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New Food Product Development: Strategic Planning and Design

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이 논문을 경제학 석사학위논문으로 제출함
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Abstract

New Food Product Development:

Strategic Planning and Design

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New food product development (NFPD) is essential for food companies to profit and succeed in a highly competitive market. This study examines the key factors that lead to successful NFPD. Essay 1 investigates the differences in product attributes and marketing factors that influence the sales of new frozen cooked rice and frozen dumpling products. To accomplish the aim of the study, sales data from a product panel were analyzed by using a generalized least squares (GLS) random-effects model. The results show that the key product attributes and marketing factors that affect sales are different for new frozen cooked rice and frozen dumpling products. Essay 2 examines the effects of formulation changes and research and development (R&D) cooperation types on the volume of online reviews for extension products. The multiple linear regression was conducted using secondary data from extension products in the Korean dessert market whose formulations were

changed. The results indicate that formulation categories and R&D cooperation types play key roles in the proliferation of online reviews for products with changed formulations. These findings contribute to increasing the chance of successful NFPD.

Keywords: New product development, Consumption situation, Product attributes, Marketing strategies, Online reviews, Brand extension

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Preface

Achieving market success in an increasingly competitive business environment requires companies to be consistently engaged in new product development (NPD) (Hsieh et al., 2008; Paladino, 2007). NPD is especially important in the food industry, as it is highly competitive and saturated in almost all relevant food categories (Hoffmann et al., 2020). This forces food companies to constantly invest in NPD to meet the growing consumer demand for new and innovative products (Rudder, 2003). In this respect, new food product development (NFPD) is essential for food companies to gain a competitive advantage and succeed in the marketplace (Rudder et al., 2001; Stewart-Knox & Mitchell, 2003). Although many food companies continuously invest in NPD, the failure rate is high: 40–50% of new food products disappear from the market in the first year (Costa & Jongen, 2006). Therefore, it is important for food companies to understand the key factors that affect the performance of new food products.

The frozen food industry is one of the fastest-growing industries worldwide (Popescu et al., 2017). In the Korean frozen food market, frozen cooked rice has shown rapid sales growth in recent years (Kwak et al., 2015), and frozen dumplings have achieved the largest market share (aT & MAFRA, 2018). As the demand for frozen food products increases, the variety of new products has also expanded (Kumar et al., 2020).

Throughout the NPD process, food companies generally place more emphasis on the product development and marketing strategy development stages (Ilori et al.,

2000), as product attributes and marketing factors are the main determinants of new products' performance (Ekambaram et al., 2020). Product attributes affect purchase intention by shaping consumer perceptions (Lange et al., 2000; Zaman & Arslan, 2014), while marketing factors induce consumers to adopt a product by providing information about product attributes that can satisfy consumer needs (Crawford & Di Benedetto, 2011).

The impact of these two key factors on NPD success depends on the expected consumption situation of the product (Kivetz & Zheng, 2017; Parreño-Selva et al., 2014; Quester & Smart, 1998). People often classify foods as meals or snacks based on consumption situations, such as meal type or time (Blake et al., 2007). Accordingly, frozen cooked rice can be classified as a meal and frozen dumplings as a snack (Kim et al., 2009; Kwon et al., 2017). It is important to increase the relevance of product attributes and marketing factors to expected consumption situations to enhance the intention to adopt new food products (Lai, 1991; Parreño-Selva et al., 2014). Therefore, new product developers should consider expected consumption situations when developing product attributes and marketing factors. However, previous studies have not addressed the differences in the effects of product attributes and marketing factors on NPD performance in terms of consumption situations.

As competitive pressures increase, many companies employ brand extension strategies to reduce the risk of NPD failure and the cost of introducing a new product (Kapferer, 2008). Changing physical attributes (PAs) while maintaining the brand is an example of a brand extension strategy used to increase hedonic appeal (Chitturi et al., 2007; Noseworthy & Trudel, 2011). In particular, this practice appears to be

an interesting NPD phenomenon that induces consumer interest through formulation changes in the Korean dessert market. This phenomenon is also attempted through various types of R&D cooperation, such as vertical cooperation above the supply chain and horizontal cooperation with similar competitors. As a result, products with formulation change gain popularity through the active proliferation of online reviews by providing hedonic appeal.

Previous studies have demonstrated that product attributes and the type of R&D cooperation are important factors that influence the performance of new products (e.g., Brettel & Cleven, 2011; Enneking et al., 2007; Hyll & Pippel, 2015). In addition, the volume of online reviews is a key driver of NPD success, which increases sales by facilitating the diffusion and adoption of new products (Duan et al., 2008; Liu, 2006; Mahajan et al., 1984). Therefore, new product developers need to understand how formulation changes and R&D cooperation types affect the proliferation of online reviews. Although many extension products have been launched through formulation change and R&D cooperation, there is a lack of studies concerning the effect of formulation change on NPD success. Furthermore, less attention has been paid to the effects of R&D cooperation types on new product performance from a consumer perspective, such as online reviews.

Therefore, two essays were conducted to identify the key factors that lead to successful NFPD. The purpose of the first essay was to compare the product attributes and marketing factors that affect the sales of new frozen cooked rice and frozen dumpling products, which have different consumption situations, namely meal and snack, respectively. The title of the first essay is “The effects of product attributes and marketing factors on new food product development: Focusing on

frozen cooked rice and frozen dumplings." The aim of the second essay was to investigate the impacts of formulation categories and R&D cooperation types on the volume of online reviews for brand extension products. The second essay[1] is titled "The effects of formulation change and R&D cooperation types on the volume of online reviews for extension products."

1 The second essay was published in *British Food Journal*: Kim, N., Hwang, J., Lee, D., Jeong, J., & Moon, J. (2020). The impact of formulation change and R&D cooperation types on the eWOM of extension products. *British Food Journal*.

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Ⅰ. Essay 1:
The Effects of Product Attributes and Marketing Factors on New Food Product Development: Focusing on Frozen Cooked Rice and Frozen Dumplings

1. Introduction

New food product development (NFPD) is essential for food companies to profit and succeed in the marketplace (Rudder et al., 2001; Stewart-Knox & Mitchell, 2003). Intense global competition, the rapid advancement of technology, and changes in consumer needs drive companies to invest in NPD (Cooper & Kleinschmidt, 1991; Owens & Davies, 2000; Schmidt, 1995). The global frozen food market has grown gradually, and the diversity of its products has expanded due to advances in technology and increased consumer needs (Kumar et al., 2020). Its current value is about $300 billion, which is forecasted to reach $360 billion by 2024 (Cleland, 2020; Kumar et al., 2020). Similarly, the frozen food market in Korea is rapidly advancing to annual average growth of 4.1% from 2014 to 2019 (Analyst View Market, 2019). It is beneficial to launch new products at a rapid pace by identifying consumer needs for products, especially in a growing market (Sheng et al., 2013). Despite the importance of NPD, companies experience a high failure rate (60–80%) when introducing new products to the food market (Grunert & Valli, 2001), where many similar products compete for consumer attention (Barbosa et al., 2021; Peschel et al., 2019). In this competitive environment, market success is determined by differences in the factors that influence NPD (Enzing et al., 2011). In

this regard, it is necessary for food companies to identify the key factors that affect the performance of new products.

The NPD process is described by an eight-stage model (Armstrong et al., 2014): idea generation, idea screening, concept development and testing, marketing strategy development, business analysis, product development, test marketing, and commercialization. In NFPD, most food companies focus on the product development and marketing strategy development stages (Ilori et al., 2000). This is because the core activities of NFPD are to develop products by identifying product attributes that satisfy consumer needs (Costa & Jongen, 2006; Ilori et al., 2000) and plan marketing strategies that will lead to a successful launch (Rudolph, 1995). Accordingly, this study focuses on the two aforementioned stages to investigate the factors that influence the sales of new food products.

During the NPD process, the product development and marketing strategy development stages are closely linked (Kortge & Okonkwo, 1989). Product attributes, determined at the development stage, influence consumer purchase intention (Zaman & Arslan, 2014) because consumer perception cues are generated based on product attributes (Lange et al., 2000). Therefore, to achieve market performance, many companies introduce new products by configuring new attributes or improving existing attributes (Ofek & Srinivasan, 2002). Strategies established during the marketing strategy development stage provide relevant marketing factors to help narrow down feasible product options (Crawford, 1986). Marketing factors include product, price, promotion, and distribution/channel (Lages et al., 2008; Melovic et al., 2020). These factors increase market share by planning promotions and pricing policies and maximize revenue through competitive advantage

(Brooksbank, 1991; Jacobsen et al., 2014). Particularly, marketing factors contribute substantially to NPD by providing important information about new products that satisfy consumer needs (Costa & Jongen, 2006; Suwannaporn & Speece, 2003). Consequently, the sales of a new product depend on product attributes and marketing factors (Ekambaram et al., 2020). Thus, successful NFPD requires the consideration of product attributes and marketing factors.

However, most previous studies have focused on major business activities that affect NPD (e.g., Di Benedetto, 1999; Pujari, 2006). In particular, previous studies have used consumer purchase intention and willingness to pay as NPD performance indicators instead of collecting actual sales data (e.g., Kwon et al., 2008; Mcguinness & Little, 1981). In other words, there have been limitations to the research on the impacts of product attributes and marketing factors in the context of NFPD. Therefore, this study investigated the effects of product attributes and marketing factors on the sales of new food products in the frozen food category, in which NFPD is actively progressing.

2. Literature Review

2.1 Frozen Food Product Category

Frozen food is defined as a product for which the temperature of the food supply chain is maintained below -18 °C (Akkerman et al., 2010; Schmidt-Lorenz, 1983). The frozen food industry is one of the fastest-growing industries in the world today and is expected to continue to grow (Kennedy, 2000b; Popescu et al., 2017). In recent years, the quality of frozen food products has improved due to advances in food-freezing science and technology (Kumar et al., 2020). As a result, consumer perceptions of frozen food products have changed positively from "cheap and convenient junk food" to "high-quality added-value food" (Kennedy, 2000a). In addition, the market demand for frozen food has increased, and the variety and availability of frozen food products have also expanded (Kumar et al., 2020).

Frozen dumplings are traditional frozen food products that have been available in East Asia since the mid-1970s (Huang, 1999). In Korea, the frozen dumpling market had the largest market share (51.2%) in the frozen food category (aT & MAFRA, 2018). Moreover, consumer needs have diversified as the perception of frozen dumplings has become more positive (Kim et al., 2009). Accordingly, the frozen dumpling industry has experimented with various approaches to meeting consumer needs in the context of NFPD: filling and shape differentiation (e.g., Chang & Hwang, 2006; Lee et al., 2013), adjusting the thickness of the wrap and ingredients (e.g., Kim et al., 2009; Liu et al., 2019), etc.

Frozen food products were previously limited to dumplings and frozen processed meats, but a variety of new products, such as rice, stew, soup, and noodles,

have recently been developed (Lee & Yoon, 2009). The frozen cooked rice market is especially noteworthy, as rice consumption in processed cooked rice categories has increased (Kwak et al., 2015) even though rice consumption in Korea has continued to decrease (Jeong et al., 2021). As the demand for processed cooked rice has increased, new products have been developed in various categories, such as frozen, retort, and aseptic-packaged cooked rice (Sim et al., 2017). As a result, the frozen cooked rice market had an annual average growth rate of about 20–30% from 2010 to 2013, and this growth is expected to continue (Kwak et al., 2015).

Given that frozen dumplings are the traditional product with the highest market share and frozen cooked rice has recently shown rapid growth within the frozen food category, it is worthwhile to examine the factors that influence NFPD success for such products.

2.2 Consumption Situation: Meal or Snack

There are various ways that consumers classify foods (Wadhera & Capaldi, 2012), and one of these is to categorize them as either meals or snacks, according to the consumption situation (e.g., Blake et al., 2007; Wadhera & Capaldi, 2012). A product's consumption situation is defined as the anticipated usage situation (i.e., time and place) specific to that product (Belk, 1974; A. Lai, 1991). In previous studies, food products have been classified as meals or snacks based on various factors that constitute the consumption situation, such as time, place, and occasion. Marshall & Bell (2003) categorized foods as main meals, light meals, snacks, etc., depending on situational contexts, using eating occasions and specific locations as the key variables. Duffey et al. (2013) classified foods as meals or snacks according to the time at which the eating occurred. Consumption situations affect consumers' decision-making processes when it comes to food choices (A. Lai, 1991; Oyewole & Choudhury, 2006). Therefore, marketers should consider not only consumer characteristics but also consumption situations to develop more effective marketing strategies (Belk, 1974; Quester & Smart, 1998).

In the frozen food category, Korean consumers perceive the consumption situations of frozen cooked rice and frozen dumplings differently. Rice, the main ingredient of frozen cooked rice, is one of the three major grains eaten as a staple food in many countries, including Korea (Yu et al., 2017). Since rice is a staple in the diet of Korean consumers (Kwon et al., 2017), they purchase frozen cooked rice products to be consumed as a main meal. By contrast, dumplings are a traditional food that is commonly consumed as a snack in many countries (e.g., Aggarwal & Sharma, 2021; Budiarso et al., 2021; Dunlop, 2013). Korean consumers recognize

the consumption situation of dumplings as a snack rather than a meal, indicating that they are more likely to purchase dumplings as a snack (Kim et al., 2009). In summary, Korean consumers perceive the consumption situations of frozen cooked rice and frozen dumplings differently: frozen cooked rice is a meal, whereas frozen dumplings are a snack. Thus, this study classifies frozen cooked rice as a meal and frozen dumplings as a snack (according to their consumption situations) and compares the factors that influence NFPD.

2.3 Product Attributes

According to product attribute theory, a product is a bundle of attributes that influence consumers' preferences and utility (Lancaster, 1966). Consumers assign importance to product attributes according to their individual preferences and choose products based on this importance (Malaviya & Sivakumar, 1998). Consequently, product attributes have a significant impact on product performance, such as sales, diffusion, etc. (Ekambaram et al., 2020; Schmidt & Druehl, 2005). As the importance of product attributes increases, firms generally develop new products by modifying product attributes to meet changing consumer preferences and achieve a competitive advantage over other firms (Ofek & Srinivasan, 2002). In this respect, NPD can be described as an attempt to change product attributes or configure a product with completely new attributes to improve product performance (Chao & Kavadias, 2008). Therefore, for successful NFPD, new product developers and marketers must consider product attributes that satisfy consumers' desires (Flint, 2002).

Food product attributes can be divided into two main types: intrinsic attributes (IAs) and extrinsic attributes (EAs) (Asioli et al., 2017). A product's IAs cannot be altered without changing the product itself (Olson & Jacoby, 1972). IAs include physical attributes (PAs) (e.g., ingredients, shape, etc.) and sensory attributes (SAs) (e.g., taste, flavor, formulation, recipe type, etc.) (Arboleda & Arce-Lopera, 2015; Bouasla et al., 2017; Grunert, 2002; Olson & Jacoby, 1972). By contrast, a product's EAs, such as brand, price, package, and claims, can be altered without changing its physical properties (Hubbard et al., 2016; Jaeger, 2006; Lähteenmäki, 2013; Olson & Jacoby, 1972). Accordingly, in this study, the product attributes of frozen cooked rice and frozen dumplings were identified according to their unique characteristics

(Table 1). Shape was not considered a product attribute of frozen cooked rice because there were no differences between the products. Likewise, frozen dumplings' recipes and package types were not considered product attributes.

According to the Situation-Product-Consumer-Intention (SPCI) model, consumers make purchase decisions about new products in response to two stimuli: information on product attributes and perceived consumption situations (A. Lai, 1991). This is because the importance of a product's attributes as perceived by consumers varies according to its expected consumption situation (Hirche & Bruwer, 2014). This mechanism suggests that the more suitable a new product's attributes are in terms of satisfying consumers' consumption situation needs, the higher the intention to adopt a new product (A. Lai, 1991). Thus, it is crucial to increase the suitability of product attributes to expected consumption situations in NFPD (Quester & Smart, 1998).

Many studies have been conducted on the differences in the importance of product attributes across various food categories (e.g., Andersen & Lund, 2014; Maehle et al., 2015; Verain et al., 2016). However, these studies did not investigate the impacts of product attributes on the performance of new products with different consumption situations. Therefore, the primary purpose of this study is to compare the main product attributes that influence the sales of new frozen cooked rice and frozen dumpling products, which have different consumption situations, namely meals and snacks, respectively.

Table 1. Product attributes of frozen cooked rice and frozen dumplings

Product attributes		**Frozen cooked rice**	**Frozen dumplings**
Intrinsic Attributes (IAs)	Physical Attributes (PAs)	Main ingredient	Main ingredient
		-	Shape
	Sensory Attributes (SAs)	Sauce flavor	Sauce flavor
		Formulation	Formulation
		Recipe type	-
Extrinsic Attributes (EAs)		Claim	Claim
		Package type	-

2.4. Marketing Factors

A marketing strategy is a set of marketing activities that complements NPD (Hambrick et al., 1996). Marketing strategies include common marketing factors, such as the product, price, promotion, and distribution/channels (Lages et al., 2008; Melovic et al., 2020). The most important strategic decisions in marketing are positioning and segmentation through the right design of marketing factors (Bonoma & Crittenden, 1988). Therefore, strategic marketing management can be evaluated in terms of market segmentation, positioning, marketing promotion, distribution channels, etc. (Gellynck et al., 2012; Wang & Lestari, 2013).

Market segmentation is a marketing strategy that divides the entire market into subsets of consumers with common needs and then designs marketing factors by targeting them (Danneels, 1996). In the product aspect of marketing factors, product weight is one of the main product attributes used as a tool for market segmentation (Datta, 1996). Nowadays, there are multiple variations on the market in which the same product has been developed with different weights (Tompkins et al., 2010). These variations contribute to the diversity of the stock keeping units (SKUs) that make up a new product portfolio (Capgemini, 2007). Thus, product weight diversity is an important marketing factor for market segmentation and targeting in NFPD.

Marketing promotion refers to any form of marketing communication used to encourage target consumers to purchase products (Perreault Jr & McCarthy, 1996). Bundling, a type of marketing promotion, encourages consumer purchase intention and product sales by offering additional value (Stremersch & Tellis, 2002). Promotions can affect sales over time, as sales increase immediately during promotional periods and tend to decrease during subsequent periods (Foekens et al.,

1998; Kopalle et al., 1999). Likewise, bundling promotion increases sales in the current period but decreases sales in the future because consumers who have previously purchased bundles may delay their purchases (Derdenger & Kumar, 2013). Therefore, bundling is a crucial marketing factor in terms of promotion.

