

Research on the Market Area of Sports Complex by using Time Sensitivity Measurement

¹Min-Seok Baik and ²Jong-Hwan Choi

¹Department of Real Estate Semyung University, 65 Semyung-ro, Jecheon, Chungbuk-do, Korea

²Department of Physical Education Chungbuk National University, 410 Seongbong-ro, Heungduk-gu, Cheongju, Chungbuk-do, Korea

Abstract: This study analyzed the time sensitivity of optimal location based on the time distance of potential users in relation to site selection of sports complex. Having the process of selecting the location of sports Complex in domestic cities that are being developed or remodeled in various forms recently, this can be used as an important indicator in the process of selecting the best location from multiple locations. This study conducted a survey for empirical analysis and calculated OTP (Optimal Time Point) and ITP (Indifference Time Point) to travel to the complex sports facilities through analysis of the collected data. The optimal time point was 48.14 min and the in difference time point was 48.96 min. As a result of the above analysis, the stress value for travelling time to sports complex was calculated as -0.82. The results of this analysis are interpreted as a result of the proof that considering the time distance of the complex sports facilities of the complex sports facilities is very important in the process of selecting sports complex.

Key words: Sports complex, time sensitivity measurement, OTP, ITP, domestic cities, multiple

INTRODUCTION

Recently, having 5-workday system and increased income, local residents have been increasing interest in health and leisure activities and then increasing the demand for public cultural sports facilities. Local governments continue to expand public cultural sports facilities to meet these demands but due to various factors such as economic conditions, unexpected problems have been occurred by lack of facilities, imbalance of facilities, similar facilities between and within region and jumboized facilities (Park and Lim, 2005). In the case of provincial cities, the implementation of complex sports facilities by the heads of provincial governments is seen as a duplicate phenomenon and reality it that the needs of local residents are also reaching a considerable level. The complex sports facilities have spread throughout the country since the establishment of a policy of stabilization of athletic sports through the revitalization of the sports for all by Induction and propulsion process of Asian Game, Olympic Game and World Cup Game, since, the 1980's. In these processing, dubbed the public sports center, the complex sports center functioned as a space for community activities and functioned as a place for local residents to act autonomously in the community.

On the other hand, most of the sports facilities currently operating in the country pose a management problem. First of all, traditional complex sports facilities do not meet the needs of ordinary citizens, sports for all athletes and professional athletes and most of the facilities fail to function properly because of the old facilities and poor utilization (Oh, 2010). In the case of public sports facilities, the focus of the post-competition is not to be effective and the lack of competitive advantage is not based on the operational and private facilities that are not based on the needs of consumers. In particular, the chronic operational deficit acts as a difficulty for ongoing maintenance and operation of the sports facilities. This is due to the establishment of the facility in which the facility was not suitable for long-term operation of the facility during the location selection process. In addition, there is a lack of in-depth research on the travel time and distance of the potential users of the sports facility. In this context, this study aims to estimate the length of time for long-term operation secured by utilizing Time Sensitivity Measurement (TSM) to analyze the market segment of complex sporting facilities. The purpose of this study is to estimate the time limit for determining the optimum location of the time required for a potential consumer to travel to the facility as a single commercial facility for long-term operation.

Literature review

Theoretical background

Location of complex sports facilities: Academic definition of sports facilities means a physical environment that has a constant spatial scope that is constructed and managed as a more effective, comfortable and safe exercise activity. The broad concept includes the various conditions for the exercise such as artificially adapted to the facility and equipment, supplies and plastic sculptures and the narrow concept for athletic learning (Oh, 2010).

The legal definition of physical education facilities is defined as continuously used facilities and accessory facilities for physical activities. It is defined as a facility for continuous physical activities such as athletic sports and outdoor activities for the purpose of maintaining sound physical, mental cultivation and good use of leisure. Depending on the size and purpose of the facility, it can be divided into professional sports facilities, sports for all facilities and work sports facilities. Sports facilities are developed through consistent institutional support such as the establishment of a mid to long-term plan for balanced layout of public sports facilities as the government's sports promotion system (2006), Sports Vision 2018, sports industry planning, mid-to long-term plan for the promotion of sports for all and the 4th country comprehensive plans for modification plans (2011~2020) (Han and Kim, 2012).

