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SPORTS STADIUMS AND MODERN INFRASTRUCTURE

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Abstract: Rapid and major changes in the environment occur primarily under the influence of modern scientific and technological progress. The results of this are visible in informatics, energy, materials, new technologies, communications and other areas. All social and business systems are subject to change and adaptation to a changing environment. Changes are the basis of survival and development of all social and business systems. That's why just managing changes is a very important discipline and requires a complete and adequate management approach to it. This is valid as a general attitude, but also especially in service management, specifically in sports management, in the case of sports stadiums in particular, their construction and connection with other infrastructure. Namely, before the network of service points is designed, the organization must clearly define its accessibility goals. This assumes a clear idea of the volume of business, market share and consumer segment that the service organization is trying to attract. Accessibility objectives are derived from the positioning strategy for services. The above is set as a premise if you want a simple, propulsive and, above all, profitable service facility.

Keywords: stadium, infrastructure, traffic

Introduction

In the last few decades, many new areas of research and studies addressing location-related issues have emerged, particularly in phenomena such as stadiums. However, the majority of research has been directed towards individual attributes and goals. In

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cases where a single criterion is insufficient, such as minimizing the average reaction time for access to the service area, even if it is the simplest entry into the stadium service circle, multiple objectives must be used. Qualitative factors, such as consumer service, market demand, as well as quantitative factors like distribution and business costs, need to be appropriately measured and used in a mathematical programming model, which is a general recommendation.

The optimal location of service areas is crucial for research. Determining a suitable location for an area intending to meet growing demand represents a significant intersection for researchers (Stanković, 2021; Dašić, Ratković, 2022). Access to the service facility is a crucial factor in determining the satisfaction of demand for consumer zones. A good location strategy provides a clear strategic advantage for a company over competitors, even though it may not be as pronounced in the case of stadiums. For new types of such services, the location decision is very important because it allows the service to become available. By locating service systems in multiple places within mass facilities, providers increase their availability and thus improve their overall consumer service. However, at the same time, by providing a service at multiple service points, the costs of establishing and maintaining the service area increase (Dašić, Gavrilović, 2023; Đukić, Kojić, 2023). In this way, profit can erode unless there is sufficient increase in service utilization.

The location and type of area establish the basic form, costs, and performance of the logistics system. This paper discusses the challenges faced by service providers regarding the place and time of service delivery in mass consumption cases, especially for other or multiple services, in addition to the main service. Because service consumers are mostly involved as co-producers of the service, the time and place where they expect the process to occur become significant criteria for evaluation. Decisions about production and location cannot be made in isolation from the analysis of consumer needs. While service organizations desire to centralize production to achieve economies of scale, consumers generally seek local access to services. Therefore, decisions about service location involve a kind of trade-off between the needs of producers and the needs of consumers. The transportation system as a whole, located in the service space chain, primarily due to its specific nature, must apply this for each individual area separately, and it is necessary to optimize the area in multimodal and intermodal transport systems (Stanković, 2022).

The Phenomenon of Stadiums as a Location

In some services, production can be very inflexible. When choosing a location, it is necessary to consider this, as the selection of a location is often based on relatively

non-production-related decisions. Decisions about service location are influenced by volume, which causes consumer flexibility regarding where they want to use the service. Inflexibility arises for several reasons, and stadiums, as unique service systems, are particularly sensitive due to the following facts:

- The service is performed on a consumer's owned immovable object.
- The consumer is not mobile.
- Impulsive buying behavior.
- Specialized services – where it is inherent that consumers are not willing to buy routine services.

In reality, most service consumer decisions involve a trade-off between the service cost, delivery quality on a specific route, the volume of available choices, and the costs for the consumer in terms of time and money they engage to access the service. For some services, choosing a service delivery location is the most significant means of attracting new business. This applies to low-value services or additional consumption services, for which consumers show little willingness to plan and then execute a purchase. Location is very significant in the case of impulse purchases. Stadiums, gas stations, coffee bars in tourist areas, and restaurants are typically chosen as a result of a consumer encountering a service system without prior planning (Dašić, 2021).