A distribution channel comprises the institutions that move a product from production to consumption (Arya & Mittendorf, 2013). In particular, a diversity of distribution channels has proven to be a critical marketing factor as a positioning tool (Borch & Forsman, 2004). Therefore, this study treats weight diversity, bundling, and distribution channel diversity as marketing factors.

The benefits of a marketing strategy may not be the same for all product categories (Kivetz & Zheng, 2017; Parreño-Selva et al., 2014). This is because the consumer decision-making process is highly dependent on product categories (Bandyopadhyay et al., 2009; Parreño-Selva et al., 2014). In other words, preferences for the marketing factors provided with a product differ according to the product categories perceived by consumers. Therefore, the secondary purpose of this study is to compare the marketing factors that affect the sales of new frozen cooked rice and frozen dumpling products, which have different consumption situations, namely meals and snacks, respectively.

3. Method

3.1 Data Collection

This study collected panel data on new frozen cooked rice and frozen dumpling products in Korea, including product attributes and marketing factors, for weeks 1 to 48 in 2020 from Nielsen's point-of-sale (POS) data. Product attributes were determined via text-mining data obtained using the product name, label, and detailed descriptions of products provided on the official website. Marketing factors were determined from weekly sales data for products categorized by product weight, availability of bundling promotion, and distribution channel. Distribution channels consisted of five major offline retail channels (hypermarket, super-supermarket, private supermarket, cooperative supermarket, and convenience store). Online retail channels were not included due to data inaccessibility.

Based on the market share of manufacturer brands, the bottom 5% of the data were excluded to reduce the impact of outliers on the analysis. The top 5% of manufacturer brands in this study were the market leaders with the largest market shares in the frozen cooked rice and frozen dumplings markets, with 31.7% and 43.8%, respectively. A market leader has a strong position in NPD due to competitive marketing and technological competence (Takayama & Watanabe, 2002). Therefore, the top 5% were not excluded, as they comprise important data for investigating factors that influence NPD success in the context of frozen cooked rice and frozen dumplings.

In this study, new products were defined as those launched in the frozen cooked rice and frozen dumplings markets between week 1 of 2018 and week 48 of 2020. Within this range, new product sales data from weeks 1 to 48 in 2020 were used for the analysis. These sales data were unbalanced panel data without observation before the product was introduced to the market. The frozen cooked rice data set consisted of 152 products, and the frozen dumplings data set consisted of 185 products. Each product had a different number of observations over the 48-week period. The total number of observations in the panel data was 5,928 for the frozen cooked rice data set and 7,700 for the frozen dumplings data set.

3.2 Variables

3.2.1 Dependent Variable

This study used logarithmic transformation to handle the non-linear relationship between the independent and dependent variables (Benoit, 2011). There were valid zero values for the dependent variable when products were introduced to the market but did not generate sales. Since it is impossible to apply a log transformation when some observations are zero, a small positive constant can be added to the sample value (Hu, 1972). Thus, the value of sales added to the positive constant of 1 was converted to a logarithm variable and used as a dependent variable.

3.2.2 Independent Variables

The variables for product attributes and marketing factors were used as independent variables. The three product attributes (PAs, SAs, and EAs) each contained different variables in the frozen cooked rice and frozen dumpling models. The marketing factors consisted of three variables in both models: weight diversity, bundling, and distribution channel diversity. Weight and distribution channel diversity were numeric variables, and bundling was transformed into dummy variables indicating whether bundling promotion was implemented for products on a particular week.

In the frozen cooked rice model, PAs consisted of the main ingredient. The main ingredient was expanded into five dummy variables: meat (reference), seafood, mix, vegetables, and non-specific. There were no other products with extra ingredients, such as red beans or seeds, as the main ingredient. SAs consisted of

sauce flavor, formulation, and recipe type. Sauce flavor was expanded into two dummy variables: light (reference) and spicy. There were no products with sweet sauce or extra flavors, such as cheese or pizza sauce. In this study, the formulation of frozen cooked rice was represented as the hardness of the rice. The formulation was expanded into three dummy variables—high, middle, and low hardness—which indicated the degree of the texture of cooked rice during mastication. The hardness of cooked rice decreases with increasing amounts of water (Bett-Garber et al., 2007). Therefore, a formulation with a lot of broth, such as soup with rice, was classified as low hardness; a formulation with boiled broth, such as risotto and pilaf, was classified as middle hardness; and a formulation with little liquid, such as rice balls, was classified as high hardness. The recipe type was expanded into five dummy variables: Korean (reference), Japanese, Chinese, Western, and Southeast Asian. Finally, EAs consisted of claim and package type. The claim was converted to a single dummy variable—the local name—due to the absence of a claim related to the restaurant name and size. The package type was expanded into four variables: plastic cup (PC; reference), foil bag (FB), carton (CRT), and multi. Detailed descriptions and pictures of the package types are shown in Appendix A. These dummy variables were equal to 1 if they belonged to the attributes represented by each variable and zero otherwise.

In the frozen dumpling model, PAs consisted of the main ingredient and shape. The main ingredient was expanded into six dummy variables: meat (reference), seafood, mix, vegetables, extra, and non-specific. Dumpling shape was expanded into seven dummy variables: spore (reference), long, coil, crescent (gyoza), flat, semicircle, and extra. Detailed descriptions and pictures of the shapes are shown in

Appendix B. SAs consisted of sauce flavor and formulation. Sauce flavor was expanded into four dummy variables: light (reference), spicy, sweet, and extra. The formulation was converted to a single dummy variable—thin wrap—which indicated whether the dumpling wrap was thin or not. Finally, EAs consisted of the claim converted into three distinct variables: local name, restaurant name, and dumpling size. These dummy variables were equal to 1 if they belonged to the attributes represented by each variable and zero otherwise.

3.2.3 Control Variables

The effect of time-to-market on performance depends on the length of the product life cycle (Suomala, 2004). Brand and price are representative factors that affect NPD success (Hubbard et al., 2016). Hence, week, product life, brand, and price were used as control variables to eliminate biases in extraneous variables other than independent variables that could influence sales. The week factor was expanded to 48 weekly dummy variables to control for the effect of time, such as the seasonality of sales. The brand factor was expanded to ten dummy variables each in both the frozen cooked rice and frozen dumplings models. Descriptions of the variables are provided in Table 2.

Table 2. Descriptions of the variables

Variable			Description
DV	$\ln(Sales_{i,t})$		Logarithm transformation of the weekly sales of product *i* on week *t*
IVs	PAs	Main ingredient$_i$	Meat	Reference category indicating if the main ingredient of product *i* was meat
			Seafood	Dummy variable indicating if the main ingredient of product *i* was seafood
			Mix	Dummy variable indicating if the main ingredient of product *i* was a mixture of meat and seafood
			Vegetables	Dummy variable indicating if the main ingredient of product *i* was vegetables
			Extra	Dummy variable indicating if the main ingredient of product *i* was any other ingredient (red beans, seeds, etc.)
			Non-specific	Dummy variable indicating if the main ingredient was not specified in the name of product *i*
		Shape$_i$	Spore	Reference category indicating if the dumpling shape of product *i* was spore shaped
			Long	Dummy variable indicating if the dumpling shape of product *i* was long
			Coil	Dummy variable indicating if the dumpling shape of product *i* was coil shaped
			Crescent (gyoza)	Dummy variable indicating if the dumpling shape of product *i* was crescent shaped (like gyoza)
			Flat	Dummy variable indicating if the dumpling shape of product *i* was flat
			Semicircle	Dummy variable indicating if the dumpling shape of product *i* had a semicircle shape
			Extra	Dummy variable indicating if the main ingredient of product *i* had any other shape
	SAs	Sauce flavor$_i$	Light	Reference category indicating if the sauce flavor of product *i* was light
			Spicy	Dummy variable indicating if the sauce flavor of product *i* was spicy
			Sweet	Dummy variable indicating if the sauce flavor of product *i* was sweet
			Extra	Dummy variable indicating if the sauce flavor of product *i* was any other flavor (cheese, pizza, etc.)
		Formulation$_i$	Thin wrap	Dummy variable indicating if the thickness of the dumpling wrap of product *i* was thin
			Low hardness	Reference category indicating if the force required to chew the rice in product *i* was low due to a high liquid content
			Middle hardness	Dummy variable indicating if the force required to chew the rice in product *i* was middle due to a moderate liquid content
			High hardness	Dummy variable indicating if the force required to chew the rice in product *i* was high due to a low liquid content

EAs	Recipe type$_i$	Korean	Reference category indicating if product *i* was developed using a Korean recipe
		Japanese	Dummy variable indicating if product *i* was developed using a Japanese recipe
		Chinese	Dummy variable indicating if product *i* was developed using a Chinese recipe
		Western	Dummy variable indicating if product *i* was developed using a Western recipe
		Southeast Asian	Dummy variable indicating if product *i* was developed using a Southeast Asian recipe
	Claim$_i$	Local name	Dummy variable indicating if a local name claim is stated on product *i*
		Restaurant name	Dummy variable indicating if a restaurant name claim is stated on product *i*
		Dumpling size	Dummy variable indicating if a dumpling size claim is stated on product *i*
	Package type$_i$	Plastic cup (PC)	Reference category indicating if the package type of product *i* was a plastic cup
		Foil Bag (FB)	Dummy variable indicating if the package type of product *i* was a foil sealed bag
		Carton (CRT)	Dummy variable indicating if the package type of product *i* was a carton package
		Multi	Dummy variable indicating if product *i* had various package types
MFs	Weight diversity$_{i,t}$		The number of unique weights of product *i* on week *t*
	Bundling$_{i,t}$		Dummy variable indicating if bundling promotion was implemented for product *i* on week *t*
	Distribution channel diversity$_{i,t}$		The number of unique channels that distributed product *i* to consumers on week *t*
CVs	Product life$_{i,t}$		Time (in weeks) from the introduction of product *i* to week *t*
	Price$_{i,t}$		The price per gram of product *i* on week *t*
	Week$_t$		Dummy variables indicating week *t*
	Brand$_i$		Dummy variables indicating the manufacturer brand of product *i*

Note: DV = dependent variable, IVs = independent variables, CVs = control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors; The subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time.

3.3 Data Analysis

Descriptive statistics of sales, price, and product life are shown in Table 3, which summarizes all the variables selected for each frozen cooked rice (see Appendix C1) and frozen dumpling model (see Appendix C2). The descriptive statistics included the number of products (n), number of observations (Obs), mean, standard deviation (SD), and range (min/max). The weekly dummy variables were time independent of the product, so they were not summarized in the descriptive statistics table.

The data used in this study included product attributes as time-invariant variables and marketing factors as time-varying variables. The fixed-effects model omits important time-invariant variables from the model (Bollen & Brand, 2010). In addition, fixed-effect estimators are highly inefficient in terms of their degree of freedom, because the number of products in the data sets (185 for dumplings; 152 for cooked rice) is greater than the time period (48 weeks). Therefore, the panel random-effects model was employed to analyze the impact of both time-invariant (product attributes) and time-varying (marketing factors) variables on sales.

This study conducted the Breusch–Pagan Lagrange Multiplier (LM) test and the Wooldridge test for random-effects to select the best model. The LM test (Breusch & Pagan, 1979) showed that random-effect estimators were preferable to pooled ordinary least squares (OLS) estimators. The Wooldridge test (Wooldridge, 2010) reported the first-order serial correlation in both frozen cooked rice and frozen dumplings models. Hence, this study adopted a generalized least squares (GLS) random-effects model to address the first-order serial correlation issue.

Stepwise regression analysis can identify the best predictor from the available independent variables by adding variables at each step according to their relative importance (Draper & Smith, 1998; Wang & Jain, 2003). Thus, this study applied the stepwise method to the GLS random-effects model to identify the key variables that affect the sales of new frozen cooked rice and frozen dumpling products.

Variables were entered stepwise in the following order in the main-effect model: control variables, product attributes, and marketing factors. The control variables and product attributes were introduced into the basic model, followed by the marketing factors. In the basic model, the variables included in each attribute group (PAs, SAs, and EAs) were sequentially added according to relative importance.

The robustness of the results was confirmed by comparing the changes in the coefficients of the variables in each model. The changes in the coefficient sign of the variables for the product attributes were confirmed due to the input of the variable related to the marketing factors. In this regard, the interaction effect was examined by entering interaction terms between the variable with a significantly changed coefficient sign and the variables for the marketing factors.

In general, marketing promotions simultaneously have a positive effect on current sales and a negative effect on future sales (Kopalle et al., 1999). Thus, this study examined the dynamic effect of bundling promotion on sales by adding the time-lagged bundling variables stepwise. Furthermore, a robustness check was conducted to ensure that the results were maintained after entering the time-lagged bundling variables.

A significance level of 10% was considered for all statistical tests. All statistical analyses were performed using STATA 14.0 software.

Table 3. Descriptive statistics summarizing the data sets

Variables	Mean	SD	Min	Max
Frozen cooked rice	Products (n) = 152, Obs = 5,928			
$Sales_{i,t}$	2.53e+07	5.54e+07	0	8.13e+08
Product $life_{i,t}$	69.1427	40.4521	1	152
$Price_{i,t}$	10.2398	3.2225	0.9	21.4181
Frozen dumplings	Products (n) = 185, Obs = 7,700			
$Sales_{i,t}$	2.11e+07	7.14e+07	0	1.31e+09
Product $life_{i,t}$	61.0755	37.9578	1	152
$Price_{i,t}$	10.3213	5.03015	0.8395	52.2403

Note: Obs = the number of observations; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time; this table shows the descriptive statistics of sales before being transformed into a logarithm variable; tables of descriptive statistics of all variables are presented in Appendices C1 and C2.

4. Results

4.1 Frozen Cooked Rice

4.1.1 Product Attributes and Marketing Factors

The results of the main-effect model of frozen cooked rice are shown in Table 4. Model 1 is a basic model with control variables and independent variables for product attributes. Variables for product attributes were added in the order of SAs, EAs, and PAs according to their contribution to the model's explanatory power. The results, including the SAs, EAs, and PAs introduced sequentially in Model 1, are represented in Appendix D1. Then, the independent variables for marketing factors were added to Model 2. The results were interpreted based on Model 2, which was the last step in the main-effect model.

For SAs, the middle ($B = 2.020$, $p < 0.001$) and high ($B = 3.132$, $p < 0.001$) hardness formulations had positive impacts on sales compared to low hardness. Products with high and middle hardness formulations of rice significantly increased sales (202.0% and 313.2%, respectively) compared to those with low hardness formulations. The Chinese recipe type had a positive effect on sales compared to the Korean recipe type ($B = 1.592$, $p < 0.01$). Products using Chinese recipes significantly increased sales (159.2%) compared to products using Korean recipes. As for EAs, the product claim of local name had a negative impact on sales ($B = -1.265$, $p < 0.10$). Products with local name claims significantly decreased sales (126.5%) compared to products without such claims. The CRT package type had a positive impact on sales compared to the PC package type ($B = 1.786$, $p < 0.05$). Products packaged with CRT packages significantly increased sales (178.6%)

compared to products packaged with PC packages. Sauce flavor and main ingredient did not significantly affect sales of new frozen cooked rice products.

As shown in Model 2, weight diversity ($B = 4.836$, $p < 0.001$) and distribution channel diversity ($B = 0.659$, $p < 0.001$) had positive effects on sales. A one-unit increase in weight diversity and distribution channel diversity resulted in sales increases of frozen cooked rice of 483.6% and 65.9%, respectively. Bundling promotions did not significantly affect new frozen cooked rice product sales.

The results also show that price had a negative effect on sales ($B = -0.209$, $p < 0.001$). A one-unit increase in price per gram resulted in a 20.9% decrease in sales of frozen cooked rice. That is, products with a higher price per gram had significantly lower sales.

By comparing each model's results, it was confirmed that the coefficient sign of all variables except for spicy sauce flavor, multi-package, seafood, and non-specific main ingredients remained unchanged (Table 4). The variables with a changed coefficient sign were also not significant in both Models 1 and 2. The estimated impacts of the formulation, recipe type, claim, and package type on new frozen cooked rice product sales were highly robust.

4.1.2 Bundling Promotion

The results of the time-lagged bundling effects on sales of new frozen cooked rice products are shown in Model 3 in Table 5. The time-lagged bundling variables from week t-1 to week t-4 were added to Model 3. The results show that the effects of all the time-lagged bundling variables were not significant. Past bundling promotion had no impact on current sales of new frozen cooked rice products. Furthermore, Table 5 provides the results of the robustness check designed in the time-lagged bundling model of frozen cooked rice. The model achieved robustness, as the effect of $bundling_{i,t}$ on sales was not significant in all models, and the coefficient sign of other variables also remained unchanged.

Table 4. Results of the main-effect model for frozen cooked rice

			Model 1		Model 2	
		Variables	Coef	Std.	Coef	Std.
IVs	SAs	*Sauce flavor$_i$ - Light (ref)*				
		Spicy	0.588*	0.279	-0.017	0.274
		Formulation$_i$ - Low hardness (ref)				
		Middle hardness	2.260***	0.587	2.020***	0.577
		High hardness	3.109***	0.824	3.132***	0.805
		Recipe type$_i$ - Korean (ref)				
		Japanese	0.622	0.898	1.062	0.886
		Chinese	1.227*	0.593	1.592**	0.582
		Western	0.616	0.777	1.250	0.761
		Southeast Asian	-2.286*	0.905	-1.452	0.891
	EAs	*Claim$_i$*				
		Local name	-1.211$^+$	0.668	-1.265$^+$	0.655
		Package type$_i$ - Plastic cup (ref)				
		Foil Bag (FB)	0.357	0.492	0.437	0.480
		Carton (CRT)	1.365	0.869	1.786*	0.850
		Multi	1.293	0.945	-0.035	0.931
	PAs	*Main ingredient$_i$ – Meat (ref)*				
		Seafood	-0.481	0.317	0.052	0.313
		Mixed	-0.548	0.660	-0.202	0.649
		Vegetables	-0.622	0.399	-0.174	0.393
		Non-specific	-0.491	0.721	0.183	0.702
	MFs	*Weight diversity$_{i,t}$*			4.836***	0.085
		Bundling$_{i,t}$			-0.058	0.188
		Distribution channel diversity$_{i,t}$			0.659***	0.034
CVs		*Product life$_{i,t}$*	-0.001	0.003	-0.004	0.003
		Price$_{i,t}$	-0.331***	0.019	-0.209***	0.015
		Week dummies	YES		YES	
		Brand dummies	YES		YES	
		Constant	17.700***		9.641***	
		Observations	5,928		5,928	
		Within R-Squared	0.0661		0.4374	
		Between R-Squared	0.3755		0.5286	
		Overall R-Squared	0.3361		0.4715	

Note: IVs = independent variables, CVs = control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time; $^+$, *, **, and *** indicate significance levels of 10%, 5%, 1%, and 0.1%, respectively.

