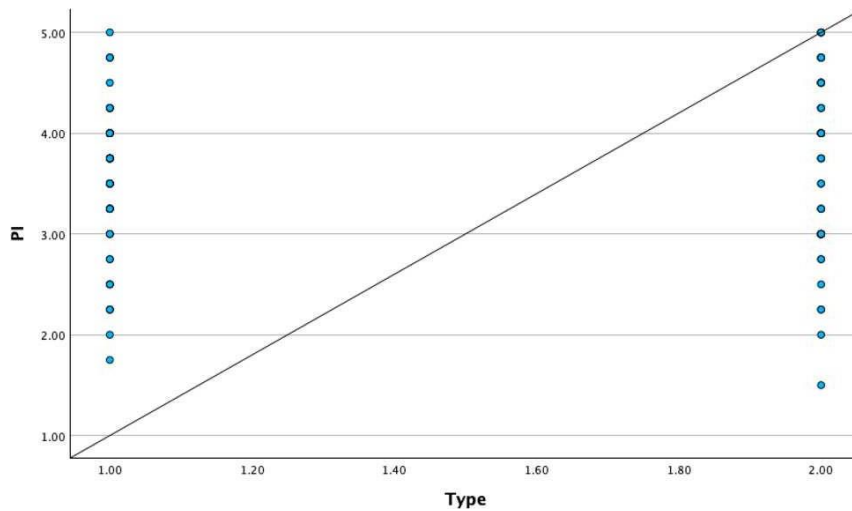
Q18 Occupation

- ☐ Student (1)
- ☐ Student Worker (2)
- ☐ Employee (3)
- ☐ Self-Employed (4)
- ☐ Unemployed (5)
- ☐ Retired (6)

End of Block: Demographics

Appendix 2 – Data for H1a

Graph – For Linearity H1a



Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Type ^b	.	Enter

a. Dependent Variable: PI

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.061 ^a	.004	-.005	.78919	1.776

a. Predictors: (Constant), Type

b. Dependent Variable: PI

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.261	1	.261	.420	.518 ^b
	Residual	69.756	112	.623		
	Total	70.018	113			

a. Dependent Variable: PI

b. Predictors: (Constant), Type

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.472	.231		15.004	<.001		
	Type	.096	.148	.061	.648	.518	1.000	1.000

a. Dependent Variable: PI

Collinearity Diagnostics^a

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions	
				(Constant)	Type
1	1	1.948	1.000	.03	.03
	2	.052	6.097	.97	.97

a. Dependent Variable: PI

Residuals Statistics^a

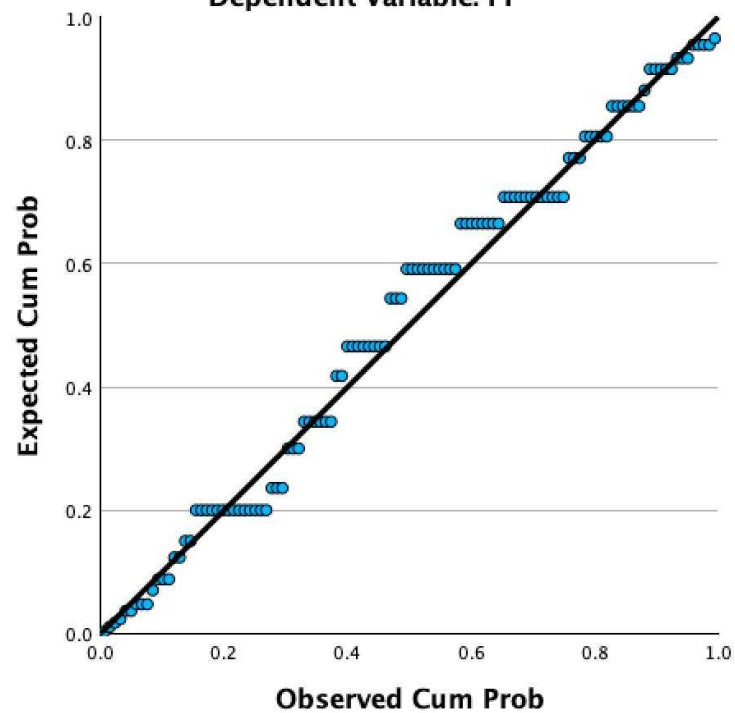
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.5678	3.6636	3.6140	.04810	114
Residual	-2.16364	1.43220	.00000	.78569	114
Std. Predicted Value	-.961	1.031	.000	1.000	114
Std. Residual	-2.742	1.815	.000	.996	114