Types of complex sports facilities include dual sports such as the Japanese-based Hokkaido baseball-dom and urban complex facilities such as the American Madison Square Garden, the Remodeled facilities such as Munich Olympic Hall of Germany and the Independence facilities such as the Sports Complex in Hwaseong-si, Korea. These facilities operate not only for sports but also, for sustainable programs and for local communities (Park and Lim, 2005). Therefore, if the project is carried out in the area, the local resident's community will suffer from competition to induce corresponding facilities local residents or other civic groups within areas. Even after selecting the location of the site, some side effects such as regionalism and self-importance are also, feared.

The reason for this is that the rational positioning of the project in the process of promoting a large facility has a significant significance. In relation to this, the study (Oh *et al.*, 2016) analyzed the importance of selecting the significance of the site considering the importance of selecting the location of the resident opinion, the urban basic plan, the expert opinion and the Willingness of local autonomy which reflect the regional characteristics of the complex sports facilities. The analysis showed the significance of each criterion such as resident opinion

(0.272)>urban basic plan (0.271)>willingness of local autonomy (0.230)>expert opinion (0.227)>expert opinion (0.227). This analysis results in the most important consideration of the location of residents in relation to the location of the larger facility projects and is interpreted as a result of confirming that the resident is a key part of the decision-making process.

Meanwhile, prior to deciding on the selection of complex sports facilities, the preceding studies on the division of decision making right of participating group, physical location factors and economic feasibility of the facility, however, did not lead to an in-depth study of the time spent on the relocation of potential users of the facility. This is partly because the facility contains some of the public facilities that are fully compared with the full form of commercial facilities but it is also recognized as a commercial facility and lacks consideration for long-term operation of the facility. In this regard, this study aims to determine the optimal time to take into account the travel time of the future user's facility in the course of choosing the location of the complex sports facilities. We hope that the results of this study can be used as a basis for determining the location of the complex sports facilities in the complex.

Market zone of complex sports facilities: Market area or trade area represent the geographic ranges of customers who will visit the market facilities for their purposes (Carn, 1988; Schmitz and Deborah, 2009; Stephen, 2005). In order to ensure that certain commercial facilities are kept intact, it is necessary to secure an autogenous market area or trade area that can secure multiple stable buyers (Kang and Shin, 2011; Mun and Choi, 2016).

According to the number of previous findings, market areas or trade areas are divided into primary market zone, secondary market zone and tertiary or fringe market zone (Berman *et al.*, 1985; Bruwer, 1997; McCollum, 1988). The first commercial zone is a geographic area where the highest repeat sales of the facilities including 60-80 % of the facility customers, are generated. The second market zone is geographically dispersed areas which cover geographically diverse areas including 15-25% of customers. The size of the second market zone will be influenced by the presence of neighboring similar facilities, the size and competitiveness of nearby facilities. The tertiary or fringe market zone will form the largest area to attract customers to neighborhoods surrounding the primary market zone and secondary market zone. Meanwhile, the market area or trade area of the target facility will be influenced by various factors. In reality, the market area and trade area of the target facilities vary depending on the corresponding facilities such as the

Table 1: Simulation parameters

Shopping center type	Distance (miles)	Travelling time (min)
Neighborhood shopping center	1-1.5	5-10
Community shopping center	3-5	10-20
Regional shopping center	10-15	20-30

Kang and Shin (2011)

type of facility, the distance and time to the facility, the man-made barriers (highway, railroad), the natural obstacles (river, lake, mountain) of the surrounding area, the characteristics and conditions of the road network, the surrounding population, etc (Schmitz and Deborah, 2009).