Table 5. Results of the time-lagged bundling model for frozen cooked rice

			Model 2		Model 3	
		Variables	Coef	Std.	Coef	Std.
IVs	SAs	*Sauce flavor$_i$ - Light (ref)*				
		Spicy	-0.017	0.274	0.122	0.272
		Formulation$_i$ - Low hardness (ref)				
		Middle hardness	2.020***	0.577	2.095***	0.560
		High hardness	3.132***	0.805	3.023***	0.830
		Recipe type$_i$ - Korean (ref)				
		Japanese	1.062	0.886	1.048	0.854
		Chinese	1.592**	0.582	1.440*	0.572
		Western	1.250	0.761	1.825*	0.780
		Southeast Asian	-1.452	0.891	-1.274	0.862
	EAs	*Claim$_i$*				
		Local name	-1.265$^+$	0.655	-0.981	0.671
		Package type$_i$ - Plastic cup (ref)				
		Foil Bag (FB)	0.437	0.480	0.044	0.481
		Carton (CRT)	1.786*	0.850	1.623$^+$	0.866
		Multi	-0.035	0.931	-0.718	0.911
	PAs	*Main ingredient$_i$ – Meat (ref)*				
		Seafood	0.052	0.313	0.073	0.308
		Mixed	-0.202	0.649	-0.233	0.629
		Vegetables	-0.174	0.393	-0.179	0.391
		Non-specific	0.183	0.702	-0.191	0.725
	MFs	*Weight diversity$_{i,t}$*	4.836***	0.085	4.492***	0.084
		Bundling$_{i,t}$	-0.058	0.188	-0.251	0.212
		Distribution channel diversity$_{i,t}$	0.659***	0.034	0.640***	0.034
Time-lagged variables		*Bundling$_{i,t-1}$*			0.021	0.215
		Bundling$_{i,t-2}$			0.248	0.214
		Bundling$_{i,t-3}$			0.329	0.216
		Bundling$_{i,t-4}$			0.067	0.221
CVs		*Product life$_{i,t}$*	-0.004	0.003	-0.007*	0.003
		Price$_{i,t}$	-0.209***	0.015	-0.211***	0.015
		Week dummies	YES		YES	
		Brand dummies	YES		YES	
		Constant	9.226***		11.114***	
		Observations	5,928		5,928	
		Within R-Squared	0.5533		0.4303	
		Between R-Squared	0.3908		0.5599	
		Overall R-Squared	0.4173		0.4892	

Note: IVs = independent variables, CVs = control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time; $^+$, *, **, and *** indicate significance levels of 10%, 5%, 1%, and 0.1%, respectively.

4.2 Frozen Dumplings

4.2.1 Product Attributes and Marketing Factors

The results of the main-effect model of frozen dumplings are shown in Table 6. Model 1 is the basic model, with control variables and independent variables for product attributes. The variables for product attributes were added in the order of PAs, SAs, and EAs according to their contribution to the model's explanatory power. The results, including the PAs, SAs, and EAs introduced sequentially in Model 1, are reported in Appendix D2. The independent variables for marketing factors were then added to Model 2. The results were interpreted based on Model 2, which was the last step in the main-effect model.

For PAs, the seafood ($B = -2.421$, $p < 0.001$), vegetables ($B = -1.137$, $p < 0.05$), non-specific ($B = -0.742$, $p < 0.05$), and extra ($B = -4.005$, $p < 0.05$) main ingredients had negative effects on sales compared to meat. Products with seafood, vegetables, non-specific, and extra main ingredients significantly decreased sales (242.1%, 113.7%, 74.2%, and 400.5%, respectively) compared with meat as the main ingredient. The dumpling shapes of coil ($B = -2.502$, $p < 0.001$), long ($B = -2.357$, $p < 0.001$), crescent ($B = -0.722$, $p < 0.10$), and extra ($B = -2.367$, $p < 0.001$) had negative impacts on sales compared to the spore shape. Dumpling products with the shapes of coil, long, crescent, and extra significantly reduced sales (250.2%, 235.7%, 72.2%, and 236.7%, respectively) compared to spore-shaped dumplings. As for SAs, the sauce flavors of sweet ($B = 4.674$, $p < 0.01$) and extra ($B = 4.285$, $p < 0.01$) had positive impacts on sales compared to light sauce flavors. Products with sweet and extra sauce flavors significantly increased sales (467.4% and 428.5%, respectively)

compared to those with light sauce flavors. The thin wrap formulation had a negative effect on sales (B = -1.450, $p < 0.001$). Products with thin dumpling wrap significantly reduced sales (145.0%) compared to products with general wrap. As for EAs, the product claim of dumpling size had a positive impact on sales (B = 0.758, $p < 0.05$). Products with a dumpling size claim significantly increased sales (75.8%) compared to products without such claims.

As shown in Model 2, weight diversity (B = 5.784, $p < 0.001$), bundling (B = 2.019, $p < 0.001$), and distribution channel diversity (B = 0.741, $p < 0.001$) had positive effects on sales. A one-unit increase in weight diversity and distribution channel diversity resulted in sales increases of frozen dumplings of 578.4% and 74.1%, respectively. Additionally, products that offered bundling promotions significantly increased sales by 201.9% compared to products without bundling promotions.

Product life (B = -0.036, $p < 0.001$) and price (B = -0.104, $p < 0.001$) had negative effects on sales. A one-unit increase in product life and price per gram resulted in sales decreases of frozen dumplings of 3.6% and 10.4%, respectively. That is, products with a longer product life and a higher price per gram had significantly lower sales.

Table 6. Results of the main-effect model for frozen dumplings

			Model 1		Model 2	
		Variables	Coef	Std.	Coef	Std.
IVs	PAs	*Main ingredient$_i$: Meat (ref)*				
		Seafood	0.431	1.405	-2.421***	1.069
		Mixed	-0.424	0.587	1.096	0.445
		Vegetables	-1.609**	0.440	-1.137*	0.334
		Non-specific	-1.434**	0.666	-0.742*	0.507
		Extra	-3.008	2.064	-4.005*	1.563
		Shape$_i$: Spore (ref)				
		Coil	0.518	0.736	-2.502***	0.560
		Long	-2.188*	0.865	-2.357***	0.667
		Crescent (gyoja)	-0.365	0.569	-0.722$^+$	0.435
		Flat	-1.399	1.201	-1.227	0.915
		Semicircle	0.085	0.783	-0.755	0.595
		Extra	-1.002	0.832	-2.367***	0.632
	SAs	*Sauce flavor$_i$: Light (ref)*				
		Spicy	0.761	0.501	0.158	0.380
		Sweet	1.354	2.279	4.674**	1.726
		Extra	2.930$^+$	1.649	4.285**	1.250
		Formulation$_i$				
		Thin wrap	1.492**	0.499	-1.450***	0.385
	EAs	*Claim$_i$*				
		Local name	-0.454	1.142	0.558	0.865
		Restaurant name	1.933*	0.951	-0.256	0.721
		Dumpling size	-0.175	0.411	0.758*	0.312
	MFs	*Weight diversity$_{i,t}$*			5.784***	0.077
		Bundling$_{i,t}$			2.019***	0.191
		Distribution channel diversity$_{i,t}$			0.741***	0.031
CVs		*Product life$_{i,t}$*	-0.011*	0.005	-0.036***	0.004
		Price$_{i,t}$	-0.230***	0.013	-0.104***	0.009
		Week dummies	YES		YES	
		Brand dummies	YES		YES	
		Constant	19.581***		9.038***	
		Observations	7,700		7,700	
		Within R-Squared	0.0963		0.5330	
		Between R-Squared	0.1745		0.4061	
		Overall R-Squared	0.1563		0.4182	

Note: IVs = independent variables, CVs = control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time; $^+$, *, **, and *** indicate significance levels of 10%, 5%, 1%, and 0.1%, respectively.

4.2.2 Bundling Promotion

The results of the time-lagged bundling effects on new frozen dumpling product sales are shown in Model 3 in Table 7. The time-lagged bundling variables from week t-1 to week t-4 were added to Model 3. The results show that the effects of the one-to-three-week time-lagged bundling variables were significant: $bundling_{i,t-1}$ (B = -1.442, $p < 0.001$), $bundling_{i,t-2}$ (B = -1.111, $p < 0.001$), and $bundling_{i,t-3}$ (B = -1.012, $p < 0.001$). The coefficient values also decreased as the time-lagged bundling variables from week t-1 to week t-3 were added. That is, products that offered bundling promotions one to three weeks prior significantly reduced sales (144.2%, 111.1%, and 101.2%, respectively) compared to products without bundling promotion. However, $bundling_{i,t-4}$ had no significant impact on the current sales of new frozen dumpling products.

4.2.3 Interaction Effects of Formulation and Marketing Factors

By comparing the results for the significant variable in each model, it was confirmed that the coefficient sign of most variables remained unchanged (Table 6). However, the coefficient signs were changed for the following variables: seafood, coil, thin wrap, restaurant name, and dumpling size. In particular, the coefficient sign of the thin wrap formulation was significantly changed after adding the variables related to marketing factors from Model 1 (B = 1.492, $p < 0.01$) to Model 2 (B = -1.450, $p < 0.001$) in Table 6. Interaction occurs when the effect of one independent variable significantly changes depending on the level of another independent variable (Kumar et al., 2014). Thus, the interaction terms derived from the thin wrap formulation and marketing factors (i.e., weight diversity, bundling, and distribution

channel diversity) were added to Model 4 (Table 7).

The results of the interaction effects of formulation and marketing factors are shown in Model 4 in Table 7. Two interaction terms were significant: Formulation × Weight diversity ($B = -5.369$, $p < 0.001$) and Formulation × Bundling ($B = 1.032$, $p < 0.05$). That is, when a product's dumpling wrap was thin, the positive effect of weight diversity on sales was weaker, and the positive effect of bundling promotion on sales was stronger. However, there was no significant interaction effect between formulation and distribution channel diversity on sales. In other words, distribution channel diversity increased the sales of new frozen dumpling products, regardless of the thickness of the dumpling wrap. Accordingly, the coefficient of the thin wrap formulation changed after entering the interaction terms from Model 2 ($B = -1.450$, $p < 0.001$) to Model 4 ($B = 5.090$, $p < 0.001$). Products with thin dumpling wrap significantly increased sales (509.0%) compared to products with general dumpling wrap.

Finally, a robustness check was conducted by contrasting the results of each model in Table 7. The coefficients of weight diversity, bundling, and distribution channel diversity were positive at the 0.1% significance level in all models. The coefficient signs of other variables, except for the thin wrap formulation, also did not change significantly. The estimated impacts of weight diversity, bundling, and distribution channel diversity on sales of new frozen dumpling products were highly robust.

Table 7. Results of time-lagged bundling and interaction effect models for frozen dumplings

			Model 2		Model 3		Model 4	
		Variables	Coef	Std.	Coef	Std.	Coef	Std.
IVs	PAs	*Main ingredient$_i$: Meat (ref)*						
		Seafood	-2.421***	1.069	-1.917***	0.496	-2.473***	1.074
		Mixed	1.096	0.445	2.758**	1.048	0.474	0.447
		Vegetables	-1.137*	0.334	-0.734^{+}	0.436	-0.804^{+}	0.335
		Non-specific	-0.742*	0.507	-0.914**	0.326	-0.888**	0.509
		Extra	-4.005*	1.563	-3.135*	1.523	-3.335*	1.570
		Shape$_i$: Spore (ref)						
		Coil	-2.502***	0.560	-1.677**	0.549	-0.919	0.564
		Long	-2.357***	0.667	-0.433	0.667	-1.915**	0.669
		Crescent (gyoja)	-0.722^{+}	0.435	0.133	0.431	-0.577	0.437
		Flat	-1.227	0.915	-0.322	0.898	-1.224	0.917
		Semicircle	-0.755	0.595	-0.081	0.585	-1.112^{+}	0.598
		Extra	-2.367***	0.632	-1.854**	0.618	-1.938**	0.634
	SAs	*Sauce flavor$_i$: Light (ref)*						
		Spicy	0.158	0.380	-0.004	0.372	-0.077	0.382
		Sweet	4.674**	1.726	3.310*	1.683	3.132^{+}	1.735
		Extra	4.285**	1.250	2.784*	1.222	3.921**	1.255
		Formulation$_i$						
		Thin wrap	-1.450***	0.385	-0.396	0.387	5.090***	0.530
	EAs	*Claim$_i$*						
		Local name	0.558	0.865	0.486	0.842	-0.542	0.870
		Restaurant name	-0.256	0.721	-0.498	0.703	-0.170	0.724
		Dumpling size	0.758*	0.312	0.796**	0.304	0.259	0.314

MFs	*Weight diversity*$_{i,t}$	5.784***	0.077	5.568***	0.077	7.193***	0.083
	Bundling$_{i,t}$	2.019***	0.191	3.036***	0.245	1.676***	0.194
	Distribution channel diversity$_{i,t}$	0.741***	0.031	0.821***	0.032	0.689***	0.032
Time-lagged variables	*Bundling*$_{i,t-1}$			-1.442***	0.248		
	Bundling$_{i,t-2}$			-1.111***	0.245		
	Bundling$_{i,t-3}$			-1.012***	0.252		
	Bundling$_{i,t-4}$			-0.220	0.259		
Inter	*Weight diversity*$_{i,t}$ * *Formulation*$_i$					-5.369***	0.163
	Bundling$_{i,t}$ * *Formulation*$_i$					1.032*	0.471
	Distribution channel diversity$_{i,t}$ * *Formulation*$_i$					-0.057	0.077
CVs	*Product life*$_{i,t}$	-0.036***	0.004	-0.029***	0.004	-0.032***	0.004
	Price$_{i,t}$	-0.104***	0.009	-0.098***	0.009	-0.090***	0.009
	Week dummies	YES		YES		YES	
	Brand dummies	YES		YES		YES	
Constant		9.038***		9.226***		8.039***	
Observations		7,700		7,700		7,700	
Within R-Squared		0.5330		0.5533		0.5817	
Between R-Squared		0.4061		0.3908		0.5064	
Overall R-Squared		0.4182		0.4173		0.5140	

Note: IVs = independent variables, CVs = control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors, Inter = interaction terms; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time; $^{+}$, *, **, and *** indicate significance levels of 10%, 5%, 1%, and 0.1%, respectively.

5. Discussion

Currently, new products in the frozen food category are being developed with a combination of different product attributes and introduced using effective marketing factors. Since the impacts of product attributes and marketing factors depend on products' perceived consumption situations, new product developers should consider the relevance of these factors in relation to consumption situations. However, few studies have investigated how product attributes and marketing factors influence NPD success in different consumption situations. This study is the first to compare the main product attributes and marketing factors that affect the sales of new frozen cooked rice and frozen dumpling products, which have different consumption situations, namely meals and snacks.

Horvat et al. (2019) developed a conceptual framework for the types of consumer data that food companies can use during the NPD process. Based on this framework, a consumer-oriented approach to NPD using rich consumer data is recommended to improve NPD success. This study contributes to embodying this approach in practice by demonstrating the importance of an optimal fit between consumer needs and new products using actual consumer data.

In this section, the key findings, implications, and limitations of this study, as well as directions for future research, are discussed. The results show that for frozen cooked rice, the formulation, recipe type, claim, and package type had significant impacts, while sauce flavor and the main ingredient had no significant effects on sales. Specifically, sales increased more for new frozen cooked rice products with middle and high hardness formulations (compared to low hardness), Chinese recipes

(compared to Korean recipes), local name claims, and CRT packaging (compared to PC packaging). As for frozen dumplings, it was found that the main ingredient, shape, sauce flavor, formulation, and claim had significant impacts on sales. Specifically, sales increased more for new frozen dumpling products with meat as the main ingredient (compared to seafood, vegetables, non-specific, and extra ingredients), a spore shape (compared to coil, long, and extra shapes), thin wrap, and a dumpling size claim.

The results also show that weight diversity and distribution channel diversity had positive effects on the sales of both frozen cooked rice and frozen dumplings, especially when the frozen dumpling wrap was thin. However, bundling promotion only positively impacted the sales of frozen dumplings, not frozen cooked rice. Similarly, past bundling promotions had a negative impact on the sales of frozen dumplings.

5.1 Implications for Practitioners

The results of this study have implications regarding the most important attributes for new product developers to consider in order to maximize the performance of new frozen food products. To achieve successful NPD, food companies must identify product attributes that consumers perceive as important based on the expected consumption situation of the product (Quester & Smart, 1998). The results suggest that new product developers can prioritize SAs and EAs (formulation, recipe type, package type, etc.) rather than PAs for successful frozen cooked rice NPD. However, PAs and SAs (main ingredient, shape, sauce flavor, formulation, etc.) can be considered first, instead of EAs, for successful frozen dumpling NPD. Therefore, this study contributes to increasing the likelihood of successful NPD by providing information on which product attributes affect new frozen cooked rice and frozen dumpling product sales.

The findings also provide new insights for new product developers who introduce new products to the frozen food market by developing effective marketing strategies. The results of this study suggest that in the frozen cooked rice and frozen dumpling markets, sales of new products increase when companies develop products with various weights and distribute them through various channels. Marketing factors contribute to NPD success by informing consumers of the existence of a new product that can satisfy their needs (Costa & Jongen, 2006; Suwannaporn & Speece, 2003). More specifically, product variants with different weights contribute to the diversity of SKUs, resulting in a diversified portfolio of new products (Capgemini, 2007). A high product variety raises market share by increasing product selection and stimulates sales through consumer segmentation (Bayus & Putsis Jr, 1999; Ho

& Tang, 1998). Distribution channel diversity provides competitive advantages of positioning by expanding consumer access to products (Borch & Forsman, 2004). Therefore, this study provides practical implications for new product developers, as weight and distribution channel diversity can be used as tools for market segmentation and positioning.