a. Dependent Variable: PI

Charts for H1a

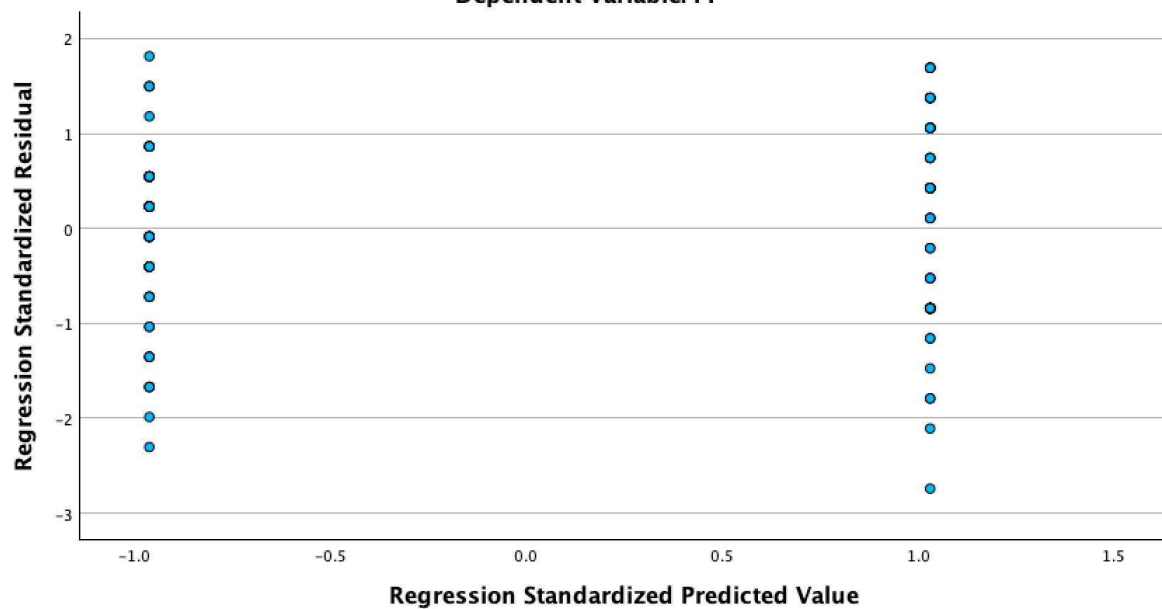
Normal P-P Plot of Regression Standardized Residual

Dependent Variable: PI



Scatterplot

Dependent Variable: PI



Appendix 3 – Data for H1b

T-Test – (For Hypothesis 1b)

Group Statistics					
Type	N	Mean	Std. Deviation	Std. Error Mean	
PI QR Code	55	3.6636	.86498	.11663	
Printed	59	3.5678	.71141	.09262	

