Consumer Preferences in Food Interactive Packaging

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Consumer Preferences in Food Interactive Packaging

By Nuchjarin Pareeratnasomporn

A Thesis submitted in partial fulfillment of the requirements for
the degree of Master of Science in Print Media in the School of Media Sciences in the
College of Imaging Arts and Sciences
of the Rochester Institute of Technology

May 2018

Primary Thesis Advisor: Dr. Barbara Birkett
Secondary Thesis Advisor: Professor Michael Riordan
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Abstract

Interactive packaging is an innovation that has been adopted by the packaging design industry. It enables consumers to interact with packaging through their smart devices. Although the technology is already available, it is uncertain how many consumers use it or will ever find it useful.

This research measured the young Millennial (18-24 years old) consumers’ perspectives and their preferences for interactive feature on food packaging. College students between 18 to 24 years old were chosen by using a purposive sampling method. First, a questionnaire asked for information about the participants’ behavior surrounding two topics. The first topic asked about their smartphone usage, and the second topic asked about the factors affecting their purchasing decisions concerning food products. Next, the survey focused on the consumers’ perceptions and their experiences with interactive activities. QR codes and Augmented Reality were the variables. Participants without any awareness of interactive features and participants without any experience in using interactive features, even though they were aware of them, were introduced to the interactive packaging functions through a video in order to help them to better understand interactive packaging features.

Lastly, the survey asked for respondents’ opinions and expectations of interactive features in terms of the content, both function and form, and their preferred method of access. In this part of the study, coffee and tea products were used as example products. The data was analyzed by using Descriptive Statistical Analysis.
A sample of 80 students between 18 to 24 years old participated the survey. Participants were more aware and have experienced the QR code scanning more than the Augmented reality scanning. Basic information and product reviews were the top two rated for the content consumers considered important. Short paragraph and text with graphic elements were preferred interactive content formats. Consumers preferred using a web browser application on their phones to search for product information more than using a scanning application.
Chapter 1

Introduction

Background

The development of technology has a direct and indirect impact on any business. The packaging industry has been influenced by the increasing use of technologies such as the Internet. Technologies have generated new features for packaging which can transform traditional packaging into an interactive medium. Interactive packaging provides functional enhancement that increases the consumer’s experience with products (Wilder, 2015). Interactive packaging can be described as a component of packaging’s ability to provide functionality; in this case, the feature allows a brand to insert information onto packaging which can be read through smartphones or other digital devices. The experience at the point of sale may stimulate the purchasing decision. The design of packaging for both aesthetics and functions is an important factor in attracting buyers among numerous competitors on the shelf.

The interactive packaging trend is rapidly expanding its markets. VisionGain (2015) forecasted the smart packaging market from 2015-2025. They reported revenue of smart packaging in 2015 was $1.9 billion. They predicted revenue to increase 36% by 2020, and 68% by 2025. Interactive packaging activity uses mobile technology, and smartphone global revenue (Statista, 2016) is predicted to increase to $401.3 billion in 2016. Statista (2016) also reveals that smartphone users worldwide, those with immediate access to interactive packaging, will be up to 5.07 billion people in 2019.
Statement of the Problem

The forecast of smart packaging trends and the growth of the mobile device market support the notion that smart packaging will play a significant role in the packaging industry. Two types of interactive packaging that do not require special printing techniques to produce them are Quick Response (QR) code scanning and Augmented Reality (AR) technology.

QR codes are common in consumer advertising. Although the usefulness of interactive technology is known and available, the functions are not widely used by consumers. The data comparing the number of mobile phone users who scanned a QR code from January of 2012 to May of 2013 showed that the number of QR Code subscribers grew by 13.84% while the number of smartphone owners increased by 39.19% (Marketing Charts, 2013). Thus, the growth of QR code scanning subscribers was not parallel to the increase in smartphone users even though the applications for QR codes scanning were available for free download. Will this be the case for other types of interactive packaging?

As Barton, Formm, and Egan (2012) revealed, the Millennial generation is increasing in number and has a significant impact on the market. Also, the Millennials have grown up in a period of advancement in innovation and technology, and they tend to be more professional in using these advancements than other generations. This thesis research focuses on the young Millennial consumers’ preferences and perspectives on
interactive food packaging.

**Reasons for Interest**

The researcher has a background in graphic design, with printing technology being a personal interest. Graphic design and printing are a perfect combination for developing new packaging products. The researcher believes that graphic design would not be successful without a good printing method. The researcher took a course on packaging in the Print Media program, and the package printing industry was shown to be highly attractive. Packaging can be presented in a variety of design types that use various techniques to produce them. Smyth (2015) stated that electronic media cannot substitute for packaging as was the case in other graphic printing sectors. However, the researcher recognizes that developed technology, for example, new interactive media, can provide a unique experience for the user as well as increase the ability for the brand to communicate with consumers. An experience that combines both of these worlds could prove to be a disruptive marketing approach.

Interactive activity is also the researcher’s personal interest. The researcher considers that an interactive feature on packaging is an effective marketing or sales feature, and food products, among other products, can take advantage of this technology.
Chapter 2  

Theoretical Basis

This chapter presents the theoretical background required to explain pertinent ideas regarding this study.

Klimchuk, Krasovec, and Sandra (2013), in the book *Packaging Design: Successful Product Branding from Concept to Shelf*, state that packaging has been used since ancient times as humans needed to gather, collect, store, transport, and preserve goods. Groth (2006) also presented the history of packing and packaging in the book *Exploring Package Design* and said that ceramic pottery, wooden boxes and barrels were used as containers to store products and food. The development of materials and the innovation of machinery and technology heightened the possibility to design and to produce packaging. Subsequently, glass, metal, paper, cardboard, and plastic were used, and all now play important roles as packaging substrates. They provide varied choices to create structure, function, and aesthetics in design.

Packaging has become more significant since the period of the Industrial Revolution (Groth, 2006). Once mechanization flourished, advanced technology was invented in order to serve demands in the area of commerce. Package labeling is an important packaging component in that it facilitates marketing communication through the design of a label that differentiates the product. Moreover, today the label can generate interactive activities on packaging.
As mentioned previously, a brand can take advantage of the package to communicate with the consumer at the point of sale. Information about the particular product can be made available to the consumer through the product label and package (Mann, 2007). The guidance for the food industry from *A Food Labeling Guide* by the Food and Drug Administration (2013) is that most food is required to clarify nutrient content claims and health messages. *A Food Labeling Guide* also describes the labeling requirements in detail as follows:

1. **Principal Display Panel (PDP)** is the place where all required label statements are shown, such as the statement of product identity and the net amount of the product. This information is generally on the front panel and should be most likely attractive to consumers at the point of purchase.

2. **Information Panel Labeling** presents the information that does not appear on the PDP which includes the name and address of the manufacturer, packer and/or distributor, the ingredient list, nutrition labeling, and any required allergy labeling.

3. **Ingredient List** provides the listing of all ingredients.

4. **Nutrition Facts Labeling** can be placed with the ingredient list and the name and address of the manufacturer or distributor either on the PDP, or on the Information Panel Labeling. Also, it can be placed on any alternative panel that can be seen by the customer.