The results also suggest that marketers should consider the expected consumption situation of the product and the expected lasting effect of the promotion over time when offering marketing promotions for new products. Marketing promotion is widely used in modern marketing practices because it attracts the interest of potential consumers and stimulates purchases (Sinha & Verma, 2020). Bundling is a widespread marketing promotion that offers two or more individual products in a single package (Sheng et al., 2007). Bundling encourages consumer purchase intention and product sales by providing additional value (Stremersch & Tellis, 2002). The results indicate that the negative impact of past bundling promotion on the current sales of frozen dumplings gradually decreased from one to three weeks prior, with no effect after four weeks. This implies that in the case of frozen dumplings, the bundling promotion effect manifests in 4-week intervals. Therefore, marketers can develop competitive promotion strategies by reflecting on the dynamic effect of bundling according to the consumption situation of the product.

These findings also contribute to our understanding of the interrelationships between product attributes and marketing factors in the NPD decision-making process. The results show the interaction between product attributes and marketing factors in the NPD of new frozen foods. Product attributes influence consumer perceptions and preferences for products (Malaviya & Sivakumar, 1998). Marketing

persuades consumers to adopt new products by effectively expressing their attributes when launching them (Crawford & Di Benedetto, 2011). There is an observable relationship between product attributes and the combination of marketing strategies used for that product (Miracle, 1965). Therefore, this study suggests that new product developers should consider this interaction to plan marketing strategies that effectively communicate the key attributes of their products.

5.2 Implications for Academics

This study contributes to expanding the scope of the literature on the differences in product attributes that affect NPD in terms of consumption situations. Previous studies have revealed that the most important factors influencing the final purchase decision in snack consumption situations are IAs, such as ingredients, taste, and flavor (e.g., Cross et al., 1994; Glanz et al., 1998; Zbib et al., 2010). Similarly, the results suggest that in terms of NPD, the importance of EAs is higher in frozen cooked rice, and the importance of IAs is higher in frozen dumplings. This study has several academic implications that derive from explaining these results based on differences in motivation according to consumption situations.

Motivation to purchase a product differs depending on the expected consumption situations (e.g., Hirche & Bruwer, 2014; Mittal, 1989). Utilitarian motivation refers to goal-oriented motives based on rational use and the essential needs of consumers (Babin et al., 1994; Hirschman & Holbrook, 1982). Since rice is a staple food, utilitarian motivations, such as hunger and nutrition, dominate rice consumption in Korea (Son et al., 2014). Therefore, utilitarian motivations may be strong in meal consumption situations, such as with frozen cooked rice. On the contrary, hedonic motivation refers to pleasure-oriented motives, such as seeking happiness, fun, and enjoyment (Hirschman & Holbrook, 1982). In general, snacks are categorized as products that offer hedonic benefits (Wang, 2017). Hence, hedonic motivations may be strong in snack consumption situations, such as with frozen dumplings. People in utilitarian-motivated consumption situations (meals) put more emphasis on EAs, such as brand, package, and claim/label (e.g., Guerreiro et al., 2015; Huang & Lu, 2016). People in hedonic-motivated consumption situations

(snacks) focus on decision-making based on their emotions through pleasurable experiences (Pham, 1998). In this regard, this study provides academic researchers with interesting insights into the product attributes that influence NPD success in different consumption situations.

The findings also support the empirical evidence for differences in the effectiveness of marketing promotion depending on the consumption situations. That is, the effect of bundling promotion differs according to the consumption situation (meal or snack) of the product. This is consistent with the results of previous studies suggesting that the effect of marketing promotion varies according to product category (Banerjee, 2009; Bogomolova et al., 2017). The results can be explained by differences in impulse buying tendencies and stockpiling behavior according to consumption situations.

Narasimhan et al. (1996) found that promotional responses were positively related to the degree of impulse buying and stockpiling capacity of product categories. Impulse buying is a sudden and unplanned behavior that occurs when a consumer experiences the urge to buy something immediately (Rook, 1987). Bundling promotion induces impulse buying by offering discounts through the bundling of individual products (Honkanen et al., 2012). In the literature, snack consumption has often been recognized as an impulsive behavior rather than a planned purchase behavior (Duarte et al., 2013; Honkanen et al., 2012), because once a snack is purchased, its need does not necessarily arise immediately, but it is likely to be consumed later (Honkanen et al., 2012). In this respect, bundling promotion is only valid for frozen dumplings, a snack with a higher degree of impulse buying, not for frozen cooked rice.

Stockpiling is defined as accumulating products by purchasing larger quantities of them and changing the time of purchase to before the next expected time of purchase (Blattberg & Neslin, 1989). Marketing promotions have a positive short-term effect on stockpiling behavior by encouraging consumers to purchase more products more quickly (Blattberg et al., 1981; Mela et al., 1998; Neslin et al., 1985). Product categories that can be stockpiled respond strongly to promotion, as purchase acceleration is very large (Litvack et al., 1985; Narasimhan et al., 1996). Thus, bundling promotion with quantity discounts induces consumers to purchase larger quantities for categories that can be stockpiled, such as frozen food (de Pechpeyrou, 2013). Even within the same category, non-impulse products are less elastic to stockpiling, so promotions for these products are expected to have a low sales effect (Bell et al., 1999). Snacks are impulse products, with strong stockpiling behavior, so consumers tend to purchase more snacks (e.g., frozen dumplings) than meals (e.g., frozen cooked rice) in response to promotions, even if they are not needed immediately. That is, bundling promotion increases sales of frozen dumplings, a snack consumption situation, by stimulating stockpiling behavior, but not frozen cooked rice, a meal consumption situation.

These findings suggest that the impact of bundling promotions on sales may vary depending on the extent of impulse buying and the stockpiling capacity of products with different consumption situations. Consequently, this study demonstrates the different effects of marketing promotion on NPD according to the consumption situation, corroborating previous research.

5.3 Limitations and Future Research

Although this study has implications for practitioners and academics, several limitations should be considered. This study only used offline sales data, because online sales data could not be collected. Therefore, our results provide a limited understanding of the effects of key success factors on online sales of new frozen cooked rice and frozen dumpling products. Offline marketing strategies are already traditionally used

worldwide, and a new strategic option for promoting competition lies in online marketing (Hoffmann et al., 2020). Purchasing food online has become common due to the COVID-19 pandemic (Sharma & Jhamb, 2020). However, since this study only dealt with offline channel data, the results for each channel could not be compared. Therefore, future research should expand the results of this study by considering a wide range of distribution channels, including online and offline.

This research focused on weight diversity, distribution channel diversity, and bundling promotion to investigate the impact of marketing factors on the sales of new frozen food products. These variables completely represented all marketing factors that could be collected from Nielsen POS data. However, factors related to price discount promotion, marketing communication, and advertising can also influence NPD success (Kalish, 1985; Narayanan et al., 2005; Sheng et al., 2007). Thus, future studies should broaden this perspective by determining the effects of various marketing variables on NPD success.

This study is also limited in that it could not determine the interrelationships between each product attribute in terms of NPD. Hoffmann et al. (2020) suggested that continuous research on the interactions between IAs and EAs is necessary to

respond to changing consumer needs. Therefore, further studies should consider the relationships between IAs and EAs to identify the most effective way to bundle attributes during the NPD process of frozen foods.

6. Conclusions

This study examined how different product attributes and marketing factors affect the sales of new frozen cooked rice and frozen dumpling products, which have different consumption situations, namely meals and snacks, respectively. The results show that the key product attributes and marketing factors that influence sales are different for new frozen cooked rice and frozen dumpling products. The key factors in the sales of frozen cooked rice are formulation, recipe type, claim, package type, weight diversity, and distribution channel diversity. The key factors in the sales of frozen dumplings are the main ingredient, dumpling shape, sauce flavor, formulation, claim, weight diversity, bundling promotion, and distribution channel diversity. The findings contribute substantially to improving the performance of NFPD by expanding our understanding of product attributes and marketing factors in different consumption situations.

Ⅱ. Essay 2:
The Effects of Formulation Change and R&D Cooperation Types on the Volume of Online Reviews for Extension Products

1. Introduction

Many companies use brand extension strategies to make new product development (NPD) successful (Tauber, 1988). In the United States, about 81% of goods launched since 1990 have been the result of brand extension (Barone et al., 2000). Similarly, an increasing number of Korean food companies have extended their brands into multiple product categories (Kang & Park, 2011). In the dessert market, an interesting NPD phenomenon, using the brand extension strategy, involves changes in formulation. This is attempted in various ways, including companies developing products within their own brands or in cooperation with other companies. Consumers find such extensions hedonically appealing, and they are led to share their feelings spontaneously online. As a result, the extension products with changed formulations gain rapid popularity through active viral marketing.

Brand extension using changes of formulation with viral marketing seems to be a widespread trend, evidenced by the fact that many formulation-changed products have been, and are being, brought to market. Despite the prevalent trend of brand extension with formulation change, prior studies have not identified the factors that make the development of these products successful. Thus, the overall aim of this study is to examine how formulation categories and cooperation types affect product

development success. Formulation categories are divided into the parent brand and the extension product to examine the effect of formulation change. This study also examines the success of product development in terms of the volume of online reviews, which indicates the extent to which a product has gone viral online.

2. Literature Review

2.1 The Volume of Online Reviews: An Indicator of Product Performance

In NPD, electronic word-of-mouth (eWOM) (Hennig-Thurau et al., 2004) plays an important role in the diffusion and adoption of new products (Mahajan et al., 1984). Consumers actively share online product reviews through eWOM, which provides them with an influential information channel (Jalilvand & Samiei, 2012). Developers can thus acquire valuable information for product improvement and NPD by examining online product reviews, which spread through eWOM (Lee & Yang, 2015).

In addition, online reviews play a critical role when consumers make purchasing decisions. The hierarchy of effect theory emphasizes that consumers make purchasing decisions through three main stages: cognitive, affective and conative. The cognitive stage involves the development of awareness and knowledge of brands and products and is related to the acquisition of information. The affective stage involves the construction of favorable attitudes or emotions, with liking and preferences. The conative stage involves behavior relating to conviction and purchasing intentions (Chakravarty & Sarma, 2018). Online reviews are an important source of information affecting consumers' searches for product information (Lin et al., 2012) and shaping consumer attitudes and behaviors (Castañeda et al., 2009). Thus, the volume of online information influences the affective stages through, for example, consumer trust, and consequently the purchase intention (Fu et al., 2011).

On eWOM platforms, online product reviews written can generate consumption by others and can motivate consumers to write their own electronic reviews (Liu et al., 2017). Consumers tend to use online reviews more frequently when purchasing experience products (e.g. cosmetics, food, movies, etc.) (Bei et al., 2004; Senecal & Nantel, 2004). In the case of food commodities, consumers use online reviews to reduce potential hazards when making a decision (Hussain et al., 2017). Moreover, hospitality industries that are experimental in nature are heavily affected by eWOM (Jeong & Jang, 2011), with several studies demonstrating the important relationship between dining experience and consumers' WOM (Zhang et al., 2014). As a result, the importance of WOM marketing (also referred to as viral marketing) has increased in food marketing campaigns (Rutsaert et al., 2013) and many food companies diffuse their products through eWOM marketing for successful product development. For example, Burger King, Anheuser-Busch and Long John Silver's have adopted viral marketing to reach consumers with the aim of NPD success (Golan & Zaidner, 2008).

Extension products provide consumers with emotional value, such as familiarity (Lane & Jacobson, 1995), which they share on social media in the process of consuming products. Similarly, extension products whose formulation has been changed gain popularity through the proliferation of online reviews providing consumers with familiarity and hedonic appeal. The online reviews that occur in this process are not only the mainspring of consumer purchase intention but also of sales outcomes (Godes & Mayzlin, 2004; Srinivasan et al., 2002). Previous studies have pointed out that the volume of online reviews is the key driver of product sales, while valence (either positive or negative) is not significantly correlated with sales (Duan

et al., 2008; Liu, 2006). In addition, the volume of online reviews significantly affects new product sales, particularly for experience products (Cui et al., 2012). Therefore, the volume of online reviews is used in the present study as a performance indicator for formulation-changed extension products.

2.2 Brand Extension: Change of Formulation

As competitive pressure increases, it is important for companies to seek marketing strategies for achieving successful market growth while reducing the risk of new product failure and the cost of new product launch (Swaminathan et al., 2001). One of these marketing strategies is to attach an existing parent brand name to different product categories, launching extension products—i.e., brand extension (Kapferer, 2008). In brand extension theory (Aaker & Keller, 1990), brand extension is based on a parent brand having a favorable image and well-established awareness. In other words, brand extension is a marketing strategy that leverages the accumulated knowledge of consumers about the parent brand to market the extension product (Tauber, 1988). This strategy is a well-known way of minimizing the burden of large-scale investments in new product launches and of more comfortably securing a profit (Tauber, 1981). Since consumers' attitudes towards existing brands are more favorable than they are towards new ones (Arslan & Altuna, 2010), firms prefer to extend existing brands to new products to reduce the risk of introducing new brands (Ambler & Styles, 1997). Given these advantages, many firms develop strategic plans for brand extension (Smith & Park, 1992).

There are various forms of brand extension, ranging from changes in high-similarity categories (narrow range of extension) to changes in low-similarity categories (wide range of extension) (Boush & Loken, 1991). Oreo is an excellent example of high-similarity brand extension, having extended from the snack category to the ice cream category. An example of low-similarity brand extension is Coca-Cola, which has extended from the beverage category to the shoe category.

A number of food companies use the formulation change method as a brand extension strategy to increase products' hedonic appeal. In NPD, marketers can create innovative products by changing the original product's physical form to enhance aesthetic or hedonic appeal (Noseworthy & Trudel, 2011). This practice is considered hedonic converting and is generally used to attract consumers' interest (Chitturi et al., 2007). As a result, there is an increasing tendency to introduce extension products by changing the formulations of highly recognized parent brands. In particular, many dessert products elicit consumer interest by expanding into various categories, such as ice cream, beverages and jelly. For example, Chupa Chups has expanded its formulations from candy to include beverages with the intention of increasing hedonic appeal (Figure 1).

Figure 1. Example of product formulation change.

On the left is the parent brand, candy.

On the right is the extension product, a beverage.

Although many extension products have been launched through changed formulations, less attention has been paid to the effect of such formulation change on product development success.

According to cue utilization theory (Cox, 1967), products consist of intrinsic and extrinsic cues used as indicators of quality to consumers. Intrinsic cues are the product's IAs, which are related to its physical properties, such as its ingredients and extrinsic cues are the product's EAs, which are not related to its physical properties (Olson & Jacoby, 1972). In particular, the intrinsic cues relating to a product category (e.g., taste, texture, aroma) have high predictive and confidence values (Olson & Jacoby, 1972). Previous studies have confirmed that differences in products' IAs (e.g., color, flavor, aroma, texture) have significant effects on consumers' purchasing behavior (Corduas et al., 2013; Vickers, 1993). Therefore, changes in products' IAs, such as formulation changes, may affect consumer responses. However, most of these studies have focused on sensory evaluations, and limited studies have considered the NPD perspective. This research, therefore, treats formulation categories as a type of IAs and uses the volume of online reviews as an indicator of NPD performance to examine the effects of intrinsic cues in terms of NPD. Given this approach, the following hypothesis is proposed.

H1. The formulation category of the parent brand affects the volume of online reviews for the extension product.

2.3 Research and Development (R&D) Cooperation Types: Vertical and Horizontal

The development of a brand extension is one type of NPD, and NPD can be achieved more effectively through cooperation (Song et al., 1997; Tether, 2002). Hence, cooperation should be regarded as important in relation to brand extension. Cooperation is defined as the mutual efforts made by participants in an agreement to achieve a common goal (Skinner et al., 1992). At the firm level, such a cooperative agreement is considered an efficient means of facilitating innovation activities, such as R&D cooperation (Koschatzky & Sternberg, 2000). In the manufacturing industry, R&D cooperation is used in both the product development and innovation processes, enhancing R&D intensity and NPD probability (Becker & Dietz, 2004). Given these advantages, many food companies have expanded their brands to include new formulations through different types of R&D cooperation.

Two types of R&D cooperation, founded on resource-based perspectives, have been suggested by previous studies (Arranz & de Arroyabe, 2008). The first is vertical cooperation, based on the synergistic effect obtained by complementary agreements, and the second is horizontal cooperation, based on competitive positioning and industrial economy theories (Cassiman & Veugelers, 2005). For manufacturers, one of the most important kinds of vertical cooperative agreements is supply chain cooperation between firms and customers or suppliers (Fritsch & Lukas, 2001). Generally, in horizontal cooperation, manufacturers cooperate with rival firms of comparable type within a connected field (Miotti & Sachwald, 2003). By examining several distinctions between vertical and horizontal cooperation,

Arranz & de Arroyabe (2008) show that firms achieve a variety of results depending on the type of R&D cooperation chosen. In this respect, the type of R&D cooperation chosen is an important factor in the successful development of extension products.

In this study, three types of R&D are introduced: cooperation with distributors, cooperation with manufacturers and non-cooperation. Cooperation with distributors is a type of vertical cooperation on the supply chain (Fritsch & Lukas, 2001). Cooperation with manufacturers is a type of horizontal cooperation with rival firms in similar fields (Tether, 2002). Thus, this study defines cooperation with distributors as vertical cooperation and cooperation with manufacturer as horizontal cooperation. The expected performance of firms is different for vertical cooperation and for horizontal cooperation. In particular, vertical R&D cooperation, which is an integral part of the innovation process, has a positive impact on the NPD of firms (Arranz & de Arroyabe, 2008). Furthermore, the volume of online reviews is key indicator of firm performance (Duan et al., 2008). Thus, this paper sets the volume of online reviews as a performance indicator of product development and examines how the type of cooperation affects product development success. In this respect, the following hypothesis is proposed:

H2. There is a difference in the volume of online reviews between types of R&D cooperation.

3. Main Study

The main study was conducted to test the impact of parent brand formulations and R&D cooperation types on the volume of online reviews for extension products.

3.1 Material and Methods

This study collected data from 109 extension products with changed formulations in the Korean dessert market from February 1, 2014, to February 19, 2019. Products that had been withdrawn or demised prior to February 19, 2019, were excluded from the sample.

Data regarding the volume of online reviews were collected from Some Trend Biz™, a social media analysis system offered by Daumsoft (https://some.co.kr/). Daumsoft is one of the leading social media analysis and consulting firms in Korea. It provides solutions and services, such as data collection, text mining and social analysis. Some Trend Biz™ collects and stores information from Facebook, Twitter, Instagram and blog contents in its own big data repository. It processes the human language contained in various pieces of information via computer and combines them to conduct multidimensional analyzes. The volume of online reviews in this study was determined via text mining data for 109 samples that represented the cumulative number of online reviews for products. The text mining data were obtained by using “Product name” as a keyword in the search term field of Some Trend Biz™ from the release date of the extension product to February 19, 2019. The volume of online reviews was used as a dependent variable in this study and was transformed into a logarithm variable to handle the non-linear relationship between

the independent and dependent variables (Benoit, 2011).

