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RETRACTED:

Analysis of Consumer Sentiment in Traditional Market Through Sentiment Information Analysis: Focusing on Seoul's Gwangjang Market

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This article has been retracted at the request of the Editor in Chief due to ethical violation.

The Editorial Board would like to extend its sincere apology for any inconvenience this retraction may have caused.

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Analysis of Consumer Sentiment in Traditional Market Through Sentiment Information Analysis: Focusing on Seoul's Gwangjang Market*

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Unlike previous studies of traditional market activation, this study examines a new approach to understanding the traditional market that has socio-cultural and economic significance. In this study, big data are used to analyze the convergence of non-physical information and physical space, enabling the systematic construction of atypical information created by a large number of people and facilitating the practical implementation of this construction. The study performs an emotional analysis of the consumers' gaze to clarify the activation factors of the commercial market, which has been received attention via broadcasting and the media since 2010, and reveals that the most important activation factor is related to "specialty clothing." This emphasizes the necessity of finding an appropriate activation strategy considering that consumers are sympathetic and showpositive emotions in response to contents unique to the market. We expect that the research process proposed and applied in this study can be used as the basic data for harmonized urban space activation plans by building various activation plan systems that consider not only the traditional market but also the application of these plans and regional characteristics.

Keywords: *traditional market; consumer's gaze; activation factor; opinion mining*

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Introduction

Background and Purpose of the Current Study

For a long period, the urban centers of many cities have been accumulating urban infrastructure and have been hubs of their respective local economies. However, due to the aging of urban areas, the influence of urban centers and the population in these areas have gradually declined, causing the phenomenon of downtown hollowing out (Choi and Yun 2007). In addition, the location of large stores, as well as the formation of new towns, have caused a reduction in the competitiveness of stores located in the hearts of cities, which has resulted in a slump in the commercial activities of urban centers (Han 2012). The decline of downtown areas and commercial districts resulted in a corresponding contraction of the distribution and service sector, as well as a decline in the locality's attractiveness and value. Therefore, it is important to systematically restructure decaying urban centers so that they can develop attractive, differentiated functions and spaces.

The decline of old urban centers, which are generally where traditional markets are located, is a global problem. In particular, this is a common problem in advanced countries, including South Korea, Japan, the United States, and the United Kingdom (Ryu 2013). In developed countries such as the United States, the United Kingdom, and Japan, the proliferation of large retailers is threatening the survival of traditional markets and that of small and medium retailers located in central business districts. Hence, in these countries, a comprehensive regional commercial activation model is being introduced to enhance the competitiveness of small and medium-sized merchants, who form the basis of local commercial areas, and to simultaneously encourage the revival of the local economy.[1] In conformance with this global trend, South Korea proposed the necessity of revitalizing traditional markets and initiated various efforts in the form of government support projects. However, given a lack of knowledge on consumers' wants, facility maintenance in traditional markets and initiation of management education projects by merchants did not provide fundamental solutions for revitalizing traditional markets and were ineffective in this respect (Kim and

[1] In order to revitalize the original downtown commercial area, the US, UK, and Japan have established Business Improvement Districts (BID), Town Center Management (TCM), and Town Management Organization (TMO), respectively, to promote regional commercial area activation projects.

Bae 2008). Hence, it was recently recognized that research studies should analyze the non-physical aspects of traditional market activation factors—that is, the emotional factors that induce consumers to visit traditional markets and the factors that affect the consumers' emotional satisfaction. Today, such studies have become more relevant since governments worldwide have made public data accessible to their citizens and the methodology of cloud-based data and big data analysis has become increasingly diverse over the years (Park 2018).

Accordingly, the current study derives the factors of traditional market activation as recognized by the visitors of such markets through the big data information generated online. Big data information refers to atypical information created online by many people. In other words, we extract objects by using various types of big data, such as news reports, blogs, and social network service (SNS) data, and objectify and quantify the traditional market activation factors using data mining techniques. In addition, this study suggests the needs and perceptions of consumers based on the traditional market activation policy and details the construction and utilization of objective data on emotional information. The results of this study do not reject the findings of earlier studies on traditional market activation. Rather, our study is meaningful in that it carefully provides measures to revitalize traditional markets by suggesting various approaches that are not derived by conventional research methodologies.[2] The methodologies and conclusions of this study are not intended to help create a uniform traditional market activation policy. Rather, they suggest the relevant research direction to establish traditional market activation policies in various aspects according to the characteristics of space, such as area, size, and specific factors.

Scope and Method of the Current Study

The spatial scope of this study is Gwangjang Market located in Jongno-gu, Seoul, South Korea. Gwangjang Market has various active contents; it is a traditional market visited by not only ordinary consumers but also many foreign and domestic tourists, revitalizing the commercial area of central Seoul. In particular, Gwangjang Market is teeming with activity, unlike many

[2] The analysis methodology used in this study is useful in identifying areas that existing research methodologies cannot derive. This study reveals that the analysis methodology developed by the main author was used, and the analysis methodology was registered as a patent (patent registration number: 10-2099927) named 'emotional information analysis method'.

markets in smaller cities outside the metropolitan area. For this reason, Gwangjang Market is easier to collect big data on than other markets and is suitable for deriving activation factors that attract consumers. The study period spans eight years from 2010, a time when Gwangjang Market started being exposed to broadcasting and mass media, to 2017, the year for which the latest data is available. The scope of the study encompasses the activating factors that are perceived by the consumers visiting Gwangjang Market. Further, the study analyzes the consumers' feelings based on the activation factors that help derive the core value of the traditional market. For this purpose, the phrase "Gwangjang Market" is set as the main keyword to apply the approach as a new perspective on revitalizing the traditional market by utilizing social big data information, such as that from the web, blogs, and SNS, and analyzing the research method that suits the research content. During this process, we examine the popularity of the activated traditional market and consumers' feelings regarding it, and we expect this effort to contribute to future business development and policymaking related to traditional market revitalization.