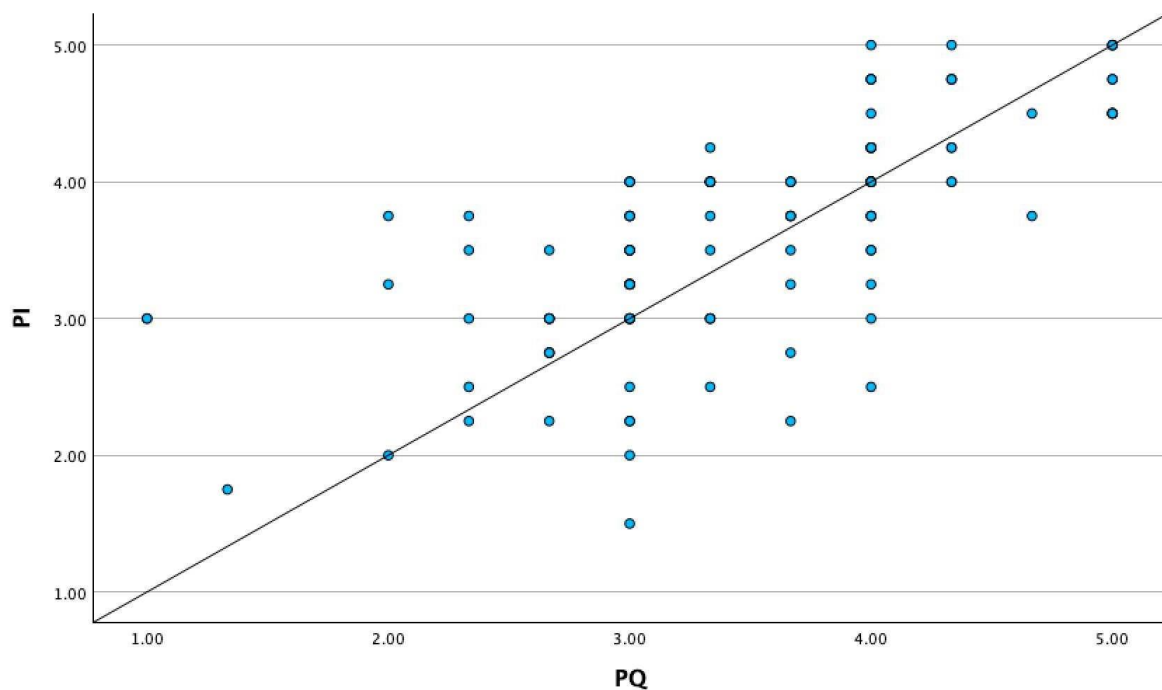
Independent Samples Test										
Levene's Test for Equality of Variances				t-test for Equality of Means						
		F	Sig.	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower Upper
PI	Equal variances assumed	5.573	.020	.648	112	.259	.518	.09584	.14792	-.19724 .38892
	Equal variances not assumed			.644	104.783	.261	.521	.09584	.14893	-.19948 .39116

Independent Samples Effect Sizes				
	Standardizer ^a	Point Estimate	95% Confidence Interval	
PI	Cohen's d	.78919	.121	-.247 .489
	Hedges' correction	.79453	.121	-.245 .486
	Glass's delta	.71141	.135	-.234 .502

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control (i.e., the second) group.

Appendix 4 – Data for H2

Graph H2 for linearity



Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	PQ ^b	.	Enter

a. Dependent Variable: PI

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.701 ^a	.492	.487	.56356	1.809

a. Predictors: (Constant), PQ

b. Dependent Variable: PI

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	34.446	1	34.446	108.456	<.001 ^b
	Residual	35.572	112	.318		
	Total	70.018	113			

a. Dependent Variable: PI

b. Predictors: (Constant), PQ

Coefficients^a

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.350	.224		6.033	<.001
	PQ	.651	.062	.701	10.414	<.001