The following categorical variables were converted into dummy variables to represent attributes with distinct categories: parent formulation categories and R&D cooperation types. The parent formulation categories indicated the original formulation type of the parent brand—i.e., the formulation from which the extension product was changed. Formulations may, of course, change within the same product category. For example, an ice cream bar can become an ice cream cone. In this study, this was considered a brand extension through formulation change. The five dummy variables of the parent brand's formulation were generated as equal to one if the parent brand's formulation belonged to the formulation attribute represented by each variable and zero if otherwise. As a result, dummy variables were generated for the parent formulations of candy, beverages, ice cream, chocolate, and snacks.

The R&D cooperation types indicated the companies with which the manufacturers of the extension products cooperated. The three dummy variables of the cooperation types were generated as equal to one if the cooperation type belonged to the cooperation attribute represented by each variable and zero if otherwise. As a result, dummy variables were generated for vertical cooperation, non-cooperation, and horizontal cooperation. These dummy variables were included as independent variables, and descriptive statistics represented the frequency of these dummy variables (Table 8).

In a linear regression analysis, the extension product life, the parent brand life, and the number of extension products were used as control variables to eliminate all biases related to time-to-market that could affect the proliferation of online reviews. The extension product life was included to control for the effects of time exposed

online. Since brand awareness positively affects purchase intention (Chi et al., 2009), parent brand life was also included as a control variable. As the number of products affiliated with a brand increases, consumers evaluate the products more favorably (Dacin & Smith, 1994), so the number of extension products was controlled. The control variables were collected from the official websites and news articles for each product.

Table 8 presents the descriptions of the variables used in the main study. Table 9 summarizes the descriptive statistics of the study's 109 samples. The descriptive statistics represent the mean, standard deviation (SD), range (min/max) and frequency of the dummy variables.

To examine the differences in the effects of parent brand formulation categories and R&D cooperation types on the volume of online reviews, this study used multiple linear regression analysis with dummy variables. Dummy variables were used as numerical variables in the regression analysis to distinguish between the different subgroups of the 109 samples in the main study (Hardy, 1993). The candy formulation was used as the reference category for the formulation variables. According to previous studies, firms achieve different results between vertical and horizontal cooperation (Arranz & de Arroyabe, 2008). Thus, for the R&D cooperation variables, vertical cooperation was used as a reference category to identify the difference between vertical and horizontal cooperation. A significance level of 5% was considered for all statistical tests. All statistical analyzes were performed using SPSS.

Table 8. Descriptions of the variables

	Variable		Description
	DV	Volume of online reviews	Cumulative number of online reviews for product
IVs	Parent form categories	Candy	Reference category indicating if the product was changed from a parent brand of candy formulation
		Beverage	Dummy variable indicating if the product was changed from a parent brand of beverage formulation
		Ice cream	Dummy variable indicating if the product was changed from a parent brand of ice cream formulation
		Chocolate	Dummy variable indicating if the product was changed from a parent brand of chocolate formulation
		Snack	Dummy variable indicating if the product was changed from a parent brand of snack formulation
	R&D cooperation types	Vertical cooperation	Reference category indicating whether the product was introduced in cooperation with a distributor
		Non-cooperation	Dummy variable indicating whether the product was introduced without cooperation
		Horizontal cooperation	Dummy variable indicating whether the product was introduced in cooperation with a manufacturer
	CVs	Extension product life	Time, in days, from the extension product's introduction to February 19, 2019
		Parent brand life	Time, in years, from the parent brand's introduction to February 19, 2019
		Number of extension products	The number of products connected to parent brand

Note: DV = dependent variable, IVs = independent variables, CVs = control variables.

Table 9. Descriptive statistics summarizing the data set

		Variable	N	Mean	Std. Dev.	Min.	Max.
	DV	Volume of online reviews	109	1,816	4,493	2	32,333
IVs	Parent form categories	Candy		Presence(1): n = 22, Absence(0): n = 87			
		Beverage		Presence(1): n = 20, Absence(0): n = 89			
		Ice cream		Presence(1): n = 46, Absence(0): n = 63			
		Chocolate		Presence(1): n = 13, Absence(0): n = 96			
		Snack		Presence(1): n = 8, Absence(0): n = 101			
	R&D cooperation types	Vertical cooperation		Presence(1): n = 33, Absence(0): n = 76			
		Non-cooperation		Presence(1): n = 7, Absence(0): n = 102			
		Horizontal cooperation		Presence(1): n = 69, Absence(0): n = 40			
	CVs	Extension product life	109	495.13	350.81	5	1,830
		Brand life	109	35.17	15.28	7	87
		Number of extension products	109	3.63	2.50	1	9

Note: DV = dependent variable, IVs = independent variables, CVs = control variables; This table shows the descriptive statistics of the volume of online reviews before being transformed into a logarithm variable.

3.2 Results

3.2.1 Parent Brands' Formulation Categories

The results support the proposed hypothesis (H1). The results also show a significant difference in the volume of online reviews based on the categories of parent formulation (Table 10). The beverage ($\beta = .227$, $p < 0.05$), ice cream ($\beta = .245$, $p < 0.05$) and snack ($\beta = .436$, $p < 0.001$) formulations significantly triggered the proliferation of online reviews when compared to the candy formulation (reference), making it 22.7%, 24.5% and 43.6% higher, respectively. However, there was no significant difference between the chocolate and candy formulation. That is, the products extended from the beverage, ice cream and snack formulations were significantly more diffused online than those extended from the candy formulation.

3.2.2 R&D Cooperation Types

Proposed hypothesis (H2) is partially supported by the results presented in Table 10. The results indicate that the volume of online reviews for extension products differed significantly between the two types of R&D cooperation (Table 10). Vertical cooperation (reference) significantly triggered the proliferation of online reviews ($\beta = -.212$, $p < 0.05$), so that it was 21.2% higher than that for horizontal cooperation. That is, vertical cooperation was significantly more diffused online than was horizontal cooperation. However, there was no significant difference between non-cooperation and vertical cooperation.

3.2.3 Control Variables

The results show that the extension product life (β = .337, p < 0.001) and the number of extension products (β = .207, p < 0.05) have a significant effect on the volume of online reviews. That is, products with longer extension product life and a larger number of extension products were significantly more diffused online.

Table 10. Results of linear regression

Variables			*B*	S.E.	Stand. B.	*t*	p
			1.647	.334		4.927	.000
IVs	Parent form categories	Candy *(ref)*					
		Beverage	.514	.246	.227	2.093	.039*
		Ice cream	.435	.199	.245	2.181	.032*
		Chocolate	.112	.274	.041	.410	.683
		Snack	1.467	.329	.436	4.457	.000***
	R&D cooperation types	Vertical cooperation *(ref)*					
		Non-cooperation	-.241	.171	-.132	-1.410	.162
		Horizontal cooperation	-.758	.317	-.212	-2.395	.019*
	CVs	Extension product life	.001	.000	.337	3.962	.000***
		Brand life	-.002	.005	-.030	-.328	.744
		Number of extension products	.073	.033	.207	2.188	.031*
Adjusted R^2 = 0.275							

Note: n = 109, IVs = independent variables, CVs = control variables; *, **, and *** indicate significance levels of 5%, 1%, and 0.1%, respectively.

In sum, the main study confirmed our suppositions and showed that parent brand formulation and cooperation type for extension products had the potential to affect the volume of online reviews for those products. However, these results were limited in that they did not examine which formulations of extension products were

effective at proliferating online reviews. Thus, follow-up tests were conducted to determine the impact of extension products' formulations and cooperation types on the volume of online reviews.

4. Follow-up Tests

Follow-up tests based on the results of the main study were conducted to examine the effect of the extension products' formulations and R&D cooperation types on the volume of online reviews in specific parent formulation categories. Beverage and ice cream categories were selected because extension products changed from these formulations more positively affected the diffusion of online reviews than did those changed from the candy formulation. Snacks were not used in the follow-up study due to the relatively small number of cases.

4.1 Material and Methods

The follow-up tests were conducted with 66 extension products selected from the same products collected in the main study. Twenty extension products had been changed from the beverage formulation and 46 extension products had been changed from the ice cream formulation.

As in the main study, the volume of online reviews was collected from Some Trend Biz™ and transformed into a logarithm variable to handle the non-linear relationship between the independent and dependent variables (Benoit, 2011).

The following categorical variables were converted to dummy variables to represent an attribute with distinct categories: extension formulation categories and cooperation types. The extension formulation categories indicated the formulation of the extension product. The six dummy variables of the extension product's formulation were generated as equal to one if the extension product's formulation belonged to the formulation attribute represented by each variable and zero if otherwise. As a result, dummy variables for candy, beverages, ice cream, jelly, snacks and "extra" were generated (the extra formulation category included bread, cakes, etc.) The three dummy variables of cooperation types were presented using the same variables generated in the main study: vertical cooperation, non-cooperation and horizontal cooperation. These dummy variables were included as independent variables. As in the main study, the extension product life, the parent brand life and the number of extension products were included as control variables.

For the data of the 46 extension products changed from ice cream, a linear regression analysis was conducted using nine dummy variables: six formulation categories of extension products (candy, beverages, ice cream, jelly, snacks and extra) and three cooperation types. There were 46 extension products changed from ice cream to six formulation categories, as follows: candy (7), beverages (4), ice cream (20), jelly (10), snacks (1) and extra (4). Also, 46 extension products were categorized into three R&D cooperation types: vertical cooperation (15), non-cooperation (3) and horizontal cooperation (28). The candy formulation and vertical cooperation were used as the reference categories for formulation variables and cooperation variables, respectively. A significance level of 5% was considered for all statistical tests.

For the data of the 20 extension products changed from beverages, a linear regression analysis was conducted using six dummy variables: three formulation categories of extension products (ice cream, jelly and extra) and three cooperation types. Formulation categories not included in the extension product formulations were excluded. There were 20 extension products changed from beverages to six formulation categories, as follows: ice cream (12), jelly (7) and extra (1). Also, 20 extension products were categorized into three R&D cooperation types: vertical cooperation (8), non-cooperation (1) and horizontal cooperation (11). The ice cream formulation and vertical cooperation were used as the reference categories for formulation variables and cooperation variables, respectively. A significance level of 5% was considered for all statistical tests.

To examine the differences in the effect of formulation categories of extension products and cooperation types on the volume of online reviews, follow-up tests used linear regression analysis with dummy variables. Dummy variables were used as numerical variables in the regression analysis to distinguish between the different subgroups of the 66 follow-up samples (Hardy, 1993). All statistical analyzes were performed using SPSS.

4.1 Results

4.1.1 Extension Products Changed from the Ice Cream Formulation

The results reveal that there was a significant difference in the volume of online reviews based on formulation (Table 11). The beverage ($\beta = .400$, $p < 0.05$) and extra ($\beta = .625$, $p < 0.01$) formulations significantly triggered the proliferation of online reviews compared to the candy formulation (reference), increasing it by 40.0% and 62.5%, respectively. This indicated that when products were extended from the ice cream formulation, the products extended to beverage and extra formulations were significantly more diffused online than those extended to the candy formulation. However, there was no significant difference in the volume of online reviews based on the type of cooperation.

The results also show that extension product life had a significant effect on the volume of online reviews ($\beta = .643$, $p < 0.001$). That is, when products were changed from the ice cream formulation, products with longer extension product life were significantly more diffused online.

Table 11. Results of linear regression for ice cream formulation change

Variables			*B*	S.E.	Stand. B.	*t*	p
			.409	.858		.477	.636
IVs	Extension form categories	Candy *(ref)*					
		Beverage	1.300	.494	.400	2.632	.013*
		Ice cream	.635	.351	.344	1.808	.079
		Jelly	.260	.370	.117	.703	.487
		Snack	-.055	.767	-.009	-.072	.943
		Extra	2.031	.593	.625	3.423	.002**
	R&D cooperation types	Vertical cooperation *(ref)*					
		Non-cooperation	.328	.297	.175	1.104	.277
		Horizontal cooperation	-.225	.540	-.061	-.417	.679
	CVs	Extension product life	.003	.001	.643	4.441	.000***
		Brand life	-.013	.013	-.126	-.989	.330
		Number of extension products	.081	.046	.241	1.764	.086
Adjusted R^2 = 0.404							

Note: n = 46, IVs = independent variables, CVs = control variables; *, **, and *** indicate significance levels of 5%, 1%, and 0.1%, respectively; The data used in the analysis were selected from extension products that had been changed from the ice cream formulation.

4.1.2 Extension Products Changed from the Beverage Formulation

In the extension formulation categories, there was a significant difference in the volume of online reviews based on the formulation (Table 12). The jelly ($\beta = .798$, $p < 0.01$) and extra ($\beta = .646$, $p < 0.01$) formulation categories significantly triggered the proliferation of online reviews compared to the ice cream formulation (reference), at 79.8% and 64.6% higher, respectively. This indicated that when products were extended from beverage formulations, the products extended to jelly and extra formulations were significantly more diffused online than were those extended to the ice cream formulation.

The volume of online reviews for extension products differed significantly between the two types of R&D cooperation (Table 12). Vertical cooperation (reference) significantly triggered the proliferation of online reviews, so that it was 58.7% higher than non-cooperation ($\beta = -.587$, $p < 0.05$). However, there was no significant difference between horizontal cooperation and vertical cooperation. In other words, for extension products changed from beverage formulations, vertical cooperation was significantly more diffused online than was non-cooperation.

The results show that extension product life had a significant effect on the volume of online reviews ($\beta = .478$, $p < 0.05$). That is, when products were changed from the beverage formulation, products with longer extension product life were significantly more diffused online.

Table 12. Results of linear regression for beverage formulation change

Variables			*B*	S.E.	Stand. B.	*t*	p
			1.326	.771		1.719	.111
IVs	Extension form categories	Ice Cream *(Ref)*					
		Jelly	1.369	.433	.798	3.158	.008**
		Extra	2.424	.776	.646	3.124	.009**
	R&D cooperation types	Vertical cooperation *(ref)*					
		Non-cooperation	-.966	.433	-.587	-2.231	.046*
		Horizontal cooperation	-1.073	.866	-.286	-1.239	.239
	CVs	Extension product life	.001	.000	.478	2.375	.035*
		Brand life	.026	.012	.437	2.145	.053
		Number of extension products	-.049	.233	-.042	-.209	.838
Adjusted R^2 = 0.396							

Note: n = 20, IVs = independent variables, CVs = control variables; *, **, and *** indicate significance levels of 5%, 1%, and 0.1%, respectively; The data used in the analysis were selected from extension products that had been changed from the beverage formulation.

5. Discussion

Currently, a growing number of extension products are being introduced through various cooperation types and changes in formulation categories, but a limited number of studies have examined how cooperation types and formulation categories have affected NPD. This study is the first to investigate the impact of formulation categories and cooperation types on the volume of online reviews for extension products.

The results of the main study show that both formulation changes and cooperation types affected the volume of online reviews. The volume of online reviews for products increased more for extension products changed from beverages, ice cream and snacks than for those changed from candy. Furthermore, the volume of online reviews for products increased more for extension products created through vertical cooperation than for those created through horizontal cooperation. The results of the follow-up tests show that when products were changed from the beverage formulation, the products extended to the jelly and extra formulations, and those produced through vertical cooperation, were better diffused online. Moreover, when the products were changed from the ice cream formulation, the products extended to the beverage, ice cream and extra formulations were better diffused online. These findings yield interesting and important insights for both practitioners and academic researchers.

5.1 Implications for Practitioners

The results from this study provide new insight into NPD and the differentiation of extension products by providing information on which formulation changes are effective for inducing consumers' interest. To achieve successful NPD, firms differentiate and position their brands by understanding the product attributes that consumers perceive as important (Dickson & Ginter, 1987; Gwin & Gwin, 2003). In particular, food industries should be more market oriented, which means reacting to consumers' needs expressed, for example, through WOM, to increase the performance of NPD (Costa & Jongen, 2006). Since consumer response appears to depend on the importance of attributes (Zeithaml, 1988), it is essential for NPD to understand which attributes may better attract consumers' interest. The results show that a change in formulation, which is a type of IAs, influences the volume of online reviews for a product. The findings also suggest that changes in formulation can be used as a differentiator for NPD success.

The study provides interesting insights for new product developers who obtain information about products through eWOM communications. The results suggest that the most effective way to diffuse online reviews is by extending products by changing the formulation from ice cream, beverage, and snack category products and through vertical cooperation. The interaction between firms and consumers is becoming a locus of value, and as the internet has evolved, new possibilities have presented themselves for customers to co-create in the NPD process (Prahalad & Ramaswamy, 2004). Thus, on the basis of these results, new product developers can adopt better formulation changes and cooperation types as co-created NPD strategies by reflecting consumers' online reviews.

Furthermore, these findings provide practical implications for understanding the factors that contribute to the success of similar extensions in NPD terms. Previous studies concerning brand extensions have mainly focused on the similarity between parent brands and extension products. In general, brand extensions are more likely to be successful when the similarity between the parent brand and the extension product is high (Loken & John, 1993; Milberg et al., 1997). However, if a similar extension is unsuccessful, there is a risk of negative feedback effects on the parent brand (Loken & John, 1993). Therefore, it is very important to identify factors that affect the success of similar extensions. This study analyzed factors that influence the success of extension products within similar categories of dessert. The results suggest that changing the formulation of a product to ice cream, beverage, or snack formulation and vertical cooperation are the most effective factors for NPD. This finding is crucial for increasing the likelihood of success for similar extensions.

5.2 Implications for Academics

The results contribute to extending the scope of the literature on the IAs that affect NPD. Understanding the relative importance of product attributes plays a crucial role in successful NPD processes (Enneking et al., 2007). Consumers use products' IAs as informational cues for evaluating products (Zeithaml, 1988). Most previous studies have examined the impact of products' IAs (such as taste, flavor, color, etc.) on consumers' purchasing behaviors through consumer sensory evaluation. However, only a limited number of studies have hinted at the effect of formulation as an intrinsic product attribute from an NPD perspective. This study is one of the first attempts to investigate the effects of formulation changes from an NPD standpoint. The findings suggest that formulation changes affect NPD success by increasing the proliferation of online reviews. The study thus provides academic researchers with interesting insights into formulation as a kind of IAs.