Further, opinion mining analysis technology is used to derive the activation factors of the market. This method can quantitatively determine the activators that are perceived by consumers visiting Gwangjang Market and whether consumer sentiment is positive or negative regarding these factors. For this purpose, we first collect text data using the Gwangjang Market keyword and convert the collected unstructured data into formal data. Further, to analyze opinion mining, data are refined and coded, and network analysis is performed to construct the relationship structure between data. This is a preparatory step in mining analysis. Afterwards, factors analysis, binomial logistic analysis, decision tree analysis, and structural path analysis are performed in a systematic manner to analyze opinion mining on Gwangjang Market. Using the results of each analysis method, we derive the emotional factors of activation for Gwangjang Market and clarify the influence relations between the activation factors.

Theoretical Relationship and Review of Previous Research

Urban Decline and the Need to Revitalize Traditional Markets

Since cities evolve over long periods of time, their urban centers have various historical, cultural, and economic resources, in addition to providing good

access to public facilities, various human and cultural resources, and infrastructure. In addition, various functions, such as work, commerce, administration, and culture, are concentrated in city centers. The city center integrates the culture and tradition of the city and provides a venue for festivals, events, and mutual exchange, whereas the city's history and culture represent regional characteristics and shape the center's identity. The identity of a city distinguishes it from other cities, and securing a city's identity is a factor that attracts people from other regions.

In this sense, the influence and ripple effect of traditional markets located in city centers are very high. However, traditional markets did not have the ability to adapt quickly to the rapid changes in consumption patterns and the emergence of competitors and eventually became depressed, creating numerous problems. The fundamental reason why traditional markets failed to function effectively and lost competitiveness is that they failed to appropriately respond to changes in the market environment and the competition posed by the external environment.

Various social problems may arise if traditional markets, in their state of crisis due to recent changes in the distribution market environment, are left unchecked. Traditional markets not only provide a workplace for merchants and are where trading activities between producers and consumers take place but also are cites of historical and cultural preservation for their city, as well as being a home to the region's identity. Therefore, the importance of the traditional market, which is gradually declining as a result of the market's competitive logic, cannot be ignored. In other words, social stability and the local economic aspects of traditional markets should be considered while addressing current issues.

Developed countries are already sharing this awareness of the problem and are pursuing various policies to prevent the decline of the city center and activate the commercial sector. The United States is very active in business activities in the central business district through the business improvement district (BID) system. The United Kingdom introduced and operated the BID system in the United States due to the continuous shrinkage of commercial rights, although it was intended to regulate suburban development and revitalize commercial areas through town center management (TCM). Japan organized the Central Urban Area Activation Society to promote the commercialization of urban areas. In South Korea, as well, the central government and local governments established many institutional apparatuses to revitalize traditional markets.

Relationship between Consumers' Emotional Information and Traditional Market Activation

It is necessary to examine the relationship between the emotional information of traditional market consumers and the revitalization of traditional markets from a general perspective. Most studies on traditional markets focus on the economic activation of these markets and the evaluation of activation policies. Recently, studies have been focusing on revitalizing the culture, tourism, arts, and leisure aspects of the traditional market to revitalize its competitiveness as a retail industry. However, relatively few studies have derived and analyzed the emotions of consumers visiting traditional markets.

By considering the studies that judged consumer sentiment as a major factor, the survey found that the concept of *jeong* is felt comparably often in the traditional market, including the superior quality and low price of primary products, such as vegetables, fruits, and fish, and accompanying regulars, free samples , and acquaintances who can form psychological solidarity with the colors of various products (Park and Noh 2007). In addition, Lee (2014) analyzed the feelings of users regarding a peony market and a traditional market while extracting the space characteristics suited to the multicultural space of the Moran Market just south of Seoul. In addition, we refer to the traditional market as a place that encompasses the staples, the local area, nostalgia, and locality; however, it is not found that many of them are specifically covered as the material of the study. Nevertheless, as shown by some studies, consumers' perception of traditional markets is related to the sociocultural and economic impact of traditional market activation.

Relationship between Consumer Sensibility Extraction and Big Data

Studies that examine and analyze human psychology, including aspects such as consumer perception and satisfaction regarding a specific object, are proceeding in various ways in various fields. However, these studies usually examine and analyze psychology based on data collected through surveys and interviews conducted during specific periods. Later, big data analytics emerged to enhance the aforementioned trend. Today, big data have become an important research consideration worldwide. In the field of big data analytics, various technologies have been introduced, initiating efforts to utilize big data in many areas, including commerce, politics, and research.

Among the methods that utilize and analyze big data, a methodology was developed to extract new information from a large amount of SNS data and to analyze the intentions of users. SNS analysis is a methodology whereby the interests, influences, inclinations, and behavior patterns of an individual or a group of social networks can be extracted and analyzed on various big data generated in the network (Back 2014). In this manner, SNS analysis enables the systematic and rational analysis of people's perceptions and satisfaction about a specific object. In addition, in the case of opinion mining or emotional analysis, it is used to identify the sentiment, affect, subjectivity, or emotion expressed in an online text created by a user. Since the 2000s, emotional analysis research techniques have been actively studied, particularly due to the rapid increase in the number of emotional analysis studies, which, in turn, was caused by the increase in popularity of social media at the time (Appel, Chiclana, and Carter 2015; Liu 2012). Emotional analysis enables the analysis of text that occurs on the web, as well as in blogs, cafes, and social network sites. Such text is often referred to as e-word of mouth on the web and is considered particularly important data in marketing (Chen and Xie 2008; Chevalier and Mayzlin 2006; Cui, Lui, and Guo 2012; Ghose and Peirotis 2011; Pagano and Maalej 2013).