For example, it is not logical for many drivers to follow media advertisements and seek gas stations located in a side street. Therefore, the visible location of the service system represents a vital factor in consumer choice, which is primarily the case due to the size of the stadium. The perishability of service offerings results in their temporal availability becoming significant, as well as their spatial location. Consumers can be segmented based on their flexibility considering the time in which they are prepared to avail the service. Thus, a purchase may not be made if the service is not immediately available. For example, the duration of a sports event is directly related to a certain time tolerance.

The flexibility of service location is a measure of its ability to be realized despite changing economic situations. Because location decisions are essentially long-term, their selection should be primary in determining future economic, demographic, cultural, and competitive changes. Competitive positioning refers to the method by which a company can occupy a place in relation to its competitors. Multiple locations can serve as a barrier to competition by building a competitive position for the company and establishing market reality. Demand management is the ability to control the quantity, quality, and timing of demand. Focus can be developed by offering the same narrowly defined service in many locations. The choice of location varies depending on the nature of the service being sold. With this in mind, services can be classified as those in which:

- Location may be irrelevant;
- Location may be concentrated; and
- Location may be dispersed.

Many services are concentrated, and the reasons lie in the status associated with specific positions: lower demand intensity, consumer willingness to be mobile. When it comes to dispersed services, the location is determined based on the market potential. The nature of demand and service characteristics require dispersion in the market. In this case, institutions can be centralized, and operations are dispersed. Before the service site network is designed, the organization must clearly define its goals related to accessibility. It must especially have a clear idea of the size of the business, market share, and consumer segment it is trying to attract (Ljubojević, 1998). The traditional idea of insufficient production and consumption of services primarily poses a problem in achieving maximum production efficiency and maximum service availability. One method of solving this apparent problem is attempting to separate production and consumption, i.e., designing a service that can be produced at the most efficient location and consumed where it is most needed.

The study conducted by Palmer highlights some methods that can distance production from the point of consumption (Palmer, 1994). Telecommunication and internet networks enable services to be produced in a central operational unit and made available at the consumer's point of choice (telephone and internet banking). Postal services can allow users to make tangible services available at any location, similar to accessibility strategies based on telecommunications. The latest means of separating production and consumption provide surrogates for services, enabling the delivery of the service at the time and place the consumer truly desires.

Location and area layout are crucial for achieving cost efficiency for two reasons. First, the location and layout must reduce costs per unit of production. Second, they must lead to high sales volume. The decision on where to locate a business depends on the relative allocation of the consumer contact component and the support component of the operation. Due to the need to create high business volume, the consumer contact component must be convenient for the consumer. Support functions, however, can be located in areas that do not require capital investment.

In choosing the location of a service system, five key criteria must be explored: operational position, merchantability, traffic intersection, cumulative competitive attractiveness, and competitive compatibility. Merchantability refers to the distance from which a consumer can conduct a transaction. The choice of service location is the first critical management decision and must be made in the process of defining the appropriate service scope. The location will depend on the operational position of the

firm. A firm using a cost-efficient approach must be located where a high level of consumer movement can be generated. A firm choosing a customized approach will want to locate where services can create prestige and an image that will impress their consumers. A firm with a service quality approach will want to create an appropriate consumer contact component for the consumer. The support component should be in low-cost areas.

Services with high merchantability can be managed without the physical presence of consumer access. Low-level services or those requiring the consumer to come for the service must be closer to the consumer. If the consumer has to come for the service, the location becomes more critical. Cost-effective operational services must ensure that their areas are suitable for consumers. Even if the service organization has chosen a service quality approach, the physical location is not crucial but still significant. For customization, the location criterion changes from a service suitable for consumers to one that is impressive and conveys specific images to consumers.

Determining the scope and type of traffic volume the service possesses for the service business is the first step in evaluating traffic intersections. Service businesses related to volume must be located where a large number of vehicles or pedestrians pass, which is inherent in the case of major sports events. Firms using the operational quality service approach will be concentrated around traffic intersections for their consumer contact areas. Stadiums positioned on technical quality will want to be located in highly trafficked areas. It is best to locate them downtown, closer to business districts, to attract business guests.