The findings also support evidence for the effectiveness of vertical R&D cooperation on NPD. The results show that vertical cooperation positively affects the proliferation of products' online reviews more than does horizontal cooperation when launching extension products in new categories. This finding suggests that vertical R&D cooperation, such as cooperation with distributors, is effective in NPD terms. This is consistent with the results of Arranz & de Arroyabe (2008), who suggested that vertical R&D cooperation positively influences the propensity of firms conducting NPD. This study's findings demonstrate the effectiveness of vertical cooperation on NPD, corroborating previous research.

5.3 Limitations and Future Research

Although these results provide new product developers with guidelines for the effective diffusion of their extension products with changed formulations through eWOM platforms, the study also has certain limitations. While the brand extension strategy is widely used in different countries, this research considered only data from extension products whose formulations were changed in Korea. Therefore, future studies should expand the research by examining cases in different countries in light of these results.

Since this study used secondary data, we could not collect data representing actual purchases for each product. Rather, we used proxy variables, such as parent brand life and extension product life data. Furthermore, previous studies have shown that the volume of online reviews has a significant impact on new product sales (Cui et al., 2012; Y. Liu, 2006). Consequently, this study presented the volume of online reviews as an indicator of product performance to examine the success factors of brand extension products whose formulations had been changed. However, the volume of online reviews signifies only current product performance. Thus, our results are limited in understanding the long-term effects of the volume of online reviews on product performance. In addition, eWOM platforms have a greater impact on new product sales early in the product life cycle (Amblee & Bui, 2008; Dellarocas et al., 2007) and product life cycles are diverse, from short to long, after the release date (Cui et al., 2012). Because the impact of eWOM on sales depends on the product life cycle, future studies should consider the long-term effects of the volume of online reviews on product sales, considering product life cycles.

This study could not collect data related to the degree of online advertising and promotion of each product. As this study focused on extension products with formulations changed from the parent brand, most of these extension products' brands were well known and only needed minimal investment through online advertisements or promotions. In the present study, parent brand life and extension product life data were used as control variables instead. However, to analyze the effect of online advertising on the volume of online reviews, further research should include variables related to online advertising or promotion.

The product data collected in this study is complete enumeration of all extension products with changed formulations, in the Korean dessert market from February 1, 2014, to February 19, 2019. However, the sample size for some subgroups of follow-up tests is small, limiting the possibility of making strong conclusions about significant results. Therefore, to increase the accuracy of the significant results from the follow-up tests, further research should consider increasing the sample size.

6. Conclusions

This study examines the effects of formulation categories and R&D cooperation types on the volume of online reviews. The results show a significant difference in the volume of online reviews based on formulation categories and R&D cooperation types. The results support the idea that formulation change and R&D cooperation types play a central part in the proliferation of online reviews, which is the key driver of product sales. The findings indicate that consumers' response to products varies according to the way in which the formulation is changed and the type of cooperation involved in the launch of the product. This suggests that when planning and launching extension products, the developers should consider formulation change and cooperation type in relation to eliciting consumers' interest. In addition, further studies with increased sample size and meaningful variables will provide an in-depth understanding of the effect of formulation categories and R&D cooperation types on the volume of online reviews for the extension products.

Reference

Aaker, D. A., & Keller, K. L. (1990). Consumer evaluations of brand extensions. *Journal of Marketing*, *54*(1), 27–41.

Aggarwal, M., & Sharma, D. (2021). Development of Colourful Frozen Dumplings. *European Journal of Molecular & Clinical Medicine*, *7*(10), 3944–3950.

Akkerman, R., Farahani, P., & Grunow, M. (2010). Quality, safety and sustainability in food distribution: a review of quantitative operations management approaches and challenges. *OR Spectrum*, *32(4)*, 863–904.

Amblee, N., & Bui, T. (2008). Can brand reputation improve the odds of being reviewed on-line?. *International Journal of Electronic Commerce*, 12(3), 11-28.

Ambler, T., & Styles, C. (1997). Brand development versus new product development: toward a process model of extension decisions. *Journal of Product & Brand Management*, *6*(4), 222–234.

Analyst View Market. (2019). *South Korea Frozen Food Market Research Report, Size, Share, Global Trends, Industry Analysis and Market Forecast from 2014-2025*. https://www.analystviewmarketinsights.com/report-highlight-South-Korea-Frozen-Food-Market/

Andersen, L. M., & Lund, T. B. (2014). Digging deeper: How do different types of organic consumers influence the increasing organic market share?. *British Food Journal*, *116*(1), 16–29.

Arboleda, A. M., & Arce-Lopera, C. (2015). Quantitative analysis of product categorization in soft drinks using bottle silhouettes. *Food Quality and Preference*, *45*, 1–10.

Armstrong, G., Adam, S., Denize, S., & Kotler, P. (2014). *Principles of marketing*. Pearson Australia.

Arranz, N., & de Arroyabe, J. C. F. (2008). The choice of partners in R&D cooperation: An empirical analysis of Spanish firms. *Technovation*, *28*(1–2), 88–100.

Arslan, F. M., & Altuna, O. K. (2010). The effect of brand extensions on product brand image. *Journal of Product and Brand Management*, *19*(3), 170–180.

Arya, A., & Mittendorf, B. (2013). The changing face of distribution channels: partial forward integration and strategic investments. *Production and Operations Management*, *22*(5), 1077–1088.

Asioli, D., Varela, P., Hersleth, M., Almli, V. L., Olsen, N. V., & Næs, T. (2017). A

discussion of recent methodologies for combining sensory and extrinsic product properties in consumer studies. *Food Quality and Preference*, *56*, 266–273.

Babin, B. J., Darden, W. R., & Griffin, M. (1994). Work and/or fun: measuring hedonic and utilitarian shopping value. *Journal of Consumer Research*, *20*(4), 644-656.

Bandyopadhyay, S., Rominger, A., & Basaviah, S. (2009). Developing a framework to improve retail category management through category captain arrangements. *Journal of Retailing and Consumer Services*, *16*(4), 315–319.

Banerjee, S. (2009). Effect of product category on promotional choice: Comparative study of discounts and freebies. *Management Research News*, *32*(2), 120–131.

Barbosa, A. A. L., de Moura, J. A., & de Medeiros, D. D. (2021). Positioning of design elements on the packaging of frozen convenience food and consumers' levels of attention: An experiment using pizza boxes. *Food Quality and Preference*, *87*, 104044.

Barone, M. J., Miniard, P. W., & Romeo, J. B. (2000). The influence of positive mood on brand extension evaluations. *Journal of Consumer Research*, *26*(4), 386–400.

Bayus, B. L., & Putsis Jr, W. P. (1999). Product proliferation: An empirical analysis of product line determinants and market outcomes. *Marketing Science*, *18*(2), 137–153.

Becker, W., & Dietz, J. (2004). R&D cooperation and innovation activities of firms - Evidence for the German manufacturing industry. *Research Policy*, *33*(2), 209–223.

Bei, L. T., Chen, E. Y., & Widdows, R. (2004). Consumers' online information search behavior and the phenomenon of search vs. experience products. *Journal of Family and Economic Issues*, *25*(4), 449–467.

Belk, R. W. (1974). An exploratory assessment of situational effects in buyer behavior. *Journal of Marketing Research*, *11*(2), 156–163.

Bell, D. R., Chiang, J., & Padmanabhan, V. (1999). The decomposition of promotional response: An empirical generalization. *Marketing Science*, *18*(4), 504–526.

Benoit, K. (2011). Linear regression models with logarithmic transformations. *London School of Economics*, *London*, 22(1), 23-36.

Bett-Garber, K. L., Champagne, E. T., Ingram, D. A., & McClung, A. M. (2007). Influence of water-to-rice ratio on cooked rice flavor and texture. *Cereal Chemistry*, *84*(6), 614–619.

Blake, C. E., Bisogni, C. A., Sobal, J., Devine, C. M., & Jastran, M. (2007). Classifying foods in contexts: How adults categorize foods for different eating settings. *Appetite*, *49*(2), 500–510.

Blattberg, R. C., Eppen, G. D., & Lieberman, J. (1981). A theoretical and empirical evaluation of price deals for consumer nondurables. *Journal of Marketing*, *45*(1), 116–129.

Blattberg, R. C., & Neslin, S. A. (1989). Sales promotion: The long and the short of it. *Marketing Letters*, *1*(1), 81–97.

Bogomolova, S., Szabo, M., & Kennedy, R. (2017). Retailers' and manufacturers' price-promotion decisions: Intuitive or evidence-based? *Journal of Business Research*, *76*, 189–200.

Bollen, K. A., & Brand, J. E. (2010). A general panel model with random and fixed effects: A structural equations approach. *Social Forces*, *89*(1), 1–34.

Bonoma, T. V., & Crittenden, V. L. (1988). Managing marketing implementation. *MIT Sloan Management Review*, *29*(2), 7.

Borch, O. J., & Forsman, S. (2004). Competitive Positioning and Resource Configuration of Small Firm in a Mature Industry. *New Perspective on Firm Growth, 1st Inter-Rent online publication, Europan Council for Small Business and Entrepreneurship, Turko.*

Bouasla, A., Wójtowicz, A., & Zidoune, M. N. (2017). Gluten-free precooked rice pasta enriched with legumes flours: Physical properties, texture, sensory attributes and microstructure. *LWT - Food Science and Technology*, *75*, 569–577.

Boush, D. M., & Loken, B. (1991). A process-tracing study of brand extension evaluation. *Journal of Marketing Research*, *28*(1), 16–28.

Brettel, M., & Cleven, N. J. (2011). Innovation culture, collaboration with external partners and NPD performance. *Creativity and Innovation Management*, *20*(4), 253–272.

Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica: Journal of the econometric society*, *47*(5), 1287-1294.

Brooksbank, R. W. (1991). Successful marketing practice: A literature review and checklist for marketing practitioners. *European Journal of Marketing*, *25*(5), 20–29.

Budiarso, T., Amarantini, C., Prihatmo, G., Restiani, R., Putri, Y., Kindagen, V., & Linggardjati, S. (2021, March). Detection of Coliforms and Enteric Pathogens in Favorite Snack Food Sold in Yogyakarta City. In *7th International*

Conference on Research, Implementation, and Education of Mathematics and Sciences (ICRIEMS 2020) (pp. 40-48). Atlantis Press.

Capgemini. (2007). *The Business Case for Product Rationalization An executive summary on the benefits, trends & technologies*. https://www.capgemini.com/wp-content/uploads/2017/07/The_Business_Case_for_Product_Rationalization.pdf

Cassiman, B., & Veugelers, R. (2005). R&D cooperation and spillovers: some empirical evidence. *Universitat Pompeu Fabra Economics WP*, (328).

Castañeda, J. A., Rodŕguez, M. A., & Luque, T. (2009). Attitudes' hierarchy of effects in online user behaviour. *Online Information Review*, *33*(1), 7–21.

Chakravarty, R., & Sarma, N. N. (2018). *Hierarchy of effects and consumer buying: findings from literature review*.

Chang, H. J., & Hwang, Y. K. (2006). Product development and market testing of ready-to-eat mandu with pond-snail as a health food. *Korean Journal of Community Nutrition*, *11*(5), 650–660.

Chao, R. O., & Kavadias, S. (2008). A theoretical framework for managing the new product development portfolio: When and how to use strategic buckets. *Management Science*, *54*(5), 907–921.

Chi, H. K., Yeh, H. R., & Yang, Y. T. (2009). The impact of brand awareness on consumer purchase intention: The mediating effect of perceived quality and brand loyalty. *The Journal of International Management Studies*, *4*(1), 135–144.

Chitturi, R., Raghunathan, R., & Mahajan, V. (2007). Form versus function: How the intensities of specific emotions evoked in functional versus hedonic trade-offs mediate product preferences. *Journal of Marketing Research*, *44*(4), 702–714.

Cleland, D. J. (2020). The History of Food Freezing. *ASHRAE Transactions*, *126*(1).

Cooper, R. G., & Kleinschmidt, E. J. (1991). New product processes at leading industrial firms. *Industrial Marketing Management*, *20*(2), 137–147.

Corduas, M., Cinquanta, L., & Ievoli, C. (2013). The importance of wine attributes for purchase decisions: A study of Italian consumers' perception. *Food Quality and Preference*, *28*(2), 407–418.

Costa, A. I. A., & Jongen, W. M. F. (2006). New insights into consumer-led food product development. *Trends in Food Science & Technology*, 17(8), 457-465.

Cox, D. F. (1967). The sorting rule model of the consumer product evaluation

process. *Risk Taking and Information Handling in Consumer Behavior*.

Crawford, C. M. (1986). Evaluating new products: A system, not an act. *Business Horizons*, *29*(6), 48–55.

Crawford, M., & Di Benedetto, A. (2011). *New Products Management*. *(10th International ed.).*

Cross, A. T., Babicz, D., & Cushman, L. F. (1994). Snacking patterns among 1,800 adults and children. *Journal of the American Dietetic Association*, *94*(12), 1398–1403.

Cui, G., Lui, H. K., & Guo, X. (2012). The effect of online consumer reviews on new product sales. *International Journal of Electronic Commerce*, *17*(1), 39–58.

Dacin, P. A., & Smith, D. C. (1994). The effect of brand portfolio characteristics on consumer evaluations of brand extensions. *Journal of Marketing Research*, *31*(2), 229–242.

Danneels, E. (1996). Market segmentation: normative model versus business reality: an exploratory study of apparel retailing in Belgium. *European Journal of Marketing*, *30*(6), 36–51.

Datta, Y. (1996). Market segmentation: An integrated framework. *Long Range Planning*, *29*(6), 797–811.

de Pechpeyrou, P. (2013). Virtual bundling with quantity discounts: When low purchase price does not lead to smart-shopper feelings. *Psychology and Marketing*, *30*(8), 707–723.

Dellarocas, C., Zhang, X. M., & Awad, N. F. (2007). Exploring the value of online product reviews in forecasting sales: The case of motion pictures. *Journal of Interactive Marketing*, *21*(4), 23–45.

Derdenger, T., & Kumar, V. (2013). The dynamic effects of bundling as a product strategy. *Marketing Science*, *32*(6), 827–859.

Di Benedetto, C. A. (1999). Identifying the key success factors in new product launch. *Journal of Product Innovation Management: An International Publication of The Product Development & Management Association*, *16*(6), 530–544.

Dickson, P. R., & Ginter, J. L. (1987). Market segmentation, product differentiation, and marketing strategy. *Journal of Marketing*, *51*(2), 1–10.

Draper, N. R., & Smith, H. (1998). *Applied regression analysis* (Vol. 326). John Wiley & Sons.

Duan, W., Gu, B., & Whinston, A. B. (2008). The dynamics of online word-of-mouth and product sales-An empirical investigation of the movie industry. *Journal of Retailing*, *84*(2), 233–242.

Duarte, P., Raposo, M., & Ferraz, M. (2013). Drivers of snack foods impulse buying behaviour among young consumers. *British Food Journal*, *115*(9), 1233–1254.

Duffey, K. J., Pereira, R. A., & Popkin, B. M. (2013). Prevalence and energy intake from snacking in Brazil: Analysis of the first nationwide individual survey. *European Journal of Clinical Nutrition*, *67*(8), 868–874.

Dunlop, F. (2013). Barbarian Heads and Turkish Dumplings: The Chinese Word Mantou. *Wrapped & Stuffed Foods*.

Ekambaram, V., Manglik, K., Mukherjee, S., Shravan, S., Sajja, K., Dwivedi, S., & Raykar, V. (2020). Attention based Multi-Modal New Product Sales Time-series Forecasting. *Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining* (pp. 3110–3118).

Enneking, U., Neumann, C., & Henneberg, S. (2007). How important intrinsic and extrinsic product attributes affect purchase decision. *Food Quality and Preference*, *18*(1), 133–138.

Enzing, C. M., Batterink, M. H., Janszen, F. H., & Omta, S. O. (2011). Where innovation processes make a difference in products' short- and long-term market success. *British Food Journal*, *113*(7), 812–837.

Flint, D. J. (2002). Compressing new product success-to-success cycle time deep customer value understanding and idea generation. *Industrial Marketing Management*, *31*(4), 305–315.

Foekens, E. W., Leeflang, P. S. H., & Wittink, D. R. (1998). Varying parameter models to accommodate dynamic promotion effects. *Journal of Econometrics*, *89*(1–2), 249–268.

Fritsch, M., & Lukas, R. (2001). Who cooperates on R&D? *Research Policy*, *30*(2), 297–312.

Fu, X., Bin, Z., Xie, Q., Liuli, X., & Yu, C. (2011). Impact of quantity and timeliness of EWOM information on consumer's online purchase intention under C2C environment. *Asian Journal of Business Research*, *1*(2).

Gellynck, X., Banterle, A., Kühne, B., Carraresi, L., & Stranieri, S. (2012). Market orientation and marketing management of traditional food producers in the EU. *British Food Journal*, *114*(4), 481–499.

Glanz, K., Basil, M., Maibach, E., Goldberg, J., & Snyder, D. A. (1998). Why Americans eat what they do: Taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of the American*

Dietetic Association, *98*(10), 1118–1126.

Godes, D., & Mayzlin, D. (2004). Using online conversations to study word-of-mouth communication. *Marketing Science*, *23*(4), 545–560.

Golan, G. J., & Zaidner, L. (2008). Creative strategies in viral advertising: An application of Taylor's six-segment message strategy wheel. *Journal of Computer-Mediated Communication*, *13*(4), 959–972.

Grunert, K. G. (2002). Current issues in the understanding of consumer food choice. *Trends in Food Science & Technology*, 13(8), 275–285.

Grunert, K. G., & Valli, C. (2001). Designer-made meat and dairy products: Consumer-led product development. *Livestock Production Science*, *72*(1–2), 83–98.

Guerreiro, J., Rita, P., & Trigueiros, D. (2015). Attention, emotions and cause-related marketing effectiveness. *European Journal of Marketing*, *49*(11–12), 1728–1750.

Gwin, C. F., & Gwin, C. R. (2003). Product attributes model: A tool for evaluating brand positioning. *Journal of Marketing Theory and Practice*, *11*(2), 30–42.

Hambrick, D. C., Cho, T. S., & Chen, M. J. (1996). The influence of top management team heterogeneity on firms' competitive moves. *Administrative Science Quarterly*, 659–684.

Hardy, M. A. (1993). *Regression with dummy variables* (Vol. 93). Sage.