Literature Review

In this study, earlier studies on the contents, subjects, and methods of research were divided into three categories. The first category comprises earlier research on the revitalization of commercial districts in the city center, whereas the second includes research on the factors activating the traditional market, which are the considerations of the current study. Finally, in the third category, earlier research was analyzed by dividing it into activating studies that used big data as a method of research.

First, earlier studies (Chung 2010; Park 2002; Ryu and Choi 2013) on urban revitalization can be divided into suggestions for city revitalization policies and institutional improvement plans, analysis and evaluation of urban renewal businesses, urban revitalization case studies, and urban revitalization research. By analyzing previous research (Chung 2010), we confirmed that the revitalization of commercial districts is very important in revitalizing depressed urban centers. We clarified that the revitalization of commercial areas, which is one of the measures of urban regeneration, would lead to the revitalization of depressed urban centers.

Second, earlier studies (Kim 2016; Kim, Cho, and Lee et al. 2010; Kwon

and Park 2011; Park 2013) on the activation factors of traditional markets defined representative variables of revitalization of the traditional market as repurchase or return visit intention. Kwon and Park (2011) used the number of visits or amounts of expenditures. Many factors affect the revitalization of the traditional market; Park (2013) considered satisfaction with the surrounding environment and services to be one such factor, whereas Kim (2016) directly used environment-related variables as the activating factors.

Finally, previous studies related to spatial activation using big data were reviewed. Related studies include a study (Heo 2014; Zukin 2009) to derive users' needs by analyzing SNS data and a study to analyze (Kim and Yeom 2017; Lee and Choi 2020) the influence of commercial districts and the inflow and outflow characteristics of consumption using credit card big data. However, few studies examined urban spatial activation using the emotional analysis method of opinion mining. Park and Lee (2017) used the text mining analysis technique to derive a change in consumers' perception of the traditional market. However, there is a limit to confirming whether the influence of a change is positive or negative. Lee (2014) proposed an algorithm to predict fashion brands based on users' information by applying the opinion mining technique to SNS text data.

As stated earlier, previous research was analyzed by categorizing studies into three categories according to their similarity to the contents and method of the current study, as shown in Table 1. Various earlier studies confirm that urban regeneration through the restoration of the commercial functions of urban center activation is a viable method for revitalizing urban centers. In the case of earlier research on the revitalization of traditional markets, analyses of consumers' complaints or perception of one-time satisfaction are often concluded through case studies or questionnaires aimed at deriving the methods, policies, and competitiveness of market activation. In such cases, there is a limit to the content and scope of the findings in providing a generalized activation plan based on a small number of cases. Therefore, this study analyzes the data collected from web pages and SNS text data as empirical data to analyze consumers' emotional information regarding the traditional market. The use of big data from the web and SNS has broadened the extent of acquisition of data on traditional market consumers and study sites since the former ensures the ease of data acquisition and proliferation of users. This further complements the limitations of survey analyzes and case studies. In addition, an analysis of visitors' experience data is particularly meaningful as an empirical analysis.

Table 1
Previous research analysis

Division		Research details	Research result
A study on the revitalization of urban centers	Ryu and Choi (2013)	Development of indicators for the evaluation of commercial area activation projects	Providing objective and quantified basic data and laying the foundation for efficient business execution
	Chung (2010)	Review the necessity of the development of the theme shopping center and suggest ways to improve the system	Need to establish a support system for the vitalization of public–private partnerships and promote support for commercial districts with distinctive characteristics of local cities
	Shin, Nam, and Cho (2007)	Research and analysis of the regeneration policy of the local and foreign downtown areas to draw up implications and present specific strategies for revitalization	Strategies such as establishing core customer base and enhancing the link between shopping activities, creating attractive walking environment, and enhancing accessibility and convenience of use are required
	Park (2002)	To identify strategies for revitalizing urban centers, analyze the urban revitalization measures and seek the direction of urban renewal and its planning implications	Reckless new development should be curbed, diverse plans are required for regional characteristics, and management measures should be prepared through comprehensive plans

Table 1 (continued)

Division		Research details	Research result
A study on the factor of activating traditional market	Kim et al. (2010)	Analysis of the traditional market choice factors and utilization probability using the multinomial logit model and the empirical analysis of the change in the use probability according to the policy support tool	The factors that increase the probability of use of traditional markets are derived from the increase in the number of stores, parking lot expansion, and policy support for traditional markets
	Kwon and Park (2011)	Critically analyze the problems of traditional market revitalization policies, explore alternatives through exploratory discussions and derive decision making factors for revisit	The environment and commodity factors of the traditional market are identified as the most important factors. Need to find activation policy by establishing a local governance system
	Park (2013)	A study on what factors influence the activation of the market from the points of view of consumers and merchants	Consumers are influenced by physical aspects, while traders are influenced by non-physical aspects, but both layers are positive about activation policy
	Kim (2016)	An empirical analysis of the factors that decrease sales in traditional markets	The factors affecting are the recession in Korea and insufficient parking facilities.