5. **Nutrition Content Claim (NCC)** is the information that is required in order to prevent the nutrition claim from being misinterpreted. It is the claim about food...
that characterizes the level of nutrients in the food, for example, “low fat,” or “contains 200 calories.”

Besides the mandatory information about the product that is revealed on packaging, the book *Design Matters: Packaging 01* (2008) also supports that packaging can be used to present general information which allows the brand to provide information to assist consumers’ purchasing decisions.

The package itself is not only a container of a product. It also has a responsibility to attract consumers’ attention. Edwards, Klimchuk, Wallace, and Werner (2009) wrote in the book *Really Good Packaging Explained* that packages not only hold the product and provide the surface for listing product attributes, but they also produce the opportunity for the brand to tell its story. Procter and Gamble, a leading company in the multinational manufacture of family, personal, and household care products, believes that packaging is the first and almost always the last moment of truth before a purchase is made. This is supported by the research of Frontiers (1996) who indicated that approximately 73% of purchasing decisions are made at the point of sale. In addition, the development in interactive technology also increases the ability of a package to communicate more information to its customers.

Mobile technology has developed rapidly in the past decades. Consumers have been surrounded with interactive devices which impact their behavior in some way. Packaging is one of the media that is trying to connect with consumers through the use of these technologies. The interactive features in packaging allow consumers to get
information beyond the information printed on the package or label. They also increase the user experience through the activities provided by the interactive technologies.

An example of interactive activities on packaging is demonstrated in Figure 1. Heinz ketchup packaging allows customers to connect to the Blippar application by using their smartphone to scan the label on the ketchup bottle. When the database recognizes the element of the label, it generates an augmented reality of a cookbook. While using the application, customers get choices of recipes in which Heinz ketchup is an ingredient. Moreover, they receive other information from the Heinz company as well as the link to the company’s website.

There are several technologies that generate a connection between packaging and consumers through mobile devices, such as the QR code scanning, augmented reality, Radio-frequency Identification (RFID) and Near Field Communication (NFC). These are described in the next chapter.
Chapter 3
Literature Review

Packaging has played a significant role in the food industry. Development of technology has influenced traditional food packaging with its responsibilities to protect, communicate, and provide convenience and containment (Biji, Ravishankar, Mohan, Gopal, 2015). Interactive packaging is an innovation that enhances communication between the brand and the consumers and is the focus of this literature review. Since packaging has become an important factor in the age of consumption-driven retail, research on consumer preferences is also reviewed.

Packaging Market and Trends

The package printing industry is growing. Smyth (2015) indicated that demands for packaging would become more substantial in both its physical protection and its promotional roles.
Smyth’s (2015) report, *The Future of Digital vs Analogue Printing to 2020*, reveals values for the global printed packaging and labeling market. Both conventional printing technology and digital printing technology in 2015 were at a high of $402.91 billion. This figure is forecasted to grow to $492.96 billion by 2020. Figure 2 shows this projected growth.

*Figure 2. Values of Global Printed Packaging and Labeling 2010-2020. Adapted from The Future of Digital vs Analogue Printing to 2020 (16), by S. Smyth, 2015, Akron, OH: Smithers Pira.*
Smart packaging is also expanding. The development of technology has influenced packaging with conventional packaging becoming smarter. VisionGain (2015) forecasted the smart packaging market from 2015-2025. The revenue from smart packaging in 2015 was $1.9 billion. They predicted it to increase 36% by 2020, and 68% by 2025. The chart showing smart packaging trends and projected annual growth from 2014 to 2025 is presented in Figure 3.

![Smart Packaging Market Forecast 2015-2025](image)

*Figure 3. Smart Packaging Trends and Annual Growth Rate between 2014 to 2025. Adapted from Smart Packaging Market Report 2015-2025 (79), 2015, VisionGain.*

Smart packaging is also expanding. The development of technology has influenced packaging with conventional packaging becoming smarter. VisionGain (2015) forecasted the smart packaging market from 2015-2025. The revenue from smart packaging in 2015 was $1.9 billion. They predicted it to increase 36% by 2020, and 68% by 2025. The chart showing smart packaging trends and projected annual growth from 2014 to 2025 is presented in Figure 3.

The number of mobile phone users and QR code subscribers (Data Dive: QR Codes, 2013) in the US from September 2011 to May 2013 indicates that the growth of QR codes scanning subscribers was not parallel to the increase in smartphone users even though the applications for QR codes scanning were available for free downloading.
The QR Code usage among 3,000 young adult consumers between 18-34 years old in the US and Western Europe was studied by the company, Pitney Bowes. The study found that consumers were more familiar with the codes on magazines and printed materials such as posters, mail, and packaging than the codes shown on websites, email, or television. However, Figure 4 shows that the percentage of users in each media is lower than 30 percent.

Impact of Packaging on Purchase

Among the competitive products on the shelf, packaging performs as a representative of the brand to draw the customer’s attraction. It acts as a silent salesman (Osborne, 2012). Even the placement of the elements in packaging design impacts the consumer’s recall of the package. Rettie and Brewer (2000) found that the most effective layout of packaging design is that the text should be presented on the right-hand side and the image should be placed on the left-hand side of the package.

The visual influence on in-store buying decisions was studied by Clement in 2007. The experiment used eye-tracking equipment to evaluate how packaging design influences buying behaviors. The study concluded that in-store purchasing could be classified into four phases. The first phase is a pre-attention phase where consumers’ attention is attracted by the visual impact of the packaging. The next phase is the succeeded attention phase in which the packaging design impacts the consumers’ minds. Then the physical action phase occurs when consumers pick the package up from the shelf. The last phase is the post-purchase phase where the decision and the purchase are made.

Visual elements of packaging (Wang and Chou, 2010) are the primary communication media between the producer and the consumer, especially for food packaging. However, the consumer’s ability to perceive the design of a package is varied. Individual consumers have their own decision-making approaches and interest in the type of information and the appearance of the package (Hawkins, Best, & Coney, 2004). Some consumers focus on price, while others might emphasize the product appearance, and
others might be concerned about ingredients and consumption instructions. Moreover, consumers’ preferences and expectations differ by generation as well.

Every generation has encountered different moments in a specific time that have an impact on their characteristics. For instance, the conservative view of life of the early Baby Boomers was influenced by the World War II period, or the Generation X’s life was affected by the destruction of the Berlin Wall and the AIDS contagion. The Millennial’s view has been influenced by the terrorist attack on September 11th, or by the repercussions from the Asian Tsunami. Moreover, a great impact on the Millennial lifestyle is the substantial use of technology (Downing, 2006; & Lowes, 2015).

The Millennial generation (Barton, Fromm, and Egan, 2012), also known as Generation Y, is increasing, and has a significant impact in the consumer market. In 2012, the number of U.S. Millennials was 79 million while there were 76 million Baby Boomers (those born between 1946-1964). In demographic terms, the Millennials are a group of people whose birth years ranged from the early 1980s to the early 2000s. Moreover, the generation of Millennials is also divided into two segments (Cohen, n.d.): Younger Millennials are from 18-24 years old, and the older Millennials are from 25-34 years old. The major difference between these two Millennial groups is the level of education, and their economic dependence on their parents (Barton, Fromm, and Egan, 2012).