Consumers try to maximize the overall usefulness associated with shopping malls in shopping activities and consumers try to minimize the availability of non-efficiency related to distance in shopping areas. The possibility of a visitor's visit to a particular commercial facility will result in a decrease in the fall curve, depending on travel distance or travel time. The possibility of choosing retail stores for these journeys can also be identified in several studies, represented by the retail gravity theory. Specifically in Reilly model of the city's urban shopping travel, the chances of residents living in the middle of the two cities are in proportion to the population of the two cities and are described as inversely proportional to the distance between the two cities. Also, Dr. Converse, the Economist of Illinois University, modified Reilly model and created the formula for calculating the random boundary areas where the ratio of the models to the two cities is identical to those of the two cities. Meanwhile, Dr. Huff, UCLA, transformed the retail gravity theory studied at urban levels into models of retail properties in urban cities. The probability that a consumer residing in a certain residential area visits a particular commercial facility is proportional to the size of a commercial facility and inversely proportional to the distance between consumers and commercial facilities. Several studies show that the possibility of a visit to certain commercial facilities decreases as a result of increased travel distance (Kang and Shin, 2011) (Table 1).

In the estimating process of these market zone by considering the characteristics of shopping consumers, the travel distance and time spent to consumer's shopping centers are often indicators of the disutility (Carn, 1988). However because the different types of shopping malls have different capacity from the type of commercial or shopping center, the scope of the market is not easy to generalize because the range of shopping malls varies depending on the type of retail store or the type of shopping center and the effects of other factors besides travel distance. but some of the literature places the scope of the market according to the type of shopping center as following. Efforts were made to estimate the scope of the market area based on travel distance with

distribution company in Korea. In relation to the discount stores in order to calculate the commercial District of discount stores in the Mapo Hapjeong District, (Lee and Choei, 2005) selected a similar commercial facility for discount stores in Grand Mart (Sinchon), Homeplus, Lotte Mart (Yeongdeungpo), Carrefour (Sangam), etc. and conducted a similar survey of the CST (Customer Spotting Technique) at similar commercial facilities. They set up 2.4 km as the range of first market zone which accounted for 60% of the retail outlets and 4.0 km as the range of second largest market zone which accounted for 20% of the company's sales which account for about 20% of the company's sales. In addition, Yuh and Lee (2003) estimated the size of the discount store market by analyzing 2.92 million customers of 2,500,000 customers operating in 15 cities nationwide. The results of the analysis suggested that the market area of 80% of sales in sales of revenues reaches 4.12 km and the market area of 85% of sales reaches 4.79 km and the market area of 90% of sales reaches 6.20 km.

The concept of travel time is often more important than travel distance in determining the extent of the market area of a particular facility. Because of the same physical distance, the travel time can vary due to factors such as road conditions, traffic jam and traffic congestion (Carn, 1988; Stephen, 2005). Accordingly, the study of the scope of market zones using the driving time or travel time in relation to the range estimation of the market area is conducted (Schmitz and Deborah, 2009). A study focused on travelling time was considered to account for travel hassle index such as traffic signals to survey the scope of market zones. It also tried to establish the scope of the market area by using the concept of isochrones that linked the same travel time with commercial facilities or shopping centers (Salvaneschi, 1996). In Korea, research has been conducted to determine the extent to which the travel time of the market area is used and (Lee, 2006) reported that the travel time of 55-70% of the department store's customers is about 30-45 min of the time between department stores and resident's house. In addition, (Choi and Kim, 2006) reported that it would be 29.3% within 15 min to the arrival time of visitors to Lotte Department Store and 36.5% within 15-30 min and 22.6% within 30-45 min in the survey.

Based on the point of view of advanced studies, this study aims to propose an alternative to the extent to which potential customers will spend the time to maintain and operate the facility for the establishment of complex sports facilities for the adoption of complex sporting facilities. Of course, complex sports facilities can be placed in a densely populated area but densely populated areas can be prohibitively expensive for the establishment of complex sports facilities. It will require in-depth study of potential customer visits to select the location of the most efficient facilities of the most efficient facilities.