Table 1 (continued)

Division		Research details	Research result
A study on the utilization of big data	Lee (2014)	Establish the Opinion Emotion Dictionary using SNS and propose analysis algorithm of emotion trend prediction through fashion trend analysis	The algorithm proposed in this study has high accuracy of 80% and is suitable for trend prediction
	Han and Yoon (2016)	Explore keywords related to Pusan International Film Festival through text mining technique and derive implications through tracking of key keywords	Public feelings, which were mostly positive or neutral before the event, are sensitive to related issues since the festival, and positive and negative feelings are mixed.
	Park and Lee (2017)	Analyze consumer perception of traditional markets using web and SNS data for 10 years	Increasing interest in support projects that leverage traditional market culture and content, consumers have experienced a sensitive change of awareness based on government policy
	Lee and Choi (2020)	Analyze the monthly sales data of credit card affiliates to analyze the impact of the local economy and commercial districts after the outbreak of COVID-19	The higher the proportion of the outside floating population and the more young people gather, the more directly affected by the spread of COVID-19.

Materials and Methods

Research Methodology for Emotional Information Extraction

This study applied opinion mining, which analyzes emotions (positive, negative, etc.) by extracting meaning from the text to clarify the emotional information of consumers related to the factors of traditional market activation. Opinion mining, which is also called sentiment analysis, is a series of processes that analyze people's opinions, emotions, assessments, attitudes, and feelings about products, services, organizations, individuals, issues, and events (Liu 2012). Recently, the manner of analyzing people's opinions through social media was recognized to have the advantage of being able to respond to the needs of customers that change over time since the use of social media enables them to understand more objective opinions in real time compared to the use of traditional survey methods (Kim 2013).

Opinion mining can be considered a series of processes that help determine whether a particular document has positive, negative, or neutral views. This study utilized the big data analysis method. In addition, the sentiment information analysis method referred to in this study refers to a step-by-step analysis method that uses the variables derived from factor analysis of 5,684 related documents to perform dichotomous logistic analysis, decision tree analysis, and structural path model analysis.

Analysis System of Research

In this study, we derived the consumer inflow factors of traditional markets, extracted the emotional information from these factors, and conducted an empirical analysis to establish a new strategy for traditional market revitalization. Prior to conducting the analysis, we selected relevant study sites and collected related data. The collected data were refined and reconstructed in an analytical form. To apply opinion mining, we analyzed consumer opinion using the natural language processing technology and the emotional analysis statistics technique for texts on the web and social media.

The first method of emotional analysis we applied is binomial logistic analysis. Through this analysis, we identified how each factor influences emotions. The dependent variable in this study is the positive or negative emotion (positive 1, negative 0), which is a binary nominal ranking scale. A categorical variable with two categories is called a dichotomous variable. If

the dependent variable has only limited values of 0 and 1, the regression model cannot be applied due to the discontinuous and limited values of the dependent variable. The binary logistic analysis used in this study is a suitable statistical analysis method to explain the functional relationship between the dependent variable and one or more independent variables when the dependent variable is categorical.

Second, we performed a "decision tree" analysis to identify the relationship among factors and priority of each factor. Decision tree analysis in data mining is used as a methodology for various analysis. (Classification of measurement data into several types, classification of outcome variables into several classes, dimension reduction and variable selection to select variables with high influence on dependent variables among independent variables.) Then, we preformed the Amos structure path model analysis, which applies the root tree derived as a key factor in the decision tree analysis as a parameter. This has the advantage of being able to identify the mediating effect of the root tree derived as a key factor in the activation of Gwangjang Market, and to check the direct and indirect effects between factors that are difficult to confirm in binary logistic analysis or decision tree analysis. To our knowledge, such an in-depth analysis has not been attempted in any previous study. In addition, the study identified the best method, among various big data analysis techniques, to analyze commercial areas and judge their value from the consumers' perspective.

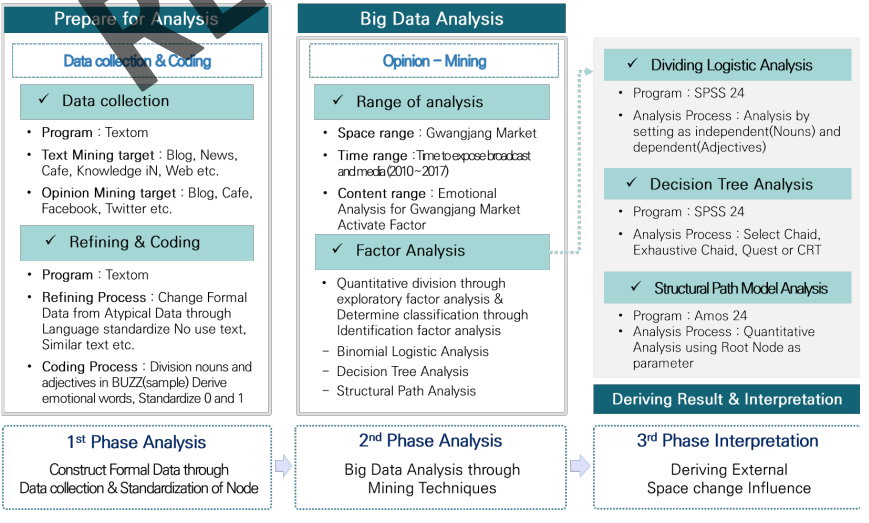

FIG. 1.—ANALYSIS STRUCTURE OF THIS RESEARCH

Data Collection and Processing

Collection of Text Data

To analyze the emotions of consumers using specific sites, it is necessary to first collect data and then analyze the data to derive emotional information. For the analysis of consumer sentiment information, in this study, the social matrix program TEXTOM (Text to Metrix) was used for data collection and analysis.[3] To construct the data used in our analysis, we searched popular Korean portal sites and SNS. First, we collected data by searching blogs, cafes (forums), and news reports on the two main South Korean portal sites, Naver and Daum. Further, we collected big data for SNS from media such as Facebook and Twitter. The keyword for data retrieval was set as "Gwangjang Market."