When the Millennials are compared with other generations, the Millennials have grown up in a period of advancement in technology. Therefore, technological advancement and innovation (Barton, Fromm, and Egan, 2012) have influenced their
behavior, including the way they purchase. Moore (2012) conducted a study, *Interactive Media Usage Among Millennial Consumers*, comparing the use of interactive technology in the context of purchasing clothes, shoes, and accessories between the Millennial consumer and the Generation X consumer, and between the Millennial consumer and the Baby Boomer consumer. The study found that Millennials were more likely to be motivated to use interactive technologies for marketing purposes, and to connect with the brand through mobile devices and conventional internet methods. However, they were not engaged with the brand’s social network activities as much as Generation X. When Millennials were compared with the Baby Boomers, Millennials were more likely to use internet resources for functional and entertainment purposes. They also interacted with the brands’ and retailers’ links through blogs and coupons. However, the study also found that the rate of online purchasing in Millennials was lower than that of the Generation X and the Baby Boomers.

In response to different preferences in consumers and the development of consuming methods, the packaging industry has also developed innovative technology to enhance the packaging potential for the consumer to obtain more information. Interactive packaging is one of the latest technologies that enables consumers to interact with the packaging through their smart devices. The history and the current state of interactive packaging is presented in the next section.

**Interactive Packaging Technology**

As was mentioned previously, interactive activities on packaging can be facilitated through several features, such as QR code scanning, Augmented Reality
scanning, RFID scanning, and NFC scanning. This section describes the characteristic of each feature.

**Quick response code scanning (QR code).** The QR code (Lin, Luo, & Chen, 2013) is a universal two-dimensional barcode that encrypts information. It is widely used because of its low creation cost. Also, it is easily scanned through smart devices by using the device’s built-in camera to access information and a downloaded app.

The QR code (Denso Wave Incorporated, n.d.) was designed in Japan for tracking components in industry. It was first used in the automotive industry, and it was later used in other industries, such as the food and pharmaceutical industries, to control their merchandise.

**QR Code Structure and Functional Elements.** The QR code is able to handle a large amount of data, up to 7,089 numerals which is its maximum version. The QR code (QRStuff, n.d.) can be read either upside down or on a distorted surface because of its error correction data feature which is described in the following section.
A QR code consists of seven major elements which are shown in Figure 5. QRCODE-Generator.de (n.d.) explains each element of the QR Code structure:

1) Version information demonstrates the datatype, version, and error correction level of the code. The datatype can be the numerical or the alphanumeric content. There are 40 versions of the QR Code. Each version indicates the dimensions and capacities of the code. The largest one is code version 40 which can hold up to 7,089 numerals as mentioned earlier. The error correction is an element that detects and corrects code errors. It helps the scanner to read the code, even if some parts of the code are damaged. There are 4 levels of error correction of which the lever L (Low) is the lowest level. Seven percent of code words can be restored in level L while 30 percent of code words can be restored in level H (High) which it is the highest level of the error correction. However, the capacity decreases in the higher error correction level.

Figure 5. QR Code Elements and its structure. Adapted from What’s A QR Code?, In QRStuff, n.d., Retrieved September 22, 2016, from http://www.qrstuff.com/qr_codes.html
2) Positioning markings signify the direction in which the code is printed.

3) Alignment markings are additional elements for a large scale QR code. They are used to indicate the code’s orientation.

4) The timing pattern is an indicator for the scanner to specify the size of the data matrix.

5) Format information helps the code to be more easily scanned. It contains information about the error tolerance and the data mask pattern.

6) Data and error correction keys hold all the data.

7) The quiet zone is a barrier to separate the code from its surroundings.

**QR Code Printed Size.** The website QRStuff (2011) explains that the published size of the code depends on an appropriate scanning environment factor such as distance and brightness. Also, the data density is a factor. The greater density of data makes the code presented in a smaller pixel size. This means that it requires a more precise scanning environment to read the code. QRCode-Generator.de (n.d.) supports that a sufficient simple code size is 20x20 millimeters for a small format publishing, for example, the code in a magazine, or the code on a package.

QR Codes are available in various types. Each type provides different functions. Denso Wave Incorporated (n.d.) describes QR Code in five types:

1) QR Code Model 1 and Model 2 are the original types of the QR Code. The largest of Model 1 is QR Code version 14, which is able to hold up to 1,167
then, the Model 2 is an enhancement of the Model 1. It can store up to 7,089 numerals in its version 40.

2) The Micro QR Code is a small size QR Code which allows it to be printed in a small space. It can store only 35 numerals as the maximum amount of data.

3) The iQR Code is a type that can be produced in either square modules or rectangular modules. The maximum capacity of this type is about 40,000 numerals.

4) The SQRC is a code that requires a specific reading instrument. It is generally used to keep private information. The SQRC has the same appearance as the regular QR Code.

5) The Frame QR is a QR Code that provides a flexible area to be used in the center of the code. For example, a brand can insert its logo to present its identity in the middle of the code, and it is still readable.

The QR Code has been developed and improved in its capability to generate a connection between offline and online media (Bosomworth, 2011). The QR Code is used in several applications, such as magazine, poster, mail, packaging, website, email, and television applications. In addition, it is used for many marketing campaigns.

Pasco (2016) has evaluated the effectiveness of QR code labels that directly deliver detailed information through free applications for smart devices. Although the QR Code provides real-time data tracking, scanning requires downloading an application which tends to inhibit consumer behavior.
Augmented reality (AR). Augmented Reality was created in 1968 by Ivan Sutherland. Carmigniani & Furht (2011) described Augmented Reality as a technology that integrates virtual and computer-generated digital content. Augmented reality causes virtual reality to interact with the physical environment. Carmigniani & Furht (2011) mentioned in the Handbook of Augmented Reality that augmented reality can be used to enhance user’s perception of and interaction with the real environment.

QR code scanning and Augmented Reality technology are two types of interactive packaging that do not require any special printing techniques. Radio-Frequency Identification (RFID) and Near Field Communication (NFC) are two other types of interactive technologies that are used in packaging. However, Schiffner (2011) explains that the layer of RFID printing contains an antenna and microchip, and its production requires a particular type of thermal transfer digital printing. Similarly, NFC technology needs microchips to store data in order to transfer the information to another NFC device. RFID and NFC technology are further described below.

Radio-Frequency Identification (RFID). RFID is explained in the book Emerging Food Packaging Technology (Yam and Lee, 2012) as the use of radio frequencies to read information electronically. The book also clarifies that the RFID tag is classified into two types. The first type is the passive tag whose power is provided by the energy of the reader; and the second type is the active tag that has its own battery to transmit signals to the reader.

The book Food and Package Engineering (Morris, 2011) presents the advantages of RFID tags. RFID provides a communicative function in devices along with large
amounts of memory. RFID in packaging is also used to track the product in its supply chain by monitoring the products in logistics, or checking its inventories. Since the RFID system can be traced from a distance, it is also used to prevent counterfeiting and theft. The tag maximum reading distance depends on several factors such as the individual RFID reader and the signal power, the integrated circuit in the tag, the material of the tag, and the material to which the tag is attached. The low frequency (LF) passive RFID tags can be read in a foot or less, while the super high frequency active tags can be read up to the range of 325 feet.