Time sensitivity measurement: In relation to the establishment of the market zone of the complex sports facilities, using consumer’s perceived travelling time, this study uses time sensitivity measurement to analyze more systematic analyses. TSM (Time Sensitivity Measurement) can be used to evaluate the TSM techniques used for PSM(price sensitivity measurement) in relation to price sensitivity, so, it is possible to measure travel time, waiting time and service delivery time that consumers are perceived to be appropriate by using TSM. Kimes *et al.* (2002) suggested that applying TSM is possible to determine the optimal waiting and travelling time for customers perceived by measuring the level of resistance and sensitivity of consumer’s waiting time or travelling time.

The PSM technique was developed by the Dutch economist Peter H. van Westendorp in a way to measure resistance and sensitivity of retail price in the marketing sector. Because the PSM technique can be found in the customer’s perspective of the price ceiling and the lower limit, these techniques can be found to be able to find the appropriate price for any product based on perceived value and can be used very profitably. In fact, these PSM techniques are widely used in various fields. In the study by Harmon *et al.* (2007), the study analyzed the optimal price of software products through PSM analysis and studies for the optimal price of highway information in the study by Kim and Lee (2003). In the field of real estate, (Han and Kim, 2008) analyzed the price of the National Recreation Forest Room, using the PSM. In addition, research by Lee *et al.* (2007) calculated potential applicant’s willingness to pay for National Rental Housing, using the PSM.

The TSM techniques are used to extend the value of the PSM techniques used by consumers in the pricing field to identify the resistance and sensitivity of customer’s time in the service industry which is used to derive the proper time to perceive the time (Kimes *et al.*, 2002). Based on these traditional studies, this study aims to determine the resistance and sensitivity of customer’s time to complex sports facilities by utilizing the TSM techniques and analyses and suggest meaningful implications for the commercial range of the complex sports facilities by drawing up the proper travel time.

MATERIALS AND METHODS

Empirical analysis

Survey overview: In this study in order to proceed empirical analysis related to the range of market zone, we developed and interviewed a structured questionnaire for

the potential users of complex sports facilities. This study focused on the perceived travel time of potential users in relation to the market area of the complex sports facilities. In this study, the questionnaire was constructed to utilize TSM techniques in connection with the perceived travel time of the user. Specifically, the questionnaire consists of four questions including the followings.

If the travel time is less than that do you feel that the complex sports facilities is near, based on one way? (short, Q1). If the travel time is more than that, do you feel that the complex sports facilities is far away, based on one way? (Long, Q2). If the travel time is more than that, do you feel that you can’t visit any of the finest complex sports facilities far away, based on one way? (Too long, Q3). If the travel time is less than that, do you feel that it is too close to feel that you are purposely going to take advantage of the complex sports facilities? (Too short, Q4).

In addition to the basic TSM 4 questions, the questionnaire configuration of this study also added the expected time items below and the respondent responded it from 10 min to 2 h, by each 10 min interval. How long do you feel that travelling to the complex sports facilities is appropriate, based on one way?

Specifically, this study conducted a survey of potential users related to complex sports facilities. The survey lasted about 1 month from July 1, 2016 to July 30th 2016. Through this survey, data were available from 77 potential users of complex sports facilities.

Sample composition: Based on the survey results, the survey showed that the gender of the respondent was 87% with 67 male respondents, 13% 67 female respondents with experience in complex sports, 41% (41 members) of the experience with complex sports facilities and 36.8% (36 members) of respondents who inexperienced with complex sports facilities. Based on the potential buyer of complex sports facilities, the respondents analyzed that the number of respondents who exercised regularly at 96.1% (74 members), showed 3.9% (3 members) of respondents who did not exercise regularly. It can be seen as a respondent who could have a lot of interest in complex sporting facilities (Table 2).