This study's data collection period extended from 2010, when the number of keyword searches for Gwangjang Market started increasing, to 2017, when the data collection became possible.[4] The factors that influenced the activation of Gwangjang Market were identified by analyzing consumers' emotions. We collected text-based documents (buzz) from 1 January 2010 through 31 December 2017 for the aforementioned channels. Further, using a crawling program, we constructed 5,648 buzzes related to the Gwangjang Market in total. The sources of market-related buzz included 2,172 sources from Naver; 2,589 from Daum; 628 from Facebook; and 259 from Twitter.

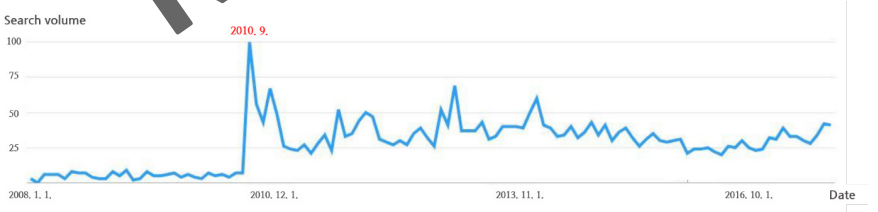

Fig. 2.—Google search term trend index of Gwangjang Market

[3] TEXTOM is a social metrics program provided by The IMC (http://textom.co.kr). Textom provides data and related keyword rankings by searching data from portal search sites such as Naver, Daum, Google, Twitter, and YouTube, and provides matrix information according to the co-occurrence frequency of search keywords.

[4] The results of Google's search term trend and issue analysis over the past eight years have consistently revealed a high trend of search terms since a program on the Gwangjang Market was aired on a broadcast program in 2010.

Data Coding and Standardization

We used TEXTOM to collect keyword data pertaining to Gwangjang Market and performed text coding and standardization to facilitate emotional analysis. This involved the process of transforming the unstructured data into structured data and was the preparatory work step for later analyzes. In this study, the collected keywords were coded and standardized into "nouns" and "adjectives."

In the case of nouns used in the analysis, it is limited to the top 200 keywords showing 20 or more values based on the frequency. The coding for adjectives was separated from that for nouns by presenting an index to judge the emotion (positive and negative) corresponding to each word. We analyzed the relevance of noun keywords through SPSS factor analysis (varimax). In this manner, each keyword was standardized. Subsequently, the group of nouns was classified as shown in Figure 3 and used as an independent variable. If each document (buzz) contained a noun in the top 200 or an adjective, it was standardized to "1"; otherwise, it was standardized to "0." In addition, when positive and negative adjectives appear repeatedly in one buzz, analysis was performed by determining the emotions of the adjectives that appeared more frequently. Based on the keywords related to Gwangjang Market, adjectives were processed using the top 30 words and separated by positive and negative words. Table 2 depicts the relevant details of this analysis.

Table 2
Results of structured coding of unstructured data

Support policy item number for traditional market	Variable name	Explanation	Remarks
1	(Raw data)	Blog text	Deduction, list keywords
2~31	Emotional word	Emotional adjective	-
32~232	Keyword	Top 200 keywords	-
233	Emotional result	Buzz emotional result	When (positive adjective - negative adjective) is 1 or more, it is A; when it is not 1 or more, it is B

Table 2 (continued)

Support policy item number for traditional market	Variable name	Explanation	Remarks
234	Market_thought	Emotion Coding Results	A = 1, B = 0
235~243	Keyword group	Factor analysis result	Group = sum of keyword results in buzz

Table 3
Classification of opinion mining keyword

Emotion	Keyword
Positive (21)	delicious, many, cheap, good, recommend, big, joyful, active, nearby, pretty, nice, famous, beautiful, happy, generous, new, great, want to eat, spectacular, warm, comfortable
Negative (9)	gloomy, declining, cold, nonexistent, chilly, crowded, hard, expensive, busy

	N Emotional texts derived from BUZZ			N Factor texts derived from BUZZ			m Factor texts's factor analysis(Varimax) s results			
	Emotional text1 (Adjective)	...	Emotional texts n (Adjective)	Factor texts 1 (Noun)	...	Factor texts m (Noun)	BUZZ emotional** (Dependent variable)	Factor Analysis Result 1 (Independent variable)	...	Factor Analysis Result s (Independent variable)
BUZZ 1	1 or 0*	...	1 or 0	1 or 0	...	1 or 0	1 or 0***	1 or 0****	...	1 or 0
BUZZ 2	1 or 0	...	1 or 0	1 or 0	...	1 or 0	1 or 0	1 or 0	...	1 or 0
BUZZ 3	1 or 0	...	1 or 0	1 or 0	...	1 or 0	1 or 0	1 or 0	...	1 or 0
BUZZ 4	1 or 0	...	1 or 0	1 or 0	...	1 or 0	1 or 0	1 or 0	...	1 or 0
BUZZ 5	1 or 0	...	1 or 0	1 or 0	...	1 or 0	1 or 0	1 or 0	...	1 or 0
BUZZ 6	1 or 0	...	1 or 0	1 or 0	...	1 or 0	1 or 0	1 or 0	...	1 or 0
BUZZ 7	1 or 0	...	1 or 0	1 or 0	...	1 or 0	1 or 0	1 or 0	...	1 or 0