**Near Field Communication (NFC).** McHugh and Yarmey (2014) introduce NFC in the book *Near Field Communication: Recent Developments and Library Implications* as a type of a radio frequency technology that transmits information wirelessly between objects, tags, posters, mobile devices, or computers across a small distance. The theoretical working distance of the NFC is about 20 centimeters.

Nagashree, Vibha, and Aswini (2014) support that NFC functions similar to RFID tags because it is a non-contact identification and an interconnection. Presently, the use of NFC enables the popular contactless payment through a mobile phone. It is secure and convenient. For example, an integration of a credit card and mobile phone and a usage over NFC generate a purchase through a wireless sensor network. Nevertheless, NFC technology is in a novel stage of development because it remains challenging to enhance its compatibility in devices. Moreover, the cost of adopting NFC technology is quite expensive.
In conclusion, technology and innovation have enabled packaging to become more communicative. The point of sale is the last chance for brands to advertise their products. Packaging then acts as a silent salesperson to present the product to consumers, and it does have an impact on the consumer’s purchasing decision. Currently, interactive media involved in the packaging industry enhances the ability of packaging to provide interactive experiences, and to allow customers to acquire more information. Interactive activities on packaging are now available. The objective of this research was to investigate Millennial consumers’ perspectives and preferences concerning interactive packaging. The significance and potential contribution of this research were to better understand the views and responses of Millennials in relation to the interactive activities on packaging.
Chapter 4

Research Objectives

Interactive features can provide extended content to printed packaging for consumer goods. This research aimed to answer these research questions:

1. For a population of 18 through 24 year-old consumers, what are the factors limiting their use of interactive packaging features?

2. For the same population, what specific interactive content, both function and form, is considered the most valuable in packaging?

3. For the same population, what is the correlation between the desired specific interactive content in packaging and the preference method of access?
Chapter 5
Methodology

This research proposes to examine the consumers’ perspective on the interactive activities on food packaging. The term, interactive packaging, refers to the ability of consumers to interact with the packaging through their smartphones or any smart device.

Sample

The sample of the study was chosen by the purposive sampling selective method. All participants were young Millennial students in college. Both male and female persons between 18 and 24 years old (includes 18 and 24 years old) were selected. In order to evaluate the respondents’ perspectives on the interactive functions of packaging; respondents must be smartphone users.

Procedure

The data about consumers’ perception of interactive packaging and the activities related to it was accumulated from a survey. The first part of the survey contained questions that asked for information about the participants’ behaviors concerning two topics. The first topic related to their smartphone usage, and the second topic related to the factors affecting their purchasing decisions about food products.

The second part of the survey focused on the consumers’ perceptions of interactive activities. QR codes and Augmented Reality were variables for this research. Participants without any awareness of interactive features and participants without any experience in using interactive features even though they were aware of them were
introduced to the interactive packaging functions through a video in order to enable them to better understand interactive packaging features.

The last part of the survey asked for respondents’ opinions and expectations about interactive features in terms of the content, both function and form, and their preferred method of access. In this part of the study, coffee and tea were used as example products. The report *Coffee Houses and Tea Shops in US* by Mintel (2015) provided that Millennials comprised a large group of coffee and tea consumers. Even though the young Millennials group was not a premium consumer of coffee and tea as the group of adult Millennials was, they were beginners that were trying to explore different kinds and different flavors of coffee. Therefore, the researcher determined that coffee and tea could be example products for the study.

**Key Variables**

This research was conducted in order to observe following variables:

1. The Independent variables were the interactive features on packaging, the QR Codes and Augmented Reality;

2. The Dependent variables were factors limiting the use of interactive features, the interactive content on packaging, the interactive form of the interactive content, and the reference method of access to the specific content.
Table 1

*Independent and Dependent Variables*

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>The interactive features on packaging, the QR Code and the Augmented Reality.</td>
<td>Factors that limit the use of interactive features</td>
</tr>
<tr>
<td></td>
<td>The kind of interactive content on packaging</td>
</tr>
<tr>
<td></td>
<td>The interactive form of the interactive content</td>
</tr>
<tr>
<td></td>
<td>The reference method of access to the specific content</td>
</tr>
</tbody>
</table>

*Analysis*

The data was analyzed by using Descriptive Statistics Analysis. The distribution, the central tendency, and the dispersion were determined.

The method of analyzes depended on the type of question in the questionnaire. The questionnaire in this survey included four question types (SurveyMonkey, n.d.).

1) A Multiple Choice Question that asked participants to select one or more choices from a list of answers. The data from this question type was presented as percentages for each choice. A pie chart was developed to provide data comparison. The distribution, the central tendency, and the dispersion were determined.
2) A Matrix Question was similar to the Multiple Choice Questions. The question allowed participants to select an answer from a same preset list of answer choices. The data from this type of question was also presented in percentages and charts to compare the results. The distribution, the central tendency, and the dispersion were determined for each answer choice.

3) A Rating Scale Question or a Likert Scale Question was a question that assigned weights to each answer. The weighted averaged was calculated for each answer choice in the analysis. Also, the distribution, the central tendency, and the dispersion were determined.

\[
\frac{x_1w_1 + x_2w_2 + x_3w_3 + \ldots + x_nw_n}{\text{Total}}
\]

\[x = \text{response count for answer choice}\]
\[w = \text{weight of answer choice}\]

4) A Ranking Question was a question that asked participant to compare items by ranking them in order. The first choice had a weight of the total number of answer choices (i.e. the question has four answers to be ranked, the first choice will have a weight of four) and the last choice had a weight of one. An average ranking was calculated for each answer choice. Also, the distribution, the central tendency, and the dispersion were determined.

\[
\frac{x_1w_1 + x_2w_2 + x_3w_3 + \ldots + x_nw_n}{\text{Total}}
\]

\[x = \text{response count for answer choice}\]
\[w = \text{weight of ranked position}\]
Chapter 6

Results

The methodology described in Chapter 5 was implemented by the researcher over a two-month period between February and March 2017. The data for the research were gathered from an online survey. The result and details are described below in the chronological order of the survey.

- Sample demographic;
- Participants’ smartphone using behavior;
- Factors and information participant consider when selecting a food product;
- Interactive Features (QR Codes and Augmented Reality) awareness, experience, and perspective;
- Questions with regard to respondents’ beverage purchase which coffee and tea are example products for this study;
  - Specific content participants consider the most valuable;
  - Format of interactive content participants prefer to see for each specific content type;
  - Preferred method for accessing each specific content type.

Sample Demographic

The respondents of the survey were RIT Students. A total of 80 surveys were completed; the respondents, all college students, were 18 through 24 years old. There
were 46 males (57.5%) and 34 females (42.5%). Respondents were from different colleges as shown in Figure 6.

**Smartphone Usage and Behavior**

From the survey, data showed that respondents spend an average time of 6 hours on their smartphones. The maximum amount was 14 hours, and the minimum was 1 hour. The range of the data was 13 hours which is a large number.
There were 63 responses (78.75%) who download a new application on their smartphone less than once a week, and 10 responses (12.5%) download once a week, and only 7 responses (8.75%) download an application more than once a week. The data is shown in Figure 7.