a. Dependent Variable: PI

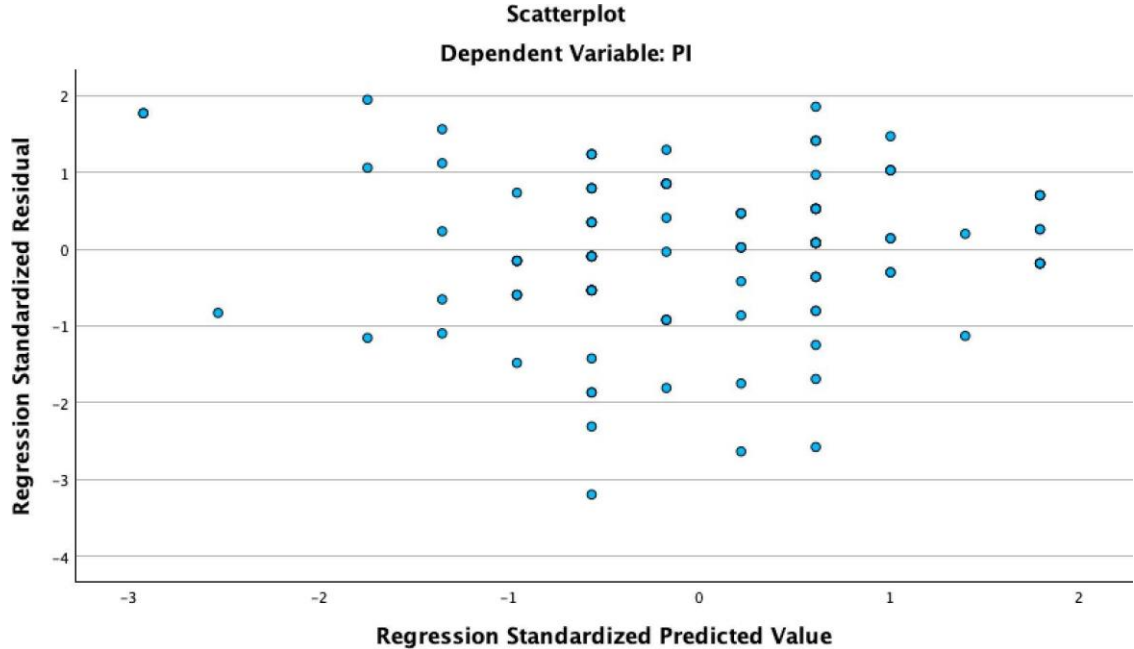
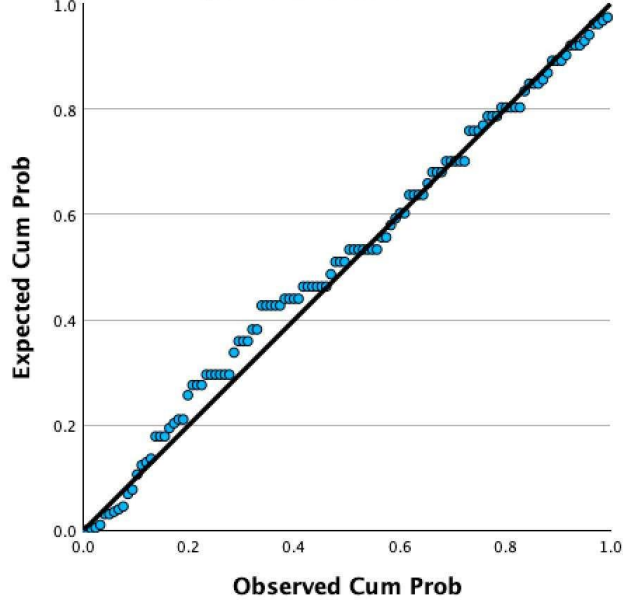
Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.0005	4.6035	3.6140	.55212	114
Residual	-1.80198	1.09877	.00000	.56106	114
Std. Predicted Value	-2.922	1.792	.000	1.000	114
Std. Residual	-3.197	1.950	.000	.996	114

a. Dependent Variable: PI

Charts

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PI



Appendix 5 – Data for H3

***** PROCESS Procedure for SPSS Version 4.2 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3

Model : 4
Y : PI
X : Type
M : PQ

Sample
Size: 114

OUTCOME VARIABLE:
PQ

Model Summary	R	R-sq	MSE	F	df1	df2	p
	.0823	.0068	.7213	.7634	1.0000	112.0000	.3841

Model	coeff	se	t	p	LLCI	ULCI
constant	3.2733	.2490	13.1439	.0000	2.7799	3.7668
Type	.1391	.1592	.8737	.3841	-.1763	.4545

Standardized coefficients
Type .1639

OUTCOME VARIABLE:
PI

Model Summary	R	R-sq	MSE	F	df1	df2	p
	.7014	.4920	.3205	53.7464	2.0000	111.0000	.0000

Model	coeff	se	t	p	LLCI	ULCI
constant	1.3427	.2647	5.0730	.0000	.8182	1.8672
Type	.0054	.1065	.0504	.9599	-.2056	.2163
PQ	.6505	.0630	10.3284	.0000	.5257	.7753

Standardized coefficients
Type .0068
PQ .7011

***** TOTAL EFFECT MODEL *****

OUTCOME VARIABLE:
PI

Model Summary	R	R-sq	MSE	F	df1	df2	p
	.0611	.0037	.6228	.4198	1.0000	112.0000	.5184

Model	coeff	se	t	p	LLCI	ULCI
constant	3.4720	.2314	15.0037	.0000	3.0135	3.9305
Type	.0958	.1479	.6479	.5184	-.1972	.3889

Standardized coefficients
Type .1218

***** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y *****

Total effect of X on Y

Effect	se	t	p	LLCI	ULCI	c_ps
.0958	.1479	.6479	.5184	-.1972	.3889	.1218

Direct effect of X on Y

Effect	se	t	p	LLCI	ULCI	c'_ps
.0054	.1065	.0504	.9599	-.2056	.2163	.0068

Indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
PQ	.0905	.1075	-.1069	.3082

Partially standardized indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
PQ	.1149	.1357	-.1421	.3828

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:
95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
5000

NOTE: Standardized coefficients for dichotomous or multicategorical X are in partially standardized form.