* 1 if there is a corresponding text in BUZZ, 0 if not present
** BUZZ's emotions on the subject (positive or normal/negative)
*** 1 if (Positive Emotional Text − Negative Emotional Text) ≥ 1, 0 if (Positive Emotional Text − Negative Emotional Text) < 1
**** The sum of the factors according to the result of factor analysis in one BUZZ(Normalized to this split of 1 or 0)

Fig. 3.—Unstructured data formulation coding and standardization method

Traditional Market Consumers' Emotional Information Analysis

Factor Analysis

After standardizing keywords, we performed factor analysis on 200 keywords of nouns. Since a large among of data was collected for this study, there was the possibility statistical problems arising in applying regression analysis on all the data. Therefore, analytical techniques that could solve these problems were required. Factor analysis is an analytical method in which collected items are grouped together and reduced to a small number of clusters. Accordingly, this study conducted exploratory factor analysis and confirmatory factor analysis. The extraction method of exploratory factor analysis was principal component analysis. Further, varimax was selected as the factorial rotation method. Finally, the sample fit of Kaiser-Meyer-Olkin was suitable at 0.723. Based on exploratory factor analysis, confirmatory factor analysis was performed. In this study, we removed the keywords with factor loadings less than 0.4, which corresponded to the explanatory power of

Table 4
Results of confirmatory factor analysis

Classification factor	Keyword					
Location	Jongno-gu	Yeji-dong	Jongno	Seoul	Changgyeonggung Palace	-
Surrounding facilities	pedestrian overpass	road	park	Seoul station	-	-
Memory	fibre	industry	past	memory	travel	fabric
Specialty clothing	Korean traditional clothes	wedding preparations	blanket	blanket for wedding presents	customized	specialty
Food alley	street	food item	gimbap	Korean sausage	mung beans, mung bean pancake	stir-fried rice cake
Beef tartare	famous restaurants	new world	beef tartare famous restaurants	beef tartare jamaejib	-	-
Codfish soup	codfish Soup	codfish soup	Eunseong sushi restaurant	Baek Jong-won	-	-
Mung bean pancake	mung bean pancake	seafood and green onion pancake	Yoogane mung bean pancake	-	-	-

variables in confirmatory factor analysis. Further, confirmatory factor analysis was conducted based on the logical appropriateness of the measurement variables for the relevant keywords. Table 4 depicts the results of confirmatory factor analysis.

Binary Logistic Analysis

Based on the confirmatory factor analysis, independent variables (*location*, *surrounding facilities*, *memory*, *specialty clothing*, *food alley*, *beef tartare*, *codfish soup*, and *mung bean pancake*) were set for binary logistic analysis (Table 5). Further, the mean values were 0.256 for *location*, 0.015 for *surrounding facilities*, 0.035 for *specialty*, 0.126 for *specialty clothing*, 0.226 for *food alley*, 0.176 for *beef tartare*, 0.022 for *codfish soup*, and 0.162 for *mung bean pancake*. The correlations among the independent variables were all below 0.4, and the variance inflation factor values of all the variables were below 10; hence, there was no risk of multi-collinearity. According to dichotomous analysis, only the *surrounding facilities* factor among the total eight Gwangjang Market activation factors was found unsuitable with a

Table 5
Results of binary logistic analysis

Division	B	S.E.	Wald	Degree of freedom	Significance probability	Exp(B)
Location	0.339	0.031	121.365	1	0.000	1.404
Surrounding facilities	0.022	0.111	0.039	1	0.844	1.022
Memory	-0.341	0.076	19.954	1	0.000	0.711
Specialty clothing	0.620	0.041	231.206	1	0.000	1.860
Food alley	0.345	0.033	112.052	1	0.000	1.412
Beef tartare	0.299	0.036	69.600	1	0.000	1.348
Codfish soup	0.202	0.090	5.036	1	0.025	1.223
Mung bean pancake	0.344	0.037	87.272	1	0.000	1.410
Constant	-0.811	0.020	1572.344	1	0.000	0.445

S.E., standard error.

significance level of 0.844. All the other factors were found appropriate, with p values less than 0.05. In addition, *specialty clothing*, which refers to a unique item for sale in Gwangjang Market, rather than a variety of foods or famous restaurants, had the highest result at 0.620, whereas memory recorded the lowest result at -0.341. In addition, *beef tartare*, *codfish soup*, *mung bean pancake*, *food alley*, and *location* were found to have a significant effect on positive emotions.

Decision Tree Analysis

The analysis algorithm for decision tree formation used Chi-squared automatic interaction detection (CHAID), which has the highest predictive power among different analysis models. CHAID is a technique to select independent variables having the highest interaction with each dependent variable (see Table 6). According to the stopping rule, the minimum case number of the upper node (parent node) is set to 100, the minimum case number of the lower node (child node) is set to 50, and the depth of the tree is not limited. In addition, to enable feasibility evaluation by data segmentation, the ratio of tracking data to test data was set at 70:30. The results of the decision tree analysis on the prediction model of Gwangjang Market emotional influencing factor reveals that the parent node of the tree structure depicts the frequency of the dependent variable alone with no reference to the independent variable. For the Gwangjang Market emotional ratio of the parent node, "not good" was 61.3% and "nice" was 38.7%. The factors at the top of the parent node are the most influential or relevant factors for the dependent variable. In this analysis, the *location*-related factors

Table 6
Suitability by decision tree classification criteria

Modelling method	Training data		Test data	
	Correct (%)	Wrong (%)	Correct (%)	Wrong (%)
CHAID	62.7	37.3	62.4	37.8
Exhaustive CHAID	62.0	38.0	62.3	37.7
CRT	62.2	37.8	62.1	37.9
QUEST	62.4	37.6	61.9	38.1

CHAID, Chi-Squared Automatic Interaction Detection.
CRT, Chi-Squared Automatic Interaction Detection.
QUEST, Quick Unbiased Efficient Statistical Tree

of the Gwangjang Market showed the greatest influence. In other words, when the influence of *location*-related factors is high, the positive feeling towards the Gwangjang Market increased from 38.7% to 45.9%. In addition, if the impact on the factors related to *food alley* was high in situations where there was a high impact on the factors related to *location*, there was an increase in positive emotion from 45.9% to 52.8%.