This data showed that students spend significant time on their smartphone; however, they rarely download a new application.

**Factors and Information Participants Consider When Selecting a Food Product**

The research also investigated factors that customers consider when purchasing a food product. The questionnaire asked respondents to rank important factors they might consider when making a purchase.

*Figure 7. The Data from the Survey Question “On Average, How Often Do You Download a New Application onto Your Smartphone?”*
The data from the survey shows in Figure 8 that the respondents considered price the most important factor when selecting a food product. As shown by the weighted average of 6.89, brand was the second factor. However, a new brand was the least considered factor. Furthermore, some respondents also provided additional suggestions as possible for this choices for this question: Product review, major food allergens, and expiration date were also mentioned as the factors they considered.

The questionnaire also asked for specific product label information customers considered when selecting a food product. The list of the labeling requirements from A Food Labeling Guide by the Food and Drug Administration (2013) were used in the ranking question.
The graph in Figure 9 presents the weighted average of the respondents to each type of label information. Amount of the product in container and Nutrition facts about the product received a similar weighted average. The amount of the product in the container was a most considered factor which received a weighted average of 4.06. Nutrition Facts about the product received 3.96. The nutrition content claim received the weighted average of only 2.75 which means that this information was considered the least. Expiration date information and product review were also mentioned by respondents as additional comments with this question.

Figure 9. The Data from The Survey Ranking Question “Product Label Information You Consider when Selecting a Food Product.”
Interactive Features Awareness, Experience, and Their Opinion to the Features

The questionnaire asked participants about their awareness and experience in using interactive features. This study, focused primarily on QR Codes and Augmented Reality.

![Bar chart showing awareness and experience with QR Codes and Augmented Reality](image)

*Figure 10. The Data from The Survey Question “Are You Aware of The Use of QR Code Scanning?”, “Are You Aware of The Use of Augmented Reality Scanning?”, and “Have You Ever Used QR Code Scanning or Augmented Reality Scanning?”*

The data presented in Figure 10 shows that 86.25% of respondents (69 people) were aware of the use of QR Code scanning; however, there was only 38.75% (31 people) of respondents who were aware of the use of Augmented Reality scanning. Moreover, the results of the survey showed that 72.50% of respondents were experienced in using QR Codes, and only 17.5% of respondents had used augmented reality scanning.
The factors limiting the use of interactive features were the next item of inquiry. A Likert Scale question was used. Participants chose the reason they were unaware of the benefit from scanning the interactive feature as the most prominent reason for their limited use. The weighted average was 3.44. However, other factors received only a slightly less rating average.

**Factors Limiting the Use of Interactive Features**

- The content provided by the code is not sufficient interest: 3.36
- Unaware of benefit from scanning the interactive feature: 3.44
- Sufficient WIFI/DATA are available for downloading the scanning application: 2.73
- Scanning take too much time: 3.15
- Do not want to download any scanning application on the phone: 3.32
- Do not have any scanning application on the phone: 3.18

*Figure 11*. The Data from The Survey Question “What Factors Limit Your Use of Interactive Features? (QR Codes, and Augmented Reality)

Figure 11 presents the weighted average for each factor that might limit the respondents’ use of interactive features. If they were arranged by weighted average from the highest to the lowest score the order would be; 1) Unaware of benefit from scanning the interactive feature, 2) The content provided by the code is not of sufficient interest, 3)
Do not want to download any scanning application on the phone, 4) Do not have any scanning application on the phone, 5) Scanning takes too much time, and 6) Sufficient WIFI/DATA are not available for downloading the scanning application.

Table 2

Factors That Can Increase the Use of Interactive Features Total of 78 Responses

(QR Codes and Augmented Reality)

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Rating Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having a universal scanning application for all codes</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>29</td>
<td>35</td>
<td><strong>4.21</strong></td>
</tr>
<tr>
<td>Packaging clearly states the benefit of scanning the code</td>
<td>2</td>
<td>1</td>
<td>10</td>
<td>40</td>
<td>25</td>
<td><strong>4.09</strong></td>
</tr>
</tbody>
</table>

The questionnaire asked for the factors that could increase the respondents’ use of interactive features. The researcher provided two choices for participants to rate by using a Likert Scale. The data shows in Table 2 that 35 participants answered strongly agree for the factor “Having a universal scanning application for all codes.” This factor received the rating average of 4.21. Moreover, the additional comments from participants also supported that they preferred that the manufacturer notify consumers about the benefit of using interactive packaging with a message on the product or on shelf advertising.
Participants also agreed that if there was a universal scanning application for all codes, it could increase the use of interactive features as well. This factor received a rating average of 4.09. Other than the knowledge of product information that could be provided by the packaging, the participants also suggested that a reward or a promotional campaign could increase their interest in using the interactive features as well.

**The Result Regarding Participants’ Beverage Purchase**

The last part of the survey asked for respondents’ opinions and expectations about interactive features in terms of the content, both function and form, and their preferred method of access. In this part of the study, coffee and tea were used as example products. The questionnaire was separated by the respondents’ beverage purchases: only coffee, only tea, both coffee and tea, or neither beverage.
Figure 12 presents the percentages showing participants' beverage purchasing choices. The data shows that 32 responses (41%) were more likely to purchase coffee. There was 33.3% of the respondents or 25 responses purchased more tea, 6.4% or 5 respondents purchased both coffee and tea in a similar frequency, and 19.2% or 15 respondents did not purchase any coffee or tea. The group of respondents who did not purchase coffee and tea were not eligible to participate in the remaining survey questions.
Table 3

*The Interactive Content Respondents Considered the Most Valuable when Making a Coffee or Tea Purchase*

<table>
<thead>
<tr>
<th>Order</th>
<th>Coffee</th>
<th>Tea</th>
<th>Coffee &amp; Tea</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic information about the product</td>
<td>Basic information about the product</td>
<td>Basic information about the product</td>
</tr>
<tr>
<td>2</td>
<td>Instructions</td>
<td>Product Reviews</td>
<td>Instructions</td>
</tr>
<tr>
<td>3</td>
<td>Product Reviews</td>
<td>Coupons and Promotions</td>
<td>Product Reviews</td>
</tr>
<tr>
<td>4</td>
<td>Coupons and Promotions</td>
<td>Instructions</td>
<td>Alternative Recipes</td>
</tr>
<tr>
<td>5</td>
<td>Alternative Recipes</td>
<td>Alternative Recipes</td>
<td>Coupons and Promotions</td>
</tr>
</tbody>
</table>

The questionnaire asked for the content respondents considered important when making a purchase of coffee, tea, or both. Table 3 indicates the content respondents considered when they purchased their beverage of choice. The content topics in Table 3 are arranged by order; number one means the most important content consumers considered. And the number five means the least important content they considered. Basic information about the product was selected as the most important content consideration.
Figure 13 presents the weighted average for the ranking question about the specific content respondents considered the most valuable when making a purchase. In the questionnaire, respondents were asked the question regarding their coffee or tea purchasing; however, the researcher compiled and calculated the overall weighted average for each content type without separating them by their beverage preferences.