Some service benefits are realized by existing in a cluster of similar or complementary businesses. However, restaurants and hotels can attract more business when located in clusters than when isolated, as is the case with stadiums (Radaković, Marinković, 2021; Tošić, 2023). If a cluster offers complementary choices, each service will benefit. The concept of cumulative attraction is most significant for services focusing on the operational approach. It is based on cost efficiency and is least significant for services using a customized approach (a method of adapting the service offer to individual requirements).

For services using a service quality approach, the significance of competitive attractiveness depends on the number of desired consumers. On the other hand, for example, hotels often use existing clusters because most guests stay only one or two nights, and the hotel needs to constantly have guests staying in it. Competitive compatibility is significant for services such as car rental agencies. Locating near hotels, airports, and stadiums allows the exchange of consumers.

Factors Influencing the Decision on Stadium Location

The issue of location can be addressed at several levels (Looz, Van B. 1998). The location of a service facility can be sought on another continent, in another country, block, or street. Depending on the size of the space under consideration, the importance of factors determining the final choice of location varies. Factors considered when locating a "Disney" amusement park in Europe differ from those "McDonald's" considers when deciding where to open a new "McDrive" restaurant in Paris. The "Disney" management analyzed factors such as the availability of adequate workforce and transportation infrastructure, climate, and the degree of government support, while "McDonald's" local management focused on entirely different considerations. Factors such as traffic density, the location of competitors, legal regulations in the construction area, available space, and easy access, especially for stadiums, are of greater importance.

The next step is the micro-location domain (within-stadium infrastructure), which deals with the precise position within the selected city center, regional shopping center, or main street and major access roads. At this level, factors such as the presence of attractive stores, the influence of entry and exit points on consumer circulation patterns, and the maximum spatial distance between stores that must be crossed on foot play a significant role. The most important factors influencing the decision on location at a general level would be the availability of good infrastructure (e.g., available roads and communications), the ability to attract a workforce, and proximity to consumers. However, there is a difference in the significance of these factors depending on the type of activity. Sectors such as health, education, social, and personal services generally attach relatively less importance to location-determining factors than sectors like storage, transportation, and wholesale, indicating that they are relatively immune to a large number of spatial factors in general. Since consumers are generally less willing to travel longer distances for routine services, it is clear that services such as retail of food products or banks place greater importance on locating near their consumers than when it comes to professional or educational services.

At the level of choosing a specific location, more specific and pragmatic factors come into play. Adequate parking emerges as the most important factor and is crucial in the case of stadiums, followed by three factors related to construction and costs. On the other hand, retail-oriented services such as stores, banks, and restaurants attach much more importance to these factors, while hospitals and public services attribute less significance. It is evident that the nature of services has a key impact on the relative importance of factors determining the choice of location. A service enterprise that provides services dependent on consumer traffic cannot afford to pay too much attention to workforce and government support factors in its location decision, despite

the capital construction of such facilities. Given that convenience and comfort are key words, such a enterprise has no choice but to locate where consumers are, seeking contact with them. In contrast, professional services do not have to be located in the immediate vicinity of consumers and have more freedom in choosing a location.

The vendor must ask the question, "What value does the service have for the consumer?" and more importantly, "What is the additional value of our service compared to the competition, even if it doesn't seem so at first glance?" It would be unreasonable to expect a consumer to drive an hour to reach a specific fast-food restaurant when it only takes them five minutes to reach another chain, regardless of how tasty the cheeseburger is. However, the same consumer may be willing to drive an hour or more to reach an exclusive place like a stadium. Therefore, the level of freedom in choosing a location depends largely on the perceived value of the service.

Increased attention to business logistics has also contributed to increased interest in location decisions, as highlighted by a thematic study (Ballou, R.H. and Masters, J.M.: 1993). Location decisions, design of the transportation system, and the level of consumer service demands represent three main components of logistical planning. The general problem of location areas lies in the fact that a set of locations for consumer groups utilizing the service is given, and it is important to:

- Determine which area to use,
- Determine which consumers need to be served from which areas to minimize the overall service costs for all consumers.

In addition to the above, other factors can be considered:

- Consumers have a linked demand for capacities (boundaries) with the total consumer demand that can be provided by the areas, or
- Consumers are served in more than one area.