Structural Path Analysis

In the decision tree, we could not verify the quantitative effect between factors related to the parent node and other factors. Therefore, this study quantitatively analyzed the relationship between *location* and other factors through structural path analysis. This study used various fitness indices to evaluate the fitness of the structural path model. However, there exist diverse opinions regarding the most valid fitness index (Kim 2016). Therefore, in this study, we analyzed the fitness of six indicators (see Figure 4).

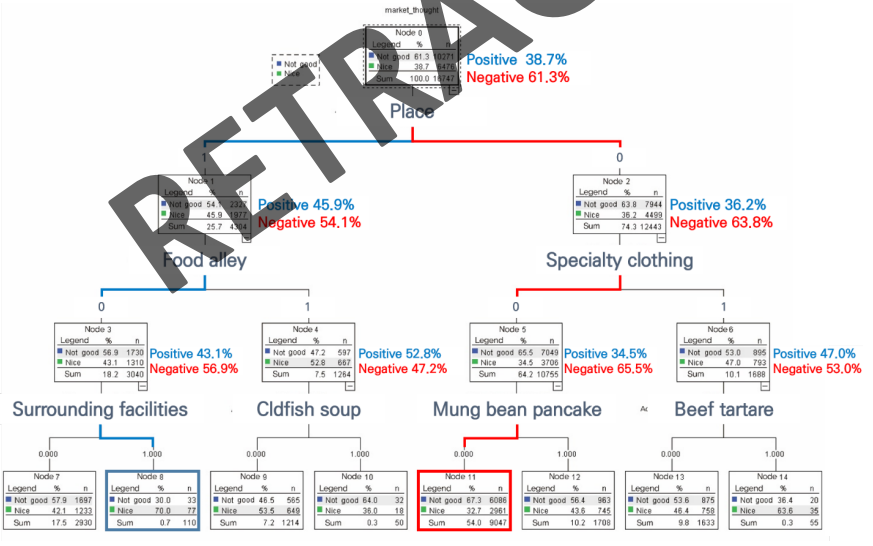

FIG. 4.—DECISION TREE ANALYSIS

The smaller the value of x^2, the higher the fitness. However, if the size of the sample is more than 200, it is recommended to reserve the judgment on the x^2 statistic (Sung, Kim, and Kang 2011). The goodness-of-fit index (GFI), which represents the absolute fit index, accepts the fit of the model at 0.9 or higher. Further, if the standardized root mean square residual (SRMR) is less than 0.8, the root mean square error of approximation (RMSEA) is less than 0.05, the Tucker-Lewis index (TLI) is 0.9 or more, and the comparative fit index (CFI) is 0.9 or more, the model is considered a good fit. The GFI, SRMR, RMSEA, TLI, and CFI values of this study all satisfy their suitability.

Since the *location* factor was derived from the parent joint in the previous decision tree analysis, the intermediaries between the groups of factors were confirmed to be the highest. The direct effect through structural path analysis implies that the emotions corresponding to each factor are not affected by the *location* factor, whereas the indirect effects are effects that take into account the effects of the *location* factor (see Figure 5 and Table 7). Following the fit analysis, a probability $p < 0.1$ was found in all cases, and direct effects were derived similar to the results of binary logistic analysis. Further, factors related to *memory* showed the lowest results, at -0.077, whereas those related to *specialty clothing* showed the highest results, at 0.147.

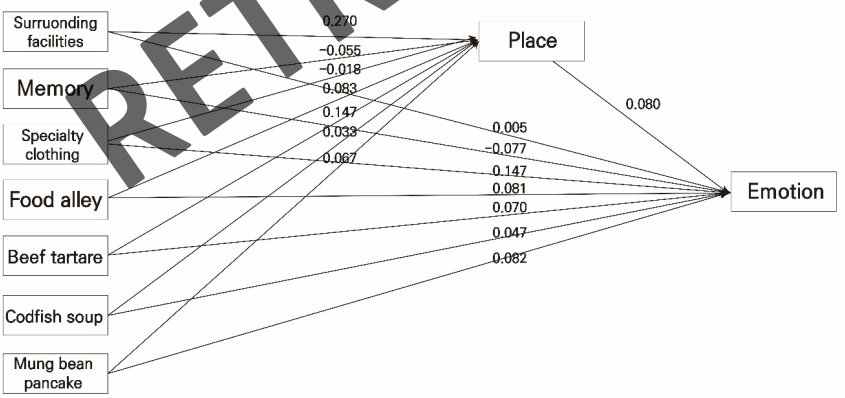

Fig. 5.—Result of structural path model analysis

Table 7
Direct and indirect effect of various factors on emotions

	Direct effect		Indirect effect		Total effect (direct effect + indirect effect)	
	B(β)	p-value	B(β)	p-value	B(β)	p-value
"Surrounding facilities" → "emotion"	0.005	0.024**	0.022	0.003***	0.026	0.027**
"Memory" → "emotion"	-0.077	0.016**	-0.004	0.001***	-0.082	0.015**
"Specialty clothing" → "emotion"	0.147	0.010**	-0.001	0.001***	0.146	0.008***
"Food alley" → "emotion"	0.081	0.008***	0.007	0.001***	0.088	0.008***
"Beef tartare" → "emotion"	0.070	0.009***	0.012	0.001***	0.082	0.009***
"Codfish soup" → "emotion"	0.047	0.023**	0.003	0.002***	0.050	0.021**
"Mung bean pancake" → "emotion"	0.082	0.009***	0.005	0.001***	0.087	0.009***