The data revealed that basic information about the product was the most important content that participants considered when purchasing. It received the highest weighted average. Then product review was considered; it was the next important information after the basic information about the product. The alternative recipes (Instructions and

<table>
<thead>
<tr>
<th>Content Type</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic information about the product (e.g. nutrition information, calories, caffeine amount, etc.)</td>
<td>3.79</td>
</tr>
<tr>
<td>Instructions (i.e. methods to brew the coffee.)</td>
<td>2.90</td>
</tr>
<tr>
<td>Alternative recipes (instructions and alternative ways to prepare the drink)</td>
<td>2.40</td>
</tr>
<tr>
<td>Coupons and Promotions</td>
<td>2.80</td>
</tr>
<tr>
<td>Product reviews</td>
<td>3.09</td>
</tr>
</tbody>
</table>

Figure 13. Weighted Average of The Survey Question “What Specific Interactive Content Would You Consider the Most Valuable When You Make a Beverage Purchase?”
alternative ways to prepare the drink) was considered the least important.

Table 4

*Respondents’ Preference for Interactive Content Format in Each Specific Content Type*

<table>
<thead>
<tr>
<th></th>
<th>Coffee</th>
<th>Tea</th>
<th>Coffee &amp; Tea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic information</td>
<td>Short Paragraph</td>
<td>Short Paragraph</td>
<td>Text with graphic Elements</td>
</tr>
<tr>
<td>about the product</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructions</td>
<td>Text with graphic</td>
<td>Short Paragraph</td>
<td>Text with graphic Elements Video Clip</td>
</tr>
<tr>
<td></td>
<td>Elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative recipes</td>
<td>Video Clip</td>
<td>Short Paragraph</td>
<td>Text with graphic Elements</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coupons and Promotions</td>
<td>Text with graphic</td>
<td>Text with graphic Elements</td>
<td>Short Paragraph</td>
</tr>
<tr>
<td></td>
<td>Elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product reviews</td>
<td>Short Paragraph</td>
<td>Short Paragraph</td>
<td>Short Paragraph</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 provides the content formats participants preferred for each content type if the content is presented through the interactive features. The questionnaire provided seven choices which are 1) short paragraph (only text without any graphic element), 2) long paragraph with full explanation, 3) text with graphic elements, 4) video clip, 5) graphic animation, 6) audio, and 7) 3D object visualization.
Figure 14 presents the overall percentages of the interactive content format participants preferred. These data accumulated all responses without separating the information by participant’s beverage purchase. A short paragraph and text with graphic element are the top two popular formats.

**Figure 14.** The Overall Response Percentages for the Survey Question “What Format of Interactive Content Would You Most Prefer when You Make a Beverage Purchase?”

<table>
<thead>
<tr>
<th>Interactive Content Format</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D objects Visualization</td>
<td>4.26%</td>
</tr>
<tr>
<td>Audio</td>
<td>2.30%</td>
</tr>
<tr>
<td>Graphic Animation</td>
<td>12.80%</td>
</tr>
<tr>
<td>Video Clip</td>
<td>11.80%</td>
</tr>
<tr>
<td>Text with Graphic Elements</td>
<td>28.52%</td>
</tr>
<tr>
<td>Long Paragraph with full explanation</td>
<td>6.89%</td>
</tr>
<tr>
<td>Short Paragraph (only text without any graphic element)</td>
<td>33.43%</td>
</tr>
</tbody>
</table>
Table 5

*Respondents’ Preference Method for Accessing Each Specific Content Type*

<table>
<thead>
<tr>
<th></th>
<th>Coffee</th>
<th>Tea</th>
<th>Coffee &amp; Tea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic information about the product</td>
<td>Phone + Individual scanning application</td>
<td>Phone + Web browser application</td>
<td>Phone + Individual scanning application</td>
</tr>
<tr>
<td>Instructions</td>
<td>Phone + Web browser application</td>
<td>Phone + Web browser application</td>
<td>Computer + Web browser application</td>
</tr>
<tr>
<td>Alternative recipes</td>
<td>Phone + Web browser application</td>
<td>Phone + Web browser application</td>
<td>Computer + Web browser application</td>
</tr>
<tr>
<td>Coupons and Promotions</td>
<td>Phone + Individual scanning application</td>
<td>Phone + Web browser application</td>
<td>Phone + Individual scanning application</td>
</tr>
<tr>
<td>Product reviews</td>
<td>Phone + Web browser application</td>
<td>Phone + Web browser application</td>
<td>Computer + Web browser application</td>
</tr>
</tbody>
</table>

Table 5 indicates the preferred method for accessing the specific content in each content type. The data shows that a web browser application on a smartphone is the most popular option consumers chose for accessing the content.
The data revealed that respondents preferred using a web browser application on their phone to search for product information over using an individual scanning application on the phone. A tablet was the least selected method for searching for the product information.

The next chapter will review this data and offer conclusions in reference to the previously outlined research questions.

Figure 15. The Overall Percentages of the Survey Question “What is Your Most Preferred Method for Accessing the Specific Content in Each Content Type?”
Chapter 7

Summary and Conclusions

The results of the study presented significant information which can be analyzed and expanded to answer each of the following the research question.

**Research Question 1: For a population of 18 through 24 year-old consumers, what are the factors limiting their use of interactive packaging features?**

This question was asked in the survey. The researcher provided five choices for participants to rate their agreement or disagreement by using a Likert scale from “strongly agree” to “strongly disagree”. There were 78 responses to this question. The Likert rating along with additional comments indicated that they were unaware of the benefit of scanning the interactive feature. Also, the content provided by the code was not of sufficient interest. Moreover, scanning the interactive feature required them to download a scanning application which they did not want to do.

The questionnaire also asked for the factors that could increase the use of these interactive features. There were 35 participants who “strongly agreed” that having a universal scanning application (not available) would likely decrease their use of interactive packaging features. There were 40 respondents who agreed that the package needed to clearly state the benefit of scanning the code.
Research Question 2: For a population of 18 through 24 year-old consumers, what specific interactive content, both function and form, is considered the most valuable in packaging?

“Function” in this research question relates to the information type or the interactive content type consumers consider the most valuable (e.g., Basic Information about the product, Product reviews, Instruction, Coupons and promotions, and Alternative recipes). And “form” in this research question refers to the interactive content format (e.g., short paragraph (only text without any graphic element), long paragraph with full explanation, text with graphic elements, video Clip, graphic animation, audio, and 3D object visualization).

This question could be answered differently depending on the type of the product: this research question is then evaluated with regard to participants’ purchase of coffee, or tea, or both. Basic information about the product with a highest weighted average of 3.79, was rated the most valuable information for all three groups of participants. The data demonstrated a slightly different response for the second answer to the most valuable content. Coffee consumers and coffee and tea consumers rated instructional information (i.e. methods to brew the drink) as the second most important package information while tea consumers rated product reviews as the second most important content. If all respondent choices are combined, the following list shows their choices in descending order of importance;

1.) Basic Information about the product,
2.) Product reviews,
3.) Instruction,
4.) Coupons and promotions, and
5.) Alternative recipes.

Form or format of the interactive content was observed for each specific content type. “A short paragraph” and “text with graphic elements” were respectively frequently chosen responses, both of with seem to be options very easy for respondents to use.