----- END MATRIX -----

Appendix 6 – Data for H4

Matrix – (For Hypothesis 4 with new nominal involvement variable)

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Version 4.2 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3

Model : 1
Y : PI
X : Type
W : Invol

Sample
Size: 114

OUTCOME VARIABLE:
PI

Model Summary	R	R-sq	MSE	F	df1	df2	p
	.2965	.0879	.5806	3.5351	3.0000	110.0000	.0172

Model		coeff	se	t	p	LLCI	ULCI
constant		4.5548	.7370	6.1804	.0000	3.0943	6.0153
Type		-.9615	.4716	-2.0389	.0439	-1.8961	-.0269
Invol		-.6926	.4501	-1.5387	.1268	-1.5846	.1994
Int_1		.6763	.2878	2.3496	.0206	.1059	1.2466

Product terms key:
Int_1 : Type x Invol

Test(s) of highest order unconditional interaction(s):

	R2-chng	F	df1	df2	p
X*W	.0458	5.5208	1.0000	110.0000	.0206

Focal predict: Type (X)
Mod var: Invol (W)

Conditional effects of the focal predictor at values of the moderator(s):

Invol	Effect	se	t	p	LLCI	ULCI
1.0000	-.2853	.2157	-1.3226	.1887	-.7127	.1422
2.0000	.3910	.1906	2.0517	.0426	.0133	.7687

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:
95.0000

----- END MATRIX -----

Appendix 7 – Data for Full Model Test

Run MATRIX procedure:

***** PROCESS Procedure for SPSS Version 4.2 *****

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3

Model : 5
Y : PI
X : Type
M : PQ
W : Invol

Sample
Size: 114

OUTCOME VARIABLE:
PQ

Model Summary

R	R-sq	MSE	F	df1	df2	p
.0823	.0068	.7213	.7634	1.0000	112.0000	.3841

Model

	coeff	se	t	p	LLCI	ULCI
constant	3.2733	.2490	13.1439	.0000	2.7799	3.7668
Type	.1391	.1592	.8737	.3841	-.1763	.4545

OUTCOME VARIABLE:
PI

Model Summary

R	R-sq	MSE	F	df1	df2	p
.7182	.5159	.3110	29.0346	4.0000	109.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	2.0564	.5964	3.4479	.0008	.8743	3.2385
Type	-.5798	.3473	-1.6693	.0979	-1.2683	.1086
PQ	.6214	.0633	9.8154	.0000	.4959	.7468
Invol	-.3956	.3308	-1.1959	.2343	-1.0513	.2601
Int_1	.3769	.2129	1.7707	.0794	-.0450	.7988

Product terms key:

Int_1 : Type x Invol

Test(s) of highest order unconditional interaction(s):

	R2-chng	F	df1	df2	p
X*W	.0139	3.1354	1.0000	109.0000	.0794

Focal predict: Type (X)
Mod var: Invol (W)

Conditional effects of the focal predictor at values of the moderator(s):

Invol	Effect	se	t	p	LLCI	ULCI
1.0000	-.2029	.1581	-1.2837	.2020	-.5163	.1104
2.0000	.1740	.1412	1.2318	.2207	-.1059	.4539

***** DIRECT AND INDIRECT EFFECTS OF X ON Y *****

Conditional direct effects of X on Y

Invol	Effect	se	t	p	LLCI	ULCI
1.0000	-.2029	.1581	-1.2837	.2020	-.5163	.1104
2.0000	.1740	.1412	1.2318	.2207	-.1059	.4539

Indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
PQ	.0864	.1018	-.1036	.2945

***** ANALYSIS NOTES AND ERRORS *****

Level of confidence for all confidence intervals in output:
95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
5000

----- END MATRIX -----