The problems of size and location of areas are closely related and need to be considered simultaneously. In fact, the approach used here does not pay attention (for simplicity's sake) to the size problem, although stadiums come in various sizes, which is logical, and it only deals with location. A typical example, applicable to traffic and stadiums, is the case of the Gotham City airport terminal with ten arrival gates and the nearby Gotham City Stadium. Baggage from incoming flights is unloaded at these gates and transferred to the place where passengers pick up their luggage. In order to logically locate places where passengers pick up their luggage, it is necessary to create the use of the quantity of baggage that moves from the gate to the baggage claim area. Logically, the gate with a large flow should be closer to the baggage claim area than the gate with a small flow. This approach to choosing the location of the baggage claim point is a precise approach used in the area location module. In such location problems, decision-makers typically

deal with the total sum of loading and distance. In the airport example, the distance model measures could be: straight-line, Euclidean, and squared Euclidean measures. Straight-line distance measures are often used for factories. The Euclidean distance measure is used where a straight-line travel is possible. The squared Euclidean distance measure is used where straight-line travel is possible but where there is a desire to intervene and encourage exaggerated distances. In the airport case, the initial choice of the distance measure was often the straight-line and Euclidean (based on the technology of how baggage moves within the terminal). If baggage moves in a Euclidean way, then the squared Euclidean measure is chosen, rather than Euclidean, which penalizes excessive long distances. If the airport is interested in having two baggage claim areas, in that case, two types of decisions must be considered:

- Location decisions - where to locate baggage claim points,
- Allocation decisions - which gates to allocate to which baggage claim points.

The ideal way would probably be automatic solving of these problems simultaneously. Some authors (Goodchild, Noronha Goodchild, M.F. and Noronha, T.V.: 1997) in their judgments then announce their decision to evaluate the most successful network of gas station locations in small towns. Potential fuel demand was measured in terms of:

- a) Resident population,
- b) Traffic flow (number of cars x length of connection) on each of the 560 road links

Contrary to these positive determinants of demand, a decreasing distance effect was introduced into the model, showing that demand should decrease if the consumer distance from the service location increases. The model was developed in the form:

$$\text{Demand}_j = A \sum \text{population } i / (1 - \text{ad}_{ij}) + B \sum \text{traffic } k / (1 - \text{ad}_{kj})$$

Where the demand for a service location j was calculated as the sum of the total population in all enumerated areas divided by factors indicating the distance of the location from each enumerated area $(1 - \text{ad}_{kj})$. A and B are weights that need to be modified according to circumstances or locally adopted areas of demand or traffic demand requirements. The location-allocation procedure was able to initiate sales and market share at each location, including competitors, and how effective a location can be even more effective if it is relocated. The analysis can be repeated using decay distance parameters and different weights for A and B in the equation to demonstrate different marketing strategies. Emphasizing demand in the local area (high value for A) favored central locations, while emphasizing traffic flow generated more dispersed local locations. The selection of location areas can be oriented either towards the organization, in search of places to locate and relocate, or towards the community trying to attract new businesses to its area.

One of the most successful location selection models is reflected in the Analytic Hierarchy Process (AHP), or the AHP location decision model for organizations seeking a location for their new area or the relocation of an existing one. By organizing all location factors into a hierarchy chain, from the overall goal to different criteria and sub-criteria for successive levels, the AHP location decision model offers flexibility and the ability to incorporate experience into decision-making and reasoning.

Based on the feedback form of the company, there are significant managerial implications from the application of the AHP location decision model in many cases (Yang, J. and Lee, H.:1997):

First, the AHP location decision model will help managers identify information sources for the required input data. The second managerial implication is related to a more relevant and systematic assessment of location characteristics and requirements for location factors. In practical location selection problems, a challenging task for managers is to consistently assess and improve these qualitative location factors.

Third, the application of the proposed AHP location decision model will provide significant managerial insights for various stakeholders involved in the location decision, such as local governments, economic development agencies, and others. Fourth, the methodological approach of organizing all location factors into a hierarchy chain in the proposed AHP location decision model has also received positive confirmation from practice.

Research in the field of location area decision-making highlights several key points. In an ideal world, a company should have a fully developed strategic plan for real estate that clearly describes the criteria for determining location. However, meeting operational needs to accommodate a large population of employees could dictate that the area be located in the suburbs with free parking.