**Research Question 3: For a population of 18 through 24 year-old consumers, what is the correlation between the desired specific interactive content in packaging and the preferred method of access?**

The method of accessing the interactive content was surveyed. The response indicated that consumers used their smartphone to search for product information when making a purchase rather than a tablet or a computer. In additional, a web browser application on their smartphone was a preferred method for accessing information rather than an individual scanning application. Overall respondents preferred using a web browser application to search for product content, 44.98%, instead of an individual scanning application that received 33.33%.
Table 6

Correlation Between Methods for Accessing Each Specific Content Type

<table>
<thead>
<tr>
<th>Content Type</th>
<th>Method of Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Information of the Product</td>
<td>Individual Scanning Application</td>
</tr>
<tr>
<td>Instructions</td>
<td>Web Browser Application</td>
</tr>
<tr>
<td>Alternative Recipes</td>
<td>Web Browser Application</td>
</tr>
<tr>
<td>Coupons and Promotions</td>
<td>Web Browser Application</td>
</tr>
<tr>
<td>Product Reviews</td>
<td>Web Browser Application</td>
</tr>
</tbody>
</table>

Table 6 shows the relationship between the method for accessing each specific content type. The data from the survey showed that respondents preferred using an individual scanning application to access the basic information of the product. However, they preferred using a web browser application to access other content types.

Analysis and Summary of Conclusions

Interactive features can advance packaging’s ability to provide functionality. These features allow a brand to insert information onto packaging which can be read through smartphones or other digital devices such as tablets. There are two types of interactive packaging that do not require special printing techniques to produce them: QR codes and Augmented Reality. These two interactive features were variables in this research. The results of the study revealed that young Millennials consumers, 18 through 24 years old, were 100% smartphone users. Among the respondent, 86.25% were aware of QR codes, but only 72.50% of them were experienced in using QR codes. Only
38.75% of the respondents knew about Augmented Reality, and 17.50% of them had experienced the Augmented Reality scanning feature. The QR code was better known than Augmented Reality. In addition, the main factors limiting the respondents, use of interactive features were that they were unawareness of the benefits of scanning the codes, and insufficient interest in content provided by the codes. Also, the respondents did not want to download the scanning application on their phone.

Besides the required information regulated by the FDA, the content on food packaging now also includes product reviews that participants considered valuable. The results of the survey showed that the basic information about the product, such as nutrition information and calories, was the most valuable content that respondents were looking for when making a purchase. Product reviews were also considered valuable content after the basic information.

Interactive features for food packaging can be presented in several formats, for example, a short paragraph, a long paragraph comprising a fully detailed explanation, graphic elements, graphic animation, video clip, audio, or a 3D object visualization. Respondents rated the short paragraph and text with graphic elements as their preferred formats for interactive content. These formats seem to be very easy to use options. Even though the interactive features are available for use, respondents still preferred using a web browser application on their phone to search for additional product information over using a specific scanning application.
Limitation and Future Research

The primary limitation of this study is that the number of participants was relatively small and thus the findings cannot be generalized to represent all 18-24 years old consumers. Also, only two products, coffee and tea, were used to represent food products. The researcher believes that the survey response would be different if the example products were different.

Another limitation of this study is the format of the online survey itself. The researcher intended to provide more open-ended type of questions so that participants could fill in their opinions rather than just rank the answers that were provided by the researcher. However, the format of questionnaire provided by the software did not allow participants to enter comments to be included with ranking order questions. Another limitation of the online survey format occurred in the matrix of dropdown menus. The question allowed respondents to evaluate several items using the same set of measurements by choosing from a preset list of answer choices, and again the researcher would have liked to have been able to ask respondents to add their opinion in the list of answer choices. That option was not available in the online survey format.

In future research, several issues can be examined which they are listed below;

1.) The representative sampling frame can be larger. For example, the sample size can be larger, other age groups can be surveyed, or cultural differences can be taken into account.
2.) Different products as examples can be used. The example products can be categorized, for example, by the type of food, the type of packages, or the instructions about how to use the product itself.

3.) Different survey software might have fewer limitations.

4.) Different methods could be used to approach the research data; for example, observation, interview, or a focus group study might reveal diverse results.

5.) The study can include NFC and RFID as choices of interactive features.

6.) The data of the study can be broken out by participant’s sex, their smartphone usage, or their educational background.

Bibliography


Klimchuk, M R., Krasovec, S A. (2013). Packaging Design:

Successful Product Branding From Concept to Shelf.


Appendix A

Informed Consent Document

The Title of Study:
Consumer Preferences in Food Interactive Packaging:

Description:
This questionnaire, Consumer Preferences in Food Interactive Packaging, is part of a Master Thesis in the School of Media Sciences, Rochester Institute of Technology. This study investigates the young Millennial (age between 18-24 years old including 18 and 24 years old) consumers’ perspectives and their preferences for interactive features on food packaging which include QR Codes and Augmented Reality on packages. You will be asked to complete a questionnaire. Also, a video about the functions of interactive features on packaging will be presented if you are not aware of or have not previously used the features.

The Involvement:
The questionnaire should take approximately 15-20 minutes to complete.

Risks and Benefits:
There are no known risks or discomforts associated with completing the survey beyond those of everyday life.

Confidentiality:
The responses will remain anonymous and your specific answers will be kept confidential and reported in aggregate form only. Information obtained in this survey is strictly for research purposes, and will not be given out to any other parties. Access to the data is also restricted to the primary researcher, and will not be provided to any other parties.

Participant’s Rights:
Your participation is completely voluntary, and you have the right to leave the survey at any time without penalty.

Contact Information:
If you have any concerns, or suggestions about this questionnaire, please contact:
Nuchjarin Pareeratanasomporn
School of Media Sciences, College of Imaging Arts and Sciences,
Rochester Institute of Technology
69 Lomb Memorial Drive, Rochester, NY 14623-5604
Email: np3801@rit.edu
Tel. +1 (703) 225 9490
Statement of Consent:
I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Would you consent to take part in the study?
- Yes
- No
## Appendix B

### Survey Questionnaire

### Consumer Preferences in Food Interactive Packaging

#### 2. Consumers Information

* * Required Question *

* 1. Are you a smartphone user?
  - [ ] Yes
  - [ ] No

#### 3. Consumers Information

* 1. Are you between 18-24 years old?
  - [ ] Yes, I am.
  - [ ] No, I am not.

#### 4. Consumer's Information

* 1. Gender
  - [ ] Male
  - [ ] Female

* 2. What college are you in?
  - [ ] College of Imaging Arts and Sciences
  - [ ] College of Applied Science and Technology
  - [ ] Saunders College of Business
  - [ ] B. Thomas Golisano College of Computing and Information Science
  - [ ] Kate Gleason College of Engineering
  - [ ] College of Health Sciences and Technology
  - [ ] College of Liberal Arts
  - [ ] National Technical Institute of the Deaf
  - [ ] College of Science
  - [ ] School of Individualized Study
3. On average, how much time do you spend on your smartphone each day? (Move circle to display time in box.)

- [ ] 0 hour
- [ ] 24 hours

4. On average, how often do you download a new application onto your smartphone?

- [ ] More than once a week
- [ ] Once a week
- [ ] Less than once a week

5. Factors you consider when selecting a food product.

Please rank the following items in order of importance with #1 being the most important factor to #8 being the least important factor.