Table 2: Composition of samples

Classification	Frequency (persons)	Ratio (%)
Gender		
Male	67	87.0
Female	10	13.0
Experiences in complex sports facilities		
Experienced	41	53.2
Non-experienced	36	46.8
Periodic exercise status		
Exercised	74	96.1
Non-exercised	3	3.9

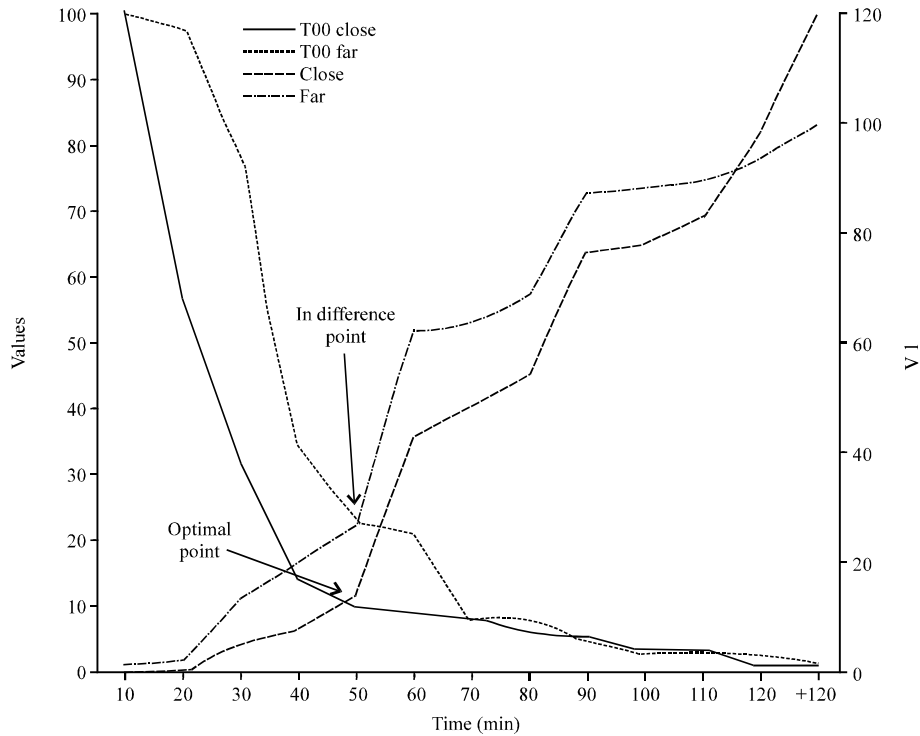


Fig. 1: Analysis of optimal time and indifference time

Table 3: Time-sensitivity scale mean and standard deviation by segmentation group

Classification	Very short travel time (min, Q4)	Short travel time (min, Q1)	Appropriate travel time (min, Q5)	Long travel time (min, Q2)	Very long travel time (min, Q3)
Mean value	24.42	38.31	34.81	68.31	87.79
Standard deviation	23.92	22.33	18.96	28.63	30.93

Time expectations: The analysis of the time sensitivity measures regarding the optimal travel time to the complex sports facilities expected by the potential users of this study was analyzed. First, the optimum time for the user’s time sensitivity measures to the complex sports facility was 34.81 min and the amount of time users felt close to 24.42 and 38.31 min, respectively. The time when users felt far or too far from the distance came to 68.31, 87.79 min, respectively. Such analysis results are expected to be utilized as an important indicator of economic feasibility in the course of the selecting location of complex sporting facilities in the future (Table 3).

Time sensitivity measurement: The time sensitivity measurement results for the travel time of total respondents to complex sports facilities in this study are as follows. The optimum time (OTP, Optimal Time Point), the time point of the hours to be traveled to the complex sports facilities was 48.14 min (10.74%) which was an intersection point between ‘too long’ and ‘too short’ perceived times and the in difference time (ITP in