With few exceptions, the most critical aspect of any location comparison is the quality and quantity of available workers. It is not enough to have a sufficient number of people available for operational staff. They must be skilled, educated, or willing to be trained for specific jobs.

The next issue relates to finding the best business environment. The definition of a "supportive" environment will vary significantly depending on the type of business the organization conducts. For each location, it is necessary to evaluate the minimum of the following criteria:

- Corporate tax rates,
- Individual property tax rates,
- Real estate taxes (commercial and residential), and
- Municipal costs.

Applicable Models for Service Location Determination

Before a service location network is designed, an organization must clearly define its accessibility goals. This assumes a clear idea of the business scope, market share, and consumer segment the service organization is trying to attract. Accessibility goals are derived from the service positioning strategy. High accessibility levels can, for example, only be compatible with business goals if they are also linked to a premium price position. High accessibility levels can also be reduced, which can change the role that promotion played within the marketing mix. Conversely, a strategy that encompasses a low level of accessibility should significantly rely on promotion to make potential consumers aware of the service location. Accessibility goals, fundamentally, according to studies, should be (Palmer, 1994):

- To provide a hotel location in all places with a population of 100,000 or more people,
- To develop supermarket locations within a ten-minute drive time of at least 50,000 people,
- To develop retail locations where pedestrian and road traffic exceeds a pre-determined threshold.

Service location decisions are used at both the micro and macro levels. At the macro level, organizations seek the most profitable areas or regions, neighborhoods, where they make their service available, giving importance to demand, the level of competition, and the costs of establishing in the area. Micro-level decisions relate to the selection of specific locations. Macro analysis begins with a clear report on the consumer profile that the organization is targeting to reach the target market. Methods used by organizations to select service locations tend to become more complex as the organization grows. In the early stages of growth, simple "rule-of-thumb" methods may be acceptable. With further growth, simple indices and ratios are common. A large number of models of varying levels of complexity have been developed to help companies make decisions about the optimal location. Since service capacities can cover a limited geographical area, the service provider wants to reach the maximum number of consumers with a minimum number of service centers, especially if they are in one place, which is the topic we are discussing. What is the exact number is difficult to determine and depends on factors such as the type of service offered to consumers, the necessary infrastructure to deliver the service, and the defined service company strategy. In order to determine the optimal number of service centers, a balance must be struck between the given number and costs on one side and transportation costs connecting the service provider and consumers on the other. Transportation costs decrease with an increase in the number of service centers since the spatial distance between the service provider and the consumer decreases.

Also, revenues are likely to increase since the company can expect more frequent visits from consumers to sports events when the distance is shorter. On the other hand, the costs of building and operating individual service centers increase with their number. The proximity of consumers is obviously the primary determinant of location. Many models are based precisely on this principle, determining the best location for a service capacity as the one that minimizes the spatial distance between consumers and service providers. Another group of models - the so-called "gravitational models" - are more profit-oriented and consider locations with the greatest potential to attract consumers. Generally, before using any of these models, we must note two questions that arise:

- How to optimize our model? Should we use minimizing spatial distance, maximizing profit, or some other criterion?
- How can the geographical demand for the service be estimated (or where can a ready-made estimate be obtained)?

Conclusion

In recent years, the quality of life decisions have become increasingly significant as the workforce diminishes, the market becomes more competitive, and the previous culture of working for a company becomes a thing of the past. Studies show that for generations after the 20th century, the quality of life decisions often become more important than the financial compensation for work itself. Therefore, assessments of the culture offered by certain areas, proximity to vacation destinations, transportation links, climate, cost of living, and intellectually stimulating environments often represent critical factors. It is very peculiar that the issue of transportation infrastructure is not at the top of the consideration list. Without a doubt, these factors play a significant role in complex geographical comparisons. In particular, the assessment should be complemented with respect to each location's ability to meet the transportation needs of the company. Increasing emphasis is placed on technology, the number and ingenuity of telecommunication services and providers in the market, and the availability of multiple power sources, which can prove crucial. The application of the AHP model for location decision-making provides a framework to help analyze various location factors, evaluate alternative locations, and make the final location selection. The fundamental principle of the AHP model is to align decision-makers' preferences with the characteristics of the location.

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