- [ ] Brand
- [ ] Price
- [ ] Advertisement
- [ ] Discount Coupon
- [ ] New Product
- [ ] New Brand
- [ ] Design of the package
- [ ] Product Information (e.g. The statement of product identity, Manufacturer, the ingredients, Nutrition)

6. Other factors you consider when you select a food product.
7. Product label information you consider when selecting a food product.

* Please rank the following items in order of importance with #1 being the most important label information to #6 being the least important label information.

- Statement of product identity (e.g. Brand, Advertising statement)
- Amount of the product in container
- Name of manufacturer, packer, or distributor of product
- Ingredients list
- Nutrition Facts about the product (e.g. serving size, calories, and nutrient information)
- Nutrition Content Claim (i.e. claim statement to be low in fat, low in sodium)

8. Other product label information you consider when you select a food product.

5. Interactive Features Awareness

* 1. Are you aware of the use of QR Code scanning?
   - Yes, I am aware of the use of QR Code scanning.
   - No, I am not aware of the use of QR Code scanning.

* 2. Are you aware of the use of Augmented Reality scanning?
   - Yes, I am aware of the use of Augmented Reality scanning.
   - No, I am not aware of the use of Augmented Reality scanning.

* 3. Have you ever used any of the QR Code scanning or the Augmented Reality scanning?
   - Yes, I have used QR Code scanning.
   - Yes, I have used Augmented Reality scanning.
   - No, I have never used QR Code scanning or Augmented Reality scanning.
6. Interactive Features on Packaging

Please play this video to get a better understanding of interactive packaging features.
You can skip this video, if you have experienced in QR code scanning and Augmented reality scanning.

https://vimeo.com/201727312
7. Consumer's Perspectives Concerning Interactive Features

* 1. What factors limit your use of interactive features? *(QR Code, Augmented Reality)*

<table>
<thead>
<tr>
<th>Reason</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not have any scanning application on the phone</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Do not want to download any scanning application on the phone</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Scanning takes too much time</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Sufficient WiFi/Data are not available for downloading the scanning application</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Unaware of benefit from scanning the interactive feature</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The content provided by the code is not of sufficient interest</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 2. What factors can increase your use of these interactive features *(QR Code, Augmented Reality)*?

<table>
<thead>
<tr>
<th>Reason</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having a universal scanning application for all codes</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Packaging clearly states the benefit of scanning the code</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Consumer's Expectations about Interactive Features in Coffee and Tea Purchases

The following questions relate specifically to your Coffee and Tea purchases.

* 1. Between coffee and tea, which beverage do you purchase more often?

- ○ Coffee
- ○ Tea
- ○ Coffee and Tea (No distinction between purchasing coffee and tea)
- ○ Neither. I do not purchase coffee or tea.
Questions based on beverage preference.

Coffee

1. What specific interactive content would you consider the most valuable when you make a coffee purchase?
   Please rank the following items in order of importance with #1 being the most important factor to #5 being the least important factor.

   1. Basic information about the product (e.g. nutrition information, calories, caffeine amount, etc.)
   2. Instructions (i.e. methods to brew the coffee)
   3. Alternative recipes (instructions and alternative ways to prepare the drink)
   4. Coupons and Promotions
   5. Product reviews

2. Other interactive content you would find valuable when you make a coffee purchase.

   

3. What format of interactive content would you most prefer when you make a coffee purchase?

   Presentation Form

   1. Basic information of the product (e.g. nutrition information, calories, caffeine amount, etc.)
   2. Instructions (i.e. methods to brew the coffee)
   3. Alternative recipe (instruction and alternative ways to mix the drink)
   4. Coupons and Promotions
   5. Product reviews
3. What format of interactive content would you most prefer when you make a coffee purchase?

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<thead>
<tr>
<th>Presentation Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic information of the product (e.g. nutrition information, calories, caffeine amount, etc.)</td>
</tr>
<tr>
<td>2. Instructions (i.e. methods to brew the coffee)</td>
</tr>
<tr>
<td>3. Alternative recipe (instruction and alternative ways to mix the drink)</td>
</tr>
<tr>
<td>4. Coupons and Promotions</td>
</tr>
<tr>
<td>5. Product reviews</td>
</tr>
</tbody>
</table>

4. What is your most preferred method for accessing the specific content in each content type?

<table>
<thead>
<tr>
<th>Access Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic information of the product (e.g. nutrition information, calories, caffeine amount, etc.)</td>
</tr>
<tr>
<td>2. Instructions (i.e. a proper method to brew the coffee)</td>
</tr>
<tr>
<td>3. Alternative recipe (instruction and alternative ways to mix the drink)</td>
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<tr>
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</tr>
<tr>
<td>5. Product reviews</td>
</tr>
</tbody>
</table>
10. Thank you

Thank you for taking the time to complete this survey. I truly value the information you have provided.
If you would like the executive summary of this study, please enter your email address in the box below.

1. Please enter your email address in order to receive the executive summary of the survey.
(Also, for a chance of winning $25)

If you have any questions, concerns, or suggestions about this survey, please contact:

Nuchjarin Pareeratanasomporn
School of Media Sciences, College of Imaging Arts and Sciences,
Rochester Institute of Technology
69 Lomb Memorial Drive, Rochester, NY 14623-5634

Email: n3801@rit.edu
Tel. +1 (703) 225 9490
Appendix C

Participant Recruitment Flyer

😊 OPINION NEEDED 😊

DO INTERACTIVE FEATURES WORK ON PACKAGING ??
THESIS RESEARCH: CONSUMER PREFERENCES IN FOOD INTERACTIVE PACKAGING
If you are 18 - 24 YEARS OLD and A SMARTPHONE USER ● PLEASE COMPLETE THIS SURVEY
SURVEY DURATION: 10-15 MINUTES ● AVAILABLE ON COMPUTER, TABLET, AND PHONE

https://goo.gl/hDVpyS

FOR MORE INFO: NUCHJARIN PARREE • CIAS • SCHOOL OF MEDIA SCIENCES • NP3801@RIT.EDU

QR CODES
AUGMENTED REALITY
RFID
NFC

If you are 18 - 24 YEARS OLD and A SMARTPHONE USER PLEASE COMPLETE THIS SURVEY
OPINION NEEDED
SURVEY DURATION: 10-15 MINUTES AVAILABLE ON COMPUTER, TABLET, AND PHONE
Appendix D

Human Subjects Committee Approval

Form C
IRB Decision Form

TO: Nuchjarin Pareerattanasonporn
FROM: RIT Institutional Review Board
DATE: February 8, 2017
RE: Decision of the RIT Institutional Review Board

Project Title – Consumer Preferences in Food Interactive Packaging

The Institutional Review Board (IRB) has taken the following action on your project named above.

☒ Exempt 46.101 (b) (2)

Now that your project is approved, you may proceed as you described in the Form A.

You are required to submit to the IRB any:
• Proposed modifications and wait for approval before implementing them,
• Unanticipated risks, and
• Actual injury to human subjects.

Heather Foti, MPH
Associate Director
Office of Human Subjects Research

Revised 10-18-06