Hennig-Thurau, T., Gwinner, K. P., Walsh, G., & Gremler, D. D. (2004). Electronic word-of-mouth via consumer-opinion platforms: What motivates consumers to articulate themselves on the Internet? *Journal of Interactive Marketing*, *18*(1), 38–52.

Hirche, M., & Bruwer, J. (2014). Buying a product for an anticipated consumption situation observation of high- and low-involved wine buyers in a retail store. *International Journal of Wine Business Research*, *26*(4), 295–318.

Hirschman, E. C., & Holbrook, M. B. (1982). Hedonic consumption: emerging concepts, methods and propositions. *Journal of Marketing*, *46*(3), 92–101.

Ho, T. H., & Tang, C. S. (1998). *Product variety management: research advances* (Vol. 10). Springer Science & Business Media.

Hoffmann, N. C., Symmank, C., Mai, R., Stok, F. M., Rohm, H., & Hoffmann, S. (2020). The influence of extrinsic product attributes on consumers' food decisions: review and network analysis of the marketing literature. *Journal of Marketing Management*, *36*(9–10), 888–915.

Honkanen, P., Olsen, S. O., Verplanken, B., & Tuu, H. H. (2012). Reflective and impulsive influences on unhealthy snacking. The moderating effects of food related self-control. *Appetite*, *58*(2), 616–622.

Horvat, A., Granato, G., Fogliano, V., & Luning, P. A. (2019). Understanding consumer data use in new product development and the product life cycle in European food firms – An empirical study. *Food Quality and Preference*, *76*, 20–32.

Hsieh, M. H., Tsai, K. H., & Wang, J. R. (2008). The moderating effects of market orientation and launch proficiency on the product advantage-performance relationship. *Industrial Marketing Management*, *37*(5), 580–592.

Hu, T. W. (1972). THE FITTING OF LOG-REGRESSION EQUATION WHEN SOME OBSERVATIONS IN THE REGRESSAND ARE ZERO OR NEGATIVE. *Metroeconomica*, *24*(1), 86–90.

Huang, L., & Lu, J. (2016). The impact of package color and the nutrition content labels on the perception of food healthiness and purchase intention. *Journal of Food Products Marketing*, *22*(2), 191–218.

Huang, S. D. (1999). Wheat products: 2. Breads, cakes, cookies, pastries and dumplings. *Asian foods: Science and technology*, 71-109.

Hubbard, E. M., Jervis, S. M., & Drake, M. A. (2016). The effect of extrinsic attributes on liking of cottage cheese. *Journal of Dairy Science*, *99*(1), 183–193.

Hussain, S., Ahmed, W., Jafar, R. M. S., Rabnawaz, A., & Jianzhou, Y. (2017). eWOM source credibility, perceived risk and food product customer's information adoption. *Computers in Human Behavior*, *66*, 96–102.

Hyll, W., & Pippel, G. (2016). Types of cooperation partners as determinants of innovation failures. *Technology Analysis & Strategic Management*, 28(4), 462-476.

Ilori, M. O., Oke, J. S., & Sanni, S. A. (2000). Management of new product development in selected food companies in Nigeria. *Technovation*, *20*(6), 333–342.

Jacobsen, L. F., Grunert, K. G., Søndergaard, H. A., Steenbekkers, B., Dekker, M., & Lähteenmäki, L. (2014). Improving internal communication between marketing and technology functions for successful new food product development. *Trends in Food Science & Technology*, 37(2), 106-114.

Jaeger, S. R. (2006). Non-sensory factors in sensory science research. *Food Quality and Preference*, *17*(1–2), 132–144.

Jalilvand, M. R., & Samiei, N. (2012). The effect of electronic word of mouth on

brand image and purchase intention: An empirical study in the automobile industry in Iran. *Marketing Intelligence and Planning*, *30*(4), 460–476.

Jeong, E., & Jang, S. S. (2011). Restaurant experiences triggering positive electronic word-of-mouth (eWOM) motivations. *International Journal of Hospitality Management*, *30*(2), 356–366.

Jeong, O. Y., Park, H. S., Baek, M. K., Kim, W. J., Lee, G. M., Lee, C. M., Bombay, M., Ancheta, M. B., & Lee, J. H. (2021). Review of rice in Korea: current status, future prospects, and comparisons with rice in other countries. *Journal of Crop Science and Biotechnology*, *24*(1), 1–11.

Kalish, S. (1985). A new product adoption model with price, advertising, and uncertainty. *Management Science*, *31*(12), 1569–1585.

Kang, S. H., & Park, K. W. (2011). A Study on the Determining of the Food Package Design by Brand Extension. *A Journal of Brand Design Association of Korea*, *9*(3), 309–323.

Kapferer, J. N. (2008). *The new strategic brand management: Creating and sustaining brand equity long term.* Kogan Page Publishers.

Kennedy, C. J. (2000a). *Managing Frozen Foods*.

Kennedy, C. J. (2000b). The future of frozen foods. *Food Science and Technology Today*, *14*(4), 195–197.

Kim, J. Y., Kim, K. B., & Park, I. S. (2009). Perceptions of mandu and usage behaviors by mandu type. *Journal of the East Asian Society of Dietary Life*, *19*(5), 690–702.

Kim, K. H., Park, B. H., Cho, Y. J., Kim, S. R., & Cho, H. S. (2009). Quality characteristics of shrimp flour added dumpling shell. *Journal of the Korean Society of Food Culture*, *24*(2), 206–211.

Kivetz, R., & Zheng, Y. (2017). The effects of promotions on hedonic versus utilitarian purchases. *Journal of Consumer Psychology*, *27*(1), 59–68.

Kopalle, P. K., Mela, C. F., & Marsh, L. (1999). The dynamic effect of discounting on sales: Empirical analysis and normative pricing implications. *Marketing Science*, *18*(3), 317–332.

Korea Agro-Fisheries & Food Trade Corporation, & Ministry of Agriculture, Food & Rural Affairs Korea. (2018). *Processed food market segment status in 2018: Frozen food market*.

Kortge, G. D., & Okonkwo, P. A. (1989). Simultaneous new product development: Reducing the new product failure rate. *Industrial Marketing Management*, *18*(4), 301–306.

Koschatzky, K., & Sternberg, R. (2000). R&D cooperation in innovation systems—some lessons from the European Regional Innovation Survey (ERIS). *European Planning Studies*, *8*(4), 487–501.

Kumar, P. K., Rasco, B. A., Tang, J., & Sablani, S. S. (2020). State/phase transitions, ice recrystallization, and quality changes in frozen foods subjected to temperature fluctuations. *Food Engineering Reviews,* 12(4), 421-451.

Kwak, H. S., Jeong, Y., & Kim, M. (2015). Influence of rice varieties on sensory profile and consumer acceptance for frozen-cooked rice. *Emirates Journal of Food and Agriculture*, *27*, 793–800.

Kwak, H. S., Kim, M., & Jeong, Y. (2015). Physicochemical properties and determination of key instrumental quality measurement parameters of frozen-cooked rice by correlating consumer acceptance. *Journal of Food Quality*, *38*(3), 192–200.

Kwon, J. C., Nejad, Z. D., & Jung, M. C. (2017). Arsenic and heavy metals in paddy soil and polished rice contaminated by mining activities in Korea. *Catena*, *148*, 92–100.

Kwon, K. N., Lee, M. H., & Kwon, Y. J. (2008). The effect of perceived product characteristics on private brand purchases. *Journal of Consumer Marketing*, *25*(2), 105–114.

Lages, L. F., Abrantes, J. L., & Lages, C. R. (2008). The STRATADAPT scale: A measure of marketing strategy adaptation to international business markets. *International Marketing Review*, 25(5), 584-600.

Lähteenmäki, L. (2013). Claiming health in food products. *Food Quality and Preference*, *27*(2), 196–201.

Lai, A. W. (1991). Consumption situation and product knowledge in the adoption of a new product. *European Journal of Marketing*, *25*(10), 55–67.

Lancaster, K. J. (1966). A new approach to consumer theory. *Journal of Political Economy*, *74*(2), 132–157.

Lane, V., & Jacobson, R. (1995). Stock market reactions to brand extension announcements: The effects of brand attitude and familiarity. *Journal of Marketing*, *59*(1), 63–77.

Lange, C., Issanchou, S., & Combris, P. (2000). Expected versus experienced quality: Trade-off with price. *Food Quality and Preference*, *11*(4), 289–297.

Lee, K. Y., & Yang, S. B. (2015). The role of online product reviews on information adoption of new product development professionals. *Internet Research*, *25*(3), 435–452.

Lee, M. J., & Yoon, K. S. (2009). Comparison of the perception of frozen processed food, food labeling and nutrition labeling between employees and non-employees in the frozen food industry. *Journal of the East Asian Society of Dietary Life*, *19*(4), 533–543.

Lee, M. S., Kim, K. B., Kim, Y. S., & Choi, S. K. (2013). The research on Sanchoneo mandu product development using conjoint analysis. *Culinary Science and Hospitality Research*, *19*(1), 164–178.

Lin, T. M, Lu, K. Y., & Wu, J. J. (2012). The effects of visual information in eWOM communication. *Journal of Research in Interactive Marketing*, *6*(1), 7–26.

Litvack, D. S., Calantone, R. J., & Warshaw, P. R. (1985). An examination of short-term retail grocery price effects: *Journal of Retailing*, *61*(3), 9–25.

Liu, X., Hu, J., & Xu, B. (2017). Does eWOM matter to brand extension?: An examination of the impact of online reviews on brand extension evaluations. *Journal of Research in Interactive Marketing*, *11*(3), 232–245.

Liu, X., Zhao, S., Wei, Q., Zhao, X., & Zhang, H. (2019). Effects of vacuum degree on the water status, physicochemical properties and microstructure of fast frozen dumpling wrappers. *International Journal of Food Science & Technology*, *54*(6), 2075–2083.

Liu, Y. (2006). Word of mouth for movies: Its dynamics and impact on box office revenue. *Journal of Marketing*, *70*(3), 74–89.

Loken, B., & John, D. R. (1993). Diluting brand beliefs: when do brand extensions have a negative impact?. *Journal of Marketing*, *57*(3), 71–84.

Maehle, N., Iversen, N., Hem, L., & Otnes, C. (2015). Exploring consumer preferences for hedonic and utilitarian food attributes. *British Food Journal*, *117*(12), 3039–3063.

Mahajan, V., Muller, E., & Kerin, R. A. (1984). Introduction strategy for new products with positive and negative word-of-mouth. *Management Science*, *30*(12), 1389–1404.

Malaviya, P., & Sivakumar, K. (1998). The moderating effect of product category knowledge and attribute importance on the attraction effect. *Marketing Letters*, *9*(1), 93–106.

Marshall, D., & Bell, R. (2003). Meal construction: Exploring the relationship between eating occasion and location. *Food Quality and Preference*, *14*(1), 53–64.

Mcguinness, N. W., & Little, B. (1981). The influence of product characteristics on the export performance of new industrial products. *Journal of Marketing*, *45*(2), 110–122.

Mela, C. F., Jedidi, K., & Bowman, D. (1998). The long-term impact of promotions on consumer stockpiling behavior. *Journal of Marketing Research*, *35*(2), 250–262.

Melovic, B., Cirovic, D., Dudic, B., Vulic, T. B., & Gregus, M. (2020). The analysis of marketing factors influencing consumers' preferences and acceptance of organic food products—recommendations for the optimization of the offer in a developing market. *Foods*, *9*(3), 259.

Milberg, S. J., Park, C. W., & McCarthy, M. S. (1997). Managing negative feedback effects associated with brand extensions: The impact of alternative branding strategies. *Journal of Consumer Psychology*, *6*(2), 119–140.

Miotti, L., & Sachwald, F. (2003). Co-operative R&D: Why and with whom? An integrated framework of analysis. *Research Policy*, *32*(8), 1481–1499.

Miracle, G. E. (1965). Product characteristics and marketing strategy. *Journal of Marketing*, *29*(1), 18–24.

Mittal, B. (1989). Measuring purchase-decision involvement. *Psychology & Marketing*, *6*(2), 147–162.

Narasimhan, C., Neslin, S. A., & Sen, S. K. (1996). Promotional elasticities and category characteristics. *Journal of Marketing*, *60*(2), 17–30.

Narayanan, S., Manchanda, P., & Chintagunta, P. K. (2005). Temporal differences in the role of marketing communication in new product categories. *Journal of Marketing Research*, *42*(3), 278–290.

Neslin, S. A., Henderson, C., & Quelch, J. (1985). Consumer promotions and the acceleration of product purchases. *Marketing Science*, *4*(2), 147–165.

Noseworthy, T. J., & Trudel, R. (2011). Looks interesting, but what does it do? evaluation of lncongruent product form depends on positioning. *Journal of Marketing Research*, *48*(6), 1008–1019.

Ofek, E., & Srinivasan, V. (2002). How much does the market value an improvement in a product attribute?. *Marketing Science*, *21*(4), 398–411.

Olson, J. C., & Jacoby, J. (1972). Cue utilization in the quality perception process. *ACR Special Volumes*.

Owens, J. D., & Davies, J. (2000, October). The importance of a new product development (NPD) process: getting started. In *1st European Conference on Knowledge Management*

Oyewole, P., & Choudhury, P. (2006). Purchase situations and the level of importance that consumers attach to services in the airline industry. *Services Marketing Quarterly*, *28*(1), 19–34.

Paladino, A. (2007). Investigating the drivers of innovation and new product sucess: A comparison of strategic orientations. *Journal of Product Innovation Management*, *24*(6), 534–553.

Parreño-Selva, J., Mas-Ruiz, F. J., & Ruiz-Conde, E. (2014). Price promotions effects of virtue and vice products. *European Journal of Marketing*, *48*(7–8), 1296–1314.

Perreault Jr, W. D., & McCarthy, E. J. (1996). *Basic marketing: A global managerial approach*. Irwin.

Peschel, A. O., Orquin, J. L., & Loose, S. M. (2019). Increasing consumers' attention capture and food choice through bottom-up effects. *Appetite*, *132*, 1–7.

Pham, M. T. (1998). Representativeness, relevance, and the use of feelings in decision making. *Journal of Consumer Research*, *25*(2), 144–159.

Popescu, C. R. G., Popescu, V. A. A., & Popescu, G. N. (2017). Forecasting of the World's Frozen Food Market, the Key Developments to Date and the Sustainability and Social Responsibility Opportunities-An Economic. *Manager*, *25*, 53–62.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, *18*(3), 5–14.

Pujari, D. (2006). Eco-innovation and new product development: Understanding the influences on market performance. *Technovation*, *26*(1), 76–85.

Quester, P. G., & Smart, J. (1998). The influence of consumption situation and product involvement over consumers' use of product attribute. *Journal of Consumer Marketing*, *15*(3), 220–238.

Rook, D. W. (1987). The buying impulse. *Journal of Consumer Research*, *14*(2), 189.

Rudder, A. (2003). An evaluation of the NPD activities of four food manufacturers. *British Food Journal*, *105*(7), 460–476.

Rudder, A., Ainsworth, P., & Holgate, D. (2001). New food product development: Strategies for success? *British Food Journal*, *103*(9), 657–671.

Rudolph, M. J. (1995). The food product development process. *British Food Journal*, *97*(3), 3–11.

Rutsaert, P., Regan, Á., Pieniak, Z., McConnon, Á., Moss, A., Wall, P., & Verbeke, W. (2013). The use of social media in food risk and benefit communication. *Trends in Food Science & Technology*, 30(1), 84-91.

Schmidt-Lorenz, W. (1983). Indicator organisms in frozen foods in relation to

spoilage. *Antonie van Leeuwenhoek*, *48*(6), 625–633.

Schmidt, G. M., & Druehl, C. T. (2005). Changes in product attributes and costs as drivers of new product diffusion and substitution. In *Production and Operations Management,* 14(3), 272-285.

Schmidt, J. B. (1995). New product myopia. *Journal of Business & Industrial Marketing*, *10*(1), 23–33.

Senecal, S., & Nantel, J. (2004). The influence of online product recommendations on consumers' online choices. *Journal of Retailing*, *80*(2), 159–169.

Sharma, A., & Jhamb, D. (2020). Changing Consumer Behaviours Towards Online Shopping-An Impact Of Covid 19. *Academy of Marketing Studies Journal*, *24*(3), 1–10.

Sheng, S., Parker, A. M., & Nakamoto, K. (2007). The effect of price discount and product complementarity on consumer evaluations of bundle components. *Journal of Marketing Theory and Practice*, *15*(1), 53–64.

Sheng, S., Zhou, K. Z., & Lessassy, L. (2013). NPD speed vs. innovativeness: The contingent impact of institutional and market environments. *Journal of Business Research*, *66*(11), 2355–2362.

Sim, E. Y., Park, H. Y., Kim, M. J., Lee, C. K., Jeon, Y. H., Oh, S. K., Won, Y. J., Lee, J. H., Ahn, E. K., & Woo, K. S. (2017). Studies on the palatability and texture of Korean rice cultivars for the cooked-rice processing. *The Korean Journal of Food And Nutrition*, *30*(5), 880–888.

Sinha, S. K., & Verma, P. (2020). Impact of sales Promotion's benefits on perceived value: Does product category moderate the results? *Journal of Retailing and Consumer Services*, *52*, 101887.

Skinner, S. J., Gassenheimer, J. B., & Kelley, S. W. (1992). Cooperation in supplier-dealer relations. *Journal of retailing*, 68(2), 174-193.

Smith, D. C., & Park, C. W. (1992). The effects of brand extensions on market share and advertising efficiency. *Journal of Marketing Research*, *29*(3), 296–313.

Son, J. S., Do, V. B., Kim, K. O., Cho, M. S., Suwonsichon, T., & Valentin, D. (2014). Understanding the effect of culture on food representations using word associations: The case of "rice" and "good rice." *Food Quality and Preference*, *31*(1), 38–48.

Song, X. M., Montoya-Weiss, M. M., & Schmidt, J. B. (1997). Antecedents and consequences of cross-functional cooperation: A comparison of R&D, manufacturing, and marketing perspectives. *Journal of Product Innovation Management*: *An international publication of the product development & management association*, 14(1), 35-47.

Srinivasan, S. S., Anderson, R., & Ponnavolu, K. (2002). Customer loyalty in e-commerce: An exploration of its antecedents and consequences. *Journal of Retailing*, *78*(1), 41–50.

Stewart-Knox, B., & Mitchell, P. (2003). What separates the winners from the losers in new food product development?. *Trends in Food Science & Technology*, 14(1-2), 58-64.