Note: Indirect effect = (exogenous variable → parameter) × (parameter → endogenous variable).
*Significance probability 10% (p<0.1), **Significance probability 5% (p<0.05),
***Significance probability 1% (p<0.01)

Results

Since 2010, when Gwangjang Market started becoming popular on various broadcasting platforms, internet media, and SNS, keyword search volume has been steadily increasing with the current level remaining high. We analyzed the various activating factors related to the market that shape the positive or negative perceptions of consumers toward it. Among the keywords related to Gwangjang Market, 200 nouns are treated as independent variables and 30 adjectives as dependent variables. Further, eight factors (*surrounding facilities*, *memory*, *specialty clothing*, *beef tartare*, *codfish soup*, *mung bean pancake*, *food alley*, and *location*) were extracted through exploratory and confirmatory factor analyses, and these factors formed the bases of emotional analysis.

First, binary logistic analysis showed that keywords related to *specialty clothing* revealed the most positive results, whereas those related to *memory*

were negative factors. Second, the decision tree analysis result recorded 61.3% of "not good" (neutral and negative) and 38.7% of "nice" (positive) responses, without any factors being included. Further, on selecting the *location*-related keyword as the parent node, the positive emotions were found to increase. While analyzing the emotions that change according to the choice of the keyword, *location* and *surrounding facilities* were selected; further, the highest positive emotion appeared when *food alley* was not selected. The lowest positive emotion was obtained when *location*, *specialty clothing*, and *mung bean pancake* were not selected. This analysis reveals that the consumers considered the geographical location of Gwangjang Market and the conditions of the surrounding area to be the factors having the highest influence on their feelings regarding the market. The next important positive emotional factor is *specialty clothing*. This is identical to the result of binary logistic analysis. As a result, Gwangjang Market was identified as a core content that can attract the positive feelings of citizens with the factors related to *specialty clothing* alone, rather than various food-related factors. Finally, using the structural path model, the *location*-related factor, which is the parent node of the decision tree, was set as a parameter and the effect of factors and variables was analyzed. The direct effects were similar to those of the earlier analysis, whereas the indirect effects were the highest for *surrounding facilities*. On the other hand, the memory-related keyword was derived as the negative result. Consequently, the Gwangjang Market does not show high mediating effects on *location*-related factors. This indicates that the characteristics of the factors themselves are more influential than the mediating effects of the location in Gwangjang Market.

Conclusions

In this study, we applied big data to the new emotional analysis methodology, which had not been utilized for traditional market activation research, thus identifying positive and negative emotional factors recognized by the consumers of traditional markets. We examined the activation factors of the commercially developed Gwangjang Market by performing an emotional analysis of its consumers. To conduct emotional analysis, we performed data collection, refinement, and coding. Further, we classified the data using factor analysis and systematically conducted binary logistic analysis, decision tree analysis, and structural path analysis to derive the affirmative and negative affect factors pertaining to Gwangjang Market consumers.

Our analysis revealed that the most positive feeling perceived by the consumers regarding Gwangjang Market was related to specialty clothing. In other words, network analysis revealed that specialty clothing significantly influences consumers' positive feelings regarding the target area. The results of this analysis have important policy implications. On the other hand, memory-related factors generated negative feelings. Further, the government has been pursuing a strategy to revitalize the market through evoking memories of the market; the associated literature cites memory as an important factor, as well. Therefore, the results of this study are expected to have significant impact on future policy and research.

Nowadays, most traditional markets are being developed with a focus on the food alley to attract consumers. However, this study revealed that the inherent characteristics of the traditional market are important factors that elicit positive emotions among consumers. In other words, to ensure that traditional markets attract more consumers, we should develop distinctive features for each market, rather than simply initiating a policy to increase the number of restaurants. In addition, many researchers suggest memory as one of the strengths of the traditional market and suggest strategies for revitalizing the market. However, this study found that memory is a negative emotional factor in the market. Our results show that the development of memory-related contents should be decided on more carefully at the time of making decisions regarding the traditional market activation support project.

The results of this study are limited to Gwangjang Market. However, the findings of our study can be applied to activate other traditional markets as well. We can apply the methodology of this study and understand the emotional aspects of the markets' consumers to implement strategies that are better customized to each business and policy.

To date, research on urban space activation has focused only on physical aspects. However, this study has established the activation strategy that reflects reality by diagnosing users' perceptions of a given urban space. Accordingly, a system was established to prevent the creation of a uniform space activation plan and to form a space activation plan in various forms based on the characteristics of the urban space, such as area, size, and specific elements. Further, this study will contribute to the expansion of multifaceted research using big data and emotional information in urban areas. Apart from enabling access to non-public information, which is generally not disclosed to people to ensure personal information protection and avoid privacy invasion, the development of methodology by using online open data and verification of the generated data has considerable research significance.

However, the limitation of this study is that the researcher's intervention is reflected in the process of refining the derived keyword due to the nature of the analysis method. In addition, in order to perform sentiment analysis, data were coded by classifying adjectives into 0 and 1. This method has a limitation in that sophisticated analysis is difficult because it is difficult to grasp the context of the document. In future research, we intend to analyze the factors and indicators that affect the use of traditional markets more rationally through the process of more sophisticated analysis methodology.

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