Table 4: Time sensitivity measurement results by segmentation group

Classification	ITP	OTP	Stress
Overall respondent	48.96	48.14	-0.82

difference Time Point) was 48.96 min which was an intersection point between ‘long’ and ‘short’ perceived times (Fig. 1). If the difference between ITP and OTP is small, the time sensitivity (consciousness) is small. If the difference between ITP and OTP is big, the stress to travel time is present. Such stresses exist when the OTP is smaller than the ITP or Inversely. If the OTP is smaller than ITP, many consumers tend to prefer low travel times and often consider switching to other alternatives. Conversely, if the OTP is larger than the ITP, meaning that the optimum time is greater than the market average, some consumers expect a longer payment. Either way, the greater the stress, the more important it is to become a market segment of this market. The stress on traveling time to complex sports facilities was seen as -0.82 indicating the importance of the time distance in the selection process of complex sports facilities (Table 4).

RESULTS AND DISCUSSION

Empirical analysis: This study was to analyze the market area and commercial range of complex sports facilities using Time Sensitivity Measurement (TSM). Specifically, this study attempted to analyze the scope of market zones based on the concept of travel time rather than the concept of travelling distance to complex sporting facilities. Setting up the range of market area, such as road networks, road networks and traffic networks to complex sports facilities does not reflect the characteristics of road conditions, traffic jam, traffic congestion, etc which affect to user's travelling. Therefore because it is not right, we believe that the market segment analysis based on travel time is needed. While the user's perception of proper travel time may include subjective time, these subjective assessments influence the determination of decisions and decisions of the user's complex sports facility. Accordingly, the establishment of market zones based on the time of the user-dependent time is believed to have its own implications and validity. In other words, the establishment of a market zone based on travel time which reflects differing factors on road conditions, traffic congestion, traffic congestion and various factors affecting road conditions besides simple travel distance is considered to be a substantial factor in determining the location of the complex sports facilities.

Next, this study showed that the Time Sensitivity Measurement (TSM) could be used to further analyze the market segment based on travel time for exercises or viewing purposes. By collecting data related to travel time and using the TSM analysis to analyze or utilize the data related to travel time, analysis of the resistance level and sensitivity of the users to the time of travel was measured and by the identifying of perceived optimal time, the user was able to increase the understanding of the market area. Meanwhile, the results of this study of complex sports facilities provide the following suggestions concerning the development of complex sports facilities.

First of all, the amount of time spent on travelling time to complex sports facilities was shown in 48.14, 48.96 min, respectively. These findings showed that a majority of visitors spend 50 min traveling to complex sports facilities. Second, this results showed that potential users of complex sports facilities were required to choose a location that considers proper travel time of 50 min when selecting the location of the complex sports facilities. Third, this empirical study showed that, since, the development of the complex sports facilities, it is necessary to inform the user that the user is aware of the optimum travel time and indifference travel time of the complex sports facilities such as "50 min

from the site of the residential district of the city" and to promote the time to arrive at the appropriate time.

RECOMMENDATIONS

Meanwhile, despite these studies, the research has several limitations. It is expected that future studies will be needed. First in order for the results of this study to be meaningful, it is possible to consider how complex sports facilities users will be able to conduct the analysis by combining the perceived time of travel and actual travel time. It is deemed possible to review the validity of this study by conducting research on the perceived travel time analyses as well as the actual travel time analyses to the complex sports facilities. Moreover, it is believed to be able to broaden the understanding of the market area of complex sports facilities by looking at how market zones differ depending on the size of the city's complex sports facilities. In addition to the fact that the time spent on time may vary, further research will be possible to further investigate more meaningful studies by conducting further investigations of respondent's dwellings, origin, main time to use and real spending time.

CONCLUSION

We hope that the results of this study can be used as meaningful criterion for deciding the location of complex sports facilities for other cities in the future.