Stremersch, S., & Tellis, G. J. (2002). Strategic bundling of products and prices: A new synthesis for marketing. *Journal of Marketing*, *66*(1), 55–72.

Suomala, P. (2004). The life cycle dimension of new product development performance measurement. *International Journal of Innovation Management*, *8*(2), 193–221.

Suwannaporn, P., & Speece, M. (2003). Marketing research and new product development success in Thai food processing. *Agribusiness*, *19*(2), 169–188.

Swaminathan, V., Fox, R. J., & Reddy, S. K. (2001). The impact of brand extension introduction on choice. *Journal of Marketing*, *65*(4), 1–15.

Takayama, M., & Watanabe, C. (2002). Myth of market needs and technology seeds as a source of product innovation - An analysis of pharmaceutical new product development in an anti-hypertensive product innovation. *Technovation*, *22*(6), 353–362.

Tauber, E. M. (1981). Brand franchise extension: New product benefits from existing Brand Names. *Business Horizons*, *24*(2), 36–41.

Tauber, E. M. (1988). *Brand leverage: strategy for growth in a cost-control world*.

Tether, B. S. (2002). Who co-operates for innovation, and why An empirical analysis. *Research Policy*, *31*(6), 947–967.

Tompkins, J. A., White, J. A., Bozer, Y. A., & Tanchoco, J. M. A. (2010). *Facilities planning*. John Wiley & Sons.

Verain, M. C., Sijtsema, S. J., & Antonides, G. (2016). Consumer segmentation based on food-category attribute importance: The relation with healthiness and sustainability perceptions. *Food Quality and Preference*, *48*, 99–106.

VICKERS, Z. M. (1993). Incorporating tasting into a conjoint analysis of taste, health claim, price and brand for purchasing strawberry yogurt. *Journal of Sensory Studies*, *8*(4), 341–352.

Wadhera, D., & Capaldi, E. D. (2012). Categorization of foods as “snack” and “meal” by college students. *Appetite*, *58*(3), 882–888.

Wang, E. S. T. (2017). Different effects of utilitarian and hedonic benefits of retail

food packaging on perceived product quality and purchase intention. *Journal of Food Products Marketing*, *23*(3), 239–250.

Wang, G. C., & Jain, C. L. (2003). *Regression analysis: modeling & forecasting*. Institute of Business Forec.

Wang, K. J., & Lestari, Y. D. (2013). Firm competencies on market entry success: Evidence from a high-tech industry in an emerging market. *Journal of Business Research*, *66*(12), 2444–2450.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.

Yu, L., Turner, M. S., Fitzgerald, M., Stokes, J. R., & Witt, T. (2017). Review of the effects of different processing technologies on cooked and convenience rice quality. *Trends in Food Science & Technology*, 59, 124-138.

Zaman, R., & Arslan, M. (2014). Effects of pre-announced product characteristics on customer's purchase intention. *European Journal of Business and Management*, *6*(23), 167–172.

Zbib, I. J., Wooldridge, B. R., Ahmed, Z. U., & Benlian, S. (2010). Selection criteria of Lebanese consumers in the global snack food industry: Country of origin perceptions. *Journal of Consumer Marketing*, *27*(2), 139–156.

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *Journal of Marketing*, *52*(3), 2–22.

Zhang, Z., Zhang, Z., & Law, R. (2014). Positive and negative word of mouth about restaurants: Exploring the asymmetric impact of the performance of attributes. *Asia Pacific Journal of Tourism Research*, *19*(2), 162–180.

Appendix A. Package types of new frozen cooked rice

Plastic Cup (PC) package	Foil Bag (FB) package
	
Carton (CRT) package	**Multi-package**
 	 

Appendix B. Shapes of new frozen dumplings

Spore	Long
	
Coil	**Crescent (gyoza)**
	

Flat	Semicircle	Extra
		

Appendix C1. Descriptive statistics of frozen cooked rice data

Variables				Mean	SD	Min	Max
Frozen cooked rice				Products (n) = 152, Obs = 5,928			
DV	$Sales_{i,t}$			2.53e+07	5.54e+07	0	8.13e+08
IVs	PAs	Main ingredient$_i$	Meat	Presence(1): n = 2,554, Absence(0): n = 3,374			
			Seafood	Presence(1): n = 1,844, Absence(0): n = 4,084			
			Mixed	Presence(1): n = 337, Absence(0): n = 5,591			
			Vegetables	Presence(1): n = 1,014, Absence(0): n = 4,914			
			Non-specific	Presence(1): n = 179, Absence(0): n = 5,749			
	SAs	Sauce flavor$_i$	Light	Presence(1): n = 3,909, Absence(0): n = 2,019			
			Spicy	Presence(1): n = 2,019, Absence(0): n = 3,909			
		Formulation$_i$	High hardness	Presence(1): n = 167, Absence(0): n = 5,761			
			Middle hardness	Presence(1): n = 5,333, Absence(0): n = 595			
			Law hardness	Presence(1): n = 428, Absence(0): n = 5,500			
		Recipe type$_i$	Korean	Presence(1): n = 5,056, Absence(0): n = 872			
			Japanese	Presence(1): n = 442, Absence(0): n = 5,486			
			Chinese	Presence(1): n = 172, Absence(0): n = 5,756			
			Western	Presence(1): n = 1,165, Absence(0): n = 6,535			
			Southeast Asian	Presence(1): n = 114, Absence(0): n = 5,814			
	EAs	Claim$_i$	Local name	Presence(1): n = 304, Absence(0): n = 5,624			
		Package-type$_i$	Plastic cup (PC)	Presence(1): n = 497, Absence(0): n = 5,431			
			Foil Bag (FB)	Presence(1): n = 4,944, Absence(0): n = 984			
			Carton (CRT)	Presence(1): n = 295, Absence(0): n = 5,633			
			Multi	Presence(1): n = 192, Absence(0): n = 5,736			

MFs	Weight diversity$_{i,t}$		1.059211	0.2985305	0	3
	Bundling$_{i,t}$		Presence(1): n = 452, Absence(0): n = 5,476			
	Distribution channel diversity$_{i,t}$		1.879217	1.05457	0	5
CVs	Product life$_{i,t}$		69.14271	40.45218	1	152
	Price$_{i,t}$		10.23989	3.222528	0.9	21.4181
	Brand$_i$	Brand 1	Presence(1): n = 486, Absence(0): n = 5,442			
		Brand 2	Presence(1): n = 785, Absence(0): n = 5,143			
		Brand 3	Presence(1): n = 251, Absence(0): n = 5,677			
		Brand 4	Presence(1): n = 336, Absence(0): n = 5,592			
		Brand 5	Presence(1): n = 2,758, Absence(0): n = 3,170			
		Brand 6	Presence(1): n = 501, Absence(0): n = 5,427			
		Brand 7	Presence(1): n = 295, Absence(0): n = 5,633			
		Brand 8	Presence(1): n = 144, Absence(0): n = 5,784			
		Brand 9	Presence(1): n = 261, Absence(0): n = 5,667			
		Brand 10	Presence(1): n = 111, Absence(0): n = 5,817			

Note: DV = dependent variable, IVs = independent variables, CVs =control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors, Obs = the number of observations; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time.

Appendix C2. Descriptive statistics of frozen dumpling data

Variables				Mean	SD	Min	Max
Frozen dumplings				Products (n) = 185, Obs = 7,700			
DV		Sales$_{i,t}$		2.11e+07	7.14e+07	0	1.31e+09
IVs	PAs	Main ingredient$_i$	Meat	Presence(1): n = 1,894, Absence(0): n = 5,806			
			Seafood	Presence(1): n = 605, Absence(0): n = 7,095			
			Mixed	Presence(1): n = 130, Absence(0): n = 7,570			
			Vegetables	Presence(1): n = 2,040, Absence(0): n = 5,660			
			Extra	Presence(1): n = 336, Absence(0): n = 7,364			
			Non-specific	Presence(1): n = 2,695, Absence(0): n = 5,005			
		Shape$_i$	Spore	Presence(1): n = 1,014, Absence(0): n = 6,686			
			Long	Presence(1): n = 431, Absence(0): n = 7,269			
			Coil	Presence(1): n = 1,165, Absence(0): n = 6,535			
			Crescent (gyoza)	Presence(1): n = 3,648, Absence(0): n = 4,052			
			Flat	Presence(1): n = 173, Absence(0): n = 7,527			
			Semicircle	Presence(1): n = 677, Absence(0): n = 7,023			
			Extra	Presence(1): n = 592, Absence(0): n = 7,108			
	SAs	Sauce flavor$_i$	Light	Presence(1): n = 4,973, Absence(0): n = 2,727			
			Spicy	Presence(1): n = 2,295, Absence(0): n = 5,405			
			Sweet	Presence(1): n = 240, Absence(0): n = 7,460			
			Extra	Presence(1): n = 192, Absence(0): n = 7,508			
		Formulation$_i$	Thin wrap	Presence(1): n = 1,543, Absence(0): n = 6,157			
	EAs	Claim$_i$	Local name	Presence(1): n = 192, Absence(0): n = 7,508			
			Restaurant name	Presence(1): n = 368, Absence(0): n = 7,332			
			Dumpling size	Presence(1): n = 1,855, Absence(0): n = 5,845			

MFs	Weight diversity$_{i,t}$		1.185195	0.625674	0	5
	Bundling$_{i,t}$			Presence(1): n = 3,323, Absence(0): n = 4,377		
	Distribution channel diversity$_{i,t}$		2.476623	1.368508	0	5
CVs	Product life$_{i,t}$		61.07558	37.95789	1	152
	Price$_{i,t}$		10.32131	5.030153	0.8395833	52.24031
	Brand$_i$	Brand 1		Presence(1): n = 837, Absence(0): n = 6,863		
		Brand 2		Presence(1): n = 336, Absence(0): n = 7,364		
		Brand 3		Presence(1): n = 543, Absence(0): n = 7,157		
		Brand 4		Presence(1): n = 580, Absence(0): n = 7,120		
		Brand 5		Presence(1): n = 530, Absence(0): n = 7,170		
		Brand 6		Presence(1): n = 2,139, Absence(0): n = 5,561		
		Brand 7		Presence(1): n = 370, Absence(0): n = 7,330		
		Brand 7		Presence(1): n = 1,007, Absence(0): n = 6,693		
		Brand 8		Presence(1): n = 499, Absence(0): n = 7,201		
		Brand 9		Presence(1): n = 811, Absence(0): n = 6,889		
		Brand 10		Presence(1): n = 48, Absence(0): n = 7,652		

Note: DV = dependent variable, IVs = independent variables, CVs = control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors, Obs = the number of observations; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time.

Appendix D1. Results of all stepwise models for the main-effect of frozen cooked rice

			Model 1a		Model 1b		Model 1		Model 2	
		Variables	Coef	Std.	Coef	Std.	Coef	Std.	Coef	Std.
IVs	SAs	*Sauce flavor$_i$ - Light (ref)*								
		Spicy	0.693*	0.284	0.571*	0.283	0.588*	0.279	-0.017	0.274
		Formulation$_i$ - Low hardness (ref)								
		Middle hardness	2.382***	0.569	2.399***	0.559	2.260***	0.587	2.020***	0.577
		High hardness	3.145***	0.824	3.334***	0.811	3.109***	0.824	3.132***	0.805
		Recipe type$_i$ - Korean (ref)								
		Japanese	0.886	0.933	0.933	0.901	0.622	0.898	1.062	0.886
		Chinese	0.755	0.501	1.323*	0.548	1.227*	0.593	1.592**	0.582
		Western	0.460	0.792	0.776	0.780	0.616	0.777	1.250	0.761
		Southeast Asian	-2.485**	0.940	-2.531**	0.904	-2.286*	0.905	-1.452	0.891
	EAs	*Claim$_i$*								
		Local name			-1.352*	0.656	-1.211$^+$	0.668	-1.265$^+$	0.655
		Package type$_i$ - Plastic cup (ref)								
		Foil Bag (FB)			0.424	0.493	0.357	0.492	0.437	0.480
		Carton (CRT)			1.455	0.841	1.365	0.869	1.786*	0.850
		Multi			1.157	0.957	1.293	0.945	-0.035	0.931
	PAs	*Main ingredient$_i$ – Meat (ref)*								
		Seafood					-0.481	0.317	0.052	0.313
		Mixed					-0.548	0.660	-0.202	0.649
		Vegetables					-0.622	0.399	-0.174	0.393
		Non-specific					-0.491	0.721	0.183	0.702

MFs	*Weight diversity*$_{i,t}$							4.836***	0.085
	Bundling$_{i,t}$							-0.058	0.188
	Distribution channel diversity$_{i,t}$							0.659***	0.034
CVs	*Product life*$_{i,t}$	0.001	0.003	0.000	0.003	-0.001	0.003	-0.004	0.003
	Price$_{i,t}$	-0.337***	0.019	-0.331***	0.019	-0.331***	0.019	-0.209***	0.015
	Week dummies	YES		YES		YES		YES	
	Brand dummies	YES		YES		YES		YES	
Constant		17.879***		17.288***		17.700***		9.641***	
Observations		5,928		5,928		5,928		5,928	
Within R-Squared		0.0659		0.0661		0.0661		0.4374	
Between R-Squared		0.3400		0.3687		0.3755		0.5286	
Overall R-Squared		0.3217		0.3308		0.3361		0.4715	

Note: CVs = control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time; $^{+}$, *, **, and *** indicate significance levels of 10%, 5%, 1%, and 0.1%, respectively.

Appendix D2. Results of all stepwise models for the main-effect of frozen dumplings

			Model 1a		Model 1b		Model 1		Model 2	
		Variables	Coef	Std.	Coef	Std.	Coef	Std.	Coef	Std.
IVs	PAs	*Main ingredient$_i$: Meat (ref)*								
		Seafood	0.543	0.668	0.411	0.662	0.431	1.405	-2.421***	1.069
		Mixed	0.419	1.318	0.255	1.363	-0.424	0.587	1.096	0.445
		Vegetables	-1.000*	0.454	-1.544**	0.584	-1.609**	0.440	-1.137*	0.334
		Non-specific	-1.536**	0.443	-1.492**	0.436	-1.434**	0.666	-0.742*	0.507
		Extra	-1.237	0.975	-3.089	2.055	-3.008	2.064	-4.005*	1.563
		Shape$_i$: Spore (ref)								
		Coil	1.312*	0.665	0.331	0.729	0.518	0.736	-2.502***	0.560
		Long	-1.963*	0.874	-2.136*	0.861	-2.188*	0.865	-2.357***	0.667
		Crescent (gyoja)	0.109	0.554	-0.362	0.564	-0.365	0.569	-0.722$^+$	0.435
		Flat	-0.415	1.146	-0.538	1.128	-1.399	1.201	-1.227	0.915
		Semicircle	0.404	0.765	0.151	0.777	0.085	0.783	-0.755	0.595
		Extra	-0.065	0.780	-1.028	0.828	-1.002	0.832	-2.367***	0.632
	SAs	*Sauce flavor$_i$: Light (ref)*								
		Spicy			0.678	0.500	0.761	0.501	0.158	0.380
		Sweet			1.337	2.277	1.354	2.279	4.674**	1.726
		Extra			2.935$^+$	1.649	2.930$^+$	1.649	4.285**	1.250
		Formulation$_i$								
		Thin wrap			1.498**	0.496	1.492**	0.499	-1.450***	0.385
	EAs	*Claim$_i$*								
		Local name					-0.454	1.142	0.558	0.865
		Restaurant name					1.933*	0.951	-0.256	0.721
		Dumpling size					-0.175	0.411	0.758*	0.312

MFs	*Weight diversity*$_{i,t}$							5.784***	0.077
	Bundling$_{i,t}$							2.019***	0.191
	Distribution channel diversity$_{i,t}$							0.741***	0.031
CVs	*Product life*$_{i,t}$	-0.016***	0.004	-0.012*	0.005	-0.011*	0.005	-0.036***	0.004
	Price$_{i,t}$	-0.228***	0.013	-0.228***	0.013	-0.230***	0.013	-0.104***	0.009
	Week dummies	YES		YES		YES		YES	
	Brand dummies	YES		YES		YES		YES	
Constant		19.603***		19.524***		19.581***		9.038***	
Observations		7,700		7,700		7,700		7,700	
Within R-Squared		0.0963		0.0963		0.0963		0.5330	
Between R-Squared		0.1281		0.1658		0.1745		0.4061	
Overall R-Squared		0.1309		0.1516		0.1563		0.4182	

Note: CVs = control variables, PAs = physical attributes, SAs = sensory attributes, EAs = extrinsic attributes, MFs = marketing factors; the subscript $i = 1, \ldots, n$, denotes products, and the subscript $t = 1, \ldots, 48$ denotes time; $^{+}$, *, **, and *** indicate significance levels of 10%, 5%, 1%, and 0.1%, respectively.

요약 (국문초록)

새로운 식품 개발: 전략적 계획 및 설계

New Food Product Development: Strategic Planning and Design

새로운 식품 개발은 경쟁이 치열한 시장에서 식품 기업이 이익을 얻고 성공하기 위해 필수적이다. 본 연구는 새로운 식품 개발의 성과에 영향을 미치는 주요 요인을 조사하였다. 첫 번째 연구에서는 냉동밥과 냉동만두 신제품의 매출에 영향을 미치는 제품 속성 및 마케팅 요인의 차이를 조사하였다. 연구의 목적을 달성하기 위해 일반화 최소 자승법 확률효과 모형을 사용하여 제품의 매출 데이터를 분석하였다. 분석 결과는 소비상황(냉동밥, 냉동만두)에 따라 신제품 매출에 영향을 미치는 주요 제품 속성과 마케팅 요인이 다르다는 것을 보여주었다. 두 번째 연구는 제형 변화 및 연구개발 협력 유형이 브랜드 확장 제품의 온라인 구전에 미치는 효과를 조사하였다. 본 연구는 한국 디저트 시장에 출시된 제형 변경 제품에 대한 2 차 데이터를 사용하여 다중회귀분석을 수행하였다. 그 결과, 제형 카테고리와 연구개발 협력 유형이 제형 변경 제품에 대한 온라인 구전의 확산에 핵심 역할을 한다는 것을 보여주었다. 이러한 결과는 식품 산업의 성공적인 신제품 개발 가능성을 높이는 것에 기여한다.

주요어: 신제품 개발(New product development), 소비상황(Consumption situation), 제품 속성(Product attributes), 마케팅 전략(Marketing strategies), 온라인 구전(Online reviews), 브랜드 확장(Brand extension)

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