REFERENCES

- Berman, B., J.R. Evans, Retail and J.R. Evans, 1985. Retail management: A strategic approach. *J. Marketing*, 49: 145-147.
- Bruwer, J.D.W., 1997. Solving the ideal tenant mix puzzle for a proposed shopping centre: A practical research methodology. *Property Manage.*, 15: 160-172.
- Carn, N.G., 1988. *Real Estate Market Analysis: Techniques and Applications*. Prentice Hall, Upper Saddle River, New Jersey, USA., ISBN:9780137633685, Pages: 353.
- Choi, I.H. and Y.R. Kim, 2006. A study on location characteristics of user behaviors on Large-scale commercial facilities: The case of department store in Seoul. *Korea Plann. Assoc.*, 41: 95-108.
- Han, J.Y. and M.C. Kim, 2012. The local economy effect of before and after mega sports event: Focused on 2002 Busan, 2003 Daegu, 2015 Kwangju. *J. Korean Soc. Sport Manage.*, 17: 21-34.
- Han, S. and J. Kim, 2008. Developing room pricing marketing strategy of the national recreation forest using Price-sensitivity measurement. *J. Korean For. Soc.*, 97: 118-126.

- Harmon, R.R., R. Unni and T.R. Anderson, 2007. Price sensitivity measurement and new product pricing: A cognitive response approach. Proceedings of the International Conference on Portland International Center for Management of Engineering and Technology, August 5-9, 2007, IEEE, Portland, Oregon, USA., pp: 1961-1967.
- Kang, M.S. and J.C. Shin, 2011. A study on the market area of outlet shopping center by using time sensitivity measurement. Korean Reg. Dev. Assoc., 23: 185-206.
- Kim, J.J. and U.E. Lee, 2003. Estimation of optimal price of freeway traffic information. Korean Soc. Civil Eng., 2003: 111-120.
- Kimes, S.E., J. Wirtz and B.M. Noone, 2002. How long should dinner take? Measuring expected meal duration for restaurant revenue management. J. Rev. Pricing Manage., 1: 220-233.
- Lee, C., K. Na, Y. Kim and S. Hwang, 2007. Determining factors of potential applicants willingness to pay for national rental housing. J. Korea Planners Assoc. KPA., 42: 149-161.
- Lee, H.B., 2006. Analyzing the characteristics of department stores based on Boltzmann's law: A case of Seoul city. Korea Real Estate Anal. Assoc., 12: 181-192.
- Lee, Y.J. and N.Y. Choei, 2005. A study of trade area analysis by way of analog Method-A case of Hap-Jong district in Seoul. J. Korea Planners Assoc., 40: 75-86.
- McCollum, W.J., 1988. Market Research for Shopping Center. 3rd Edn., International Council of Shopping Centers, New York, USA.,
- Mun, J.D. and B.K. Choi, 2016. Study on the appropriate scale of public cultural sports facility on the school complex facilities. Archit. Inst. Korea, 36: 262-263.
- Oh, H., J.H. Kim, H. Kim, M. Baik and J. Hwang, 2016. Study on the optimal site selection of large scale public facility using the importance factor based on stakeholders regional Characteristics-focused on sports complex facility. Intl. Inf. Inst. Tokyo, 19: 5723-5730.
- Oh, J.W., 2010. The revitalization strategy for a public sports facility of a local government: The case of Seongnam complex. J. Korean Soc. Sport Manage., 15: 75-90.
- Park, J.G. and R.H. Lim, 2005. A study on the current situation and development of public sports facilities in Suwon city. Artistic Lib. Myongji Univ., 16: 5-23.
- Salvaneschi, L., 1996. Location, Location, Location: How to Select the Best Site for Your Business. Oasis Press/PSI Research, London, UK., ISBN:9781555713768, Pages: 280.
- Schmitz, A. and L.B. Deborah, 2009. Real Estate Market Analysis: Methods and Case Studies. 2nd Edn., Urban Land Institute, Washington, D.C., USA., ISBN:9780874201369, Pages: 271.
- Stephen, F.F., 2005. Market Analysis for Real Estate: Concepts and Applications in Valuation and Highest and Best Use. Appraisal Institute, Chicago, Illinois, ISBN:9780922154869, Pages: 543.
- Yuh, H.K. and S.H. Lee, 2003. Analysis of hypermarket catchment area. J. Urban Plann., 38: 25-41.