

# Predictive Modelling of Sports Facility Use

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The level of attendance appears to be the central indicator for analysing the performance of public sports facilities.

attendance

aquatic centres

predictive model

## 1. Introduction

In the twenty-first century, there has been a growing demand for a reduction in public expenditure, particularly in the non-governmental sectors. Simultaneously, consumer demand for sport and leisure has increased, becoming more complex and diverse. Moreover, sedentary lifestyle has become a public health problem that has influenced changes in the public policy. Leisure sports facilities are a part of the solution to adopt a physically active lifestyle, insofar as these facilities are accessible to the largest possible number of people.

The state and local authorities are the main owners of these facilities in Europe [\[1\]](#)[\[2\]](#)[\[3\]](#), the United States [\[4\]](#), Australia [\[5\]](#), and Japan [\[6\]](#). In addition, in France, public authorities own 87% of the 318,000 installations identified [\[7\]](#)[\[8\]](#)[\[9\]](#)[\[10\]](#).

These leisure facilities are continuously diversifying as interest in health, wellness, and high-quality recreation intensifies [\[11\]](#)[\[12\]](#)[\[13\]](#)[\[14\]](#). They are more versatile but are also more expensive. The costs of building and operating public infrastructure are mainly supported by public authorities. The question regarding the relationship between the cost of these facilities and the services provided to users is even more acute at the time of public spending cuts. In a context of increasing budgetary constraints, the objective of these operating authorities is to optimise the relationship between attendance and operating costs [\[15\]](#)[\[16\]](#). In the business world, the performance of an operation is generally measured according to profit, and the evaluation of the performance of facilities intended to perform public service missions must also be understood in terms of social utility and optimisation of the services provided to users [\[17\]](#)[\[18\]](#). For this reason, the performance of a public sports facility is generally assessed in the literature based on its level of attendance [\[2\]](#)[\[17\]](#)[\[19\]](#)[\[20\]](#).

It is, therefore, essential to understand the determinants of facility attendance to model it and make the most robust forecasts possible from an exploratory perspective. The objective is to be able to determine its size within the framework of a reflection on the implementation of a new facility [\[19\]](#). However, the choice of capacity determines both the cost of building the facility and that of operating it over its lifetime [\[18\]](#). In the case of professional sports facilities, the issue of explaining and predicting attendance has been widely studied [\[21\]](#)[\[22\]](#). However, limited work has been conducted to date on leisure sports facilities [\[19\]](#).

In the current context of budgetary constraints imposed on public actors who finance these facilities, it seems interesting to provide decision-making tools to better evaluate the potential attendance at a leisure sports facility, considering its location and the services it can provide to the population. This is the purpose of this contribution. To this end, researchers sought to build a predictive model of aquatic centre attendance by considering the characteristics of the facilities and the specificities of the area in which they are located. These facilities, which combine indoor and outdoor spaces, are particularly well-suited to hosting competitive, recreational, and wellness activities. There are approximately 3200 aquatic facilities in France, of which 2850 are managed by non-market organisations (public authorities or associations) and 350 are managed by private companies [9]. Of EUR 20 billion of public spending on the sports sector as a whole [10], aquatic facilities represent the largest expenditure, with an average annual operating cost of EUR 1.2 million per facility [23]. These are also the facilities that are logically the most affected by current inflation, which generates additional costs estimated at an average of EUR 350 K per aquatic facility [10]. In response to these increasing operating costs, several public and private operators have decided to close their facilities, usually temporarily. These characteristics make them particularly interesting to study and are the subject of a large number of publications on leisure sports facilities [24].

## 2. Predictive Modelling of Sports Facility Use

In a context of policy change that aims to rationalise public spending, the rationale for subsidising sports facilities has been widely investigated, leading to questions about the performance of their operations and financial sustainability [15][18].

Indeed, the performance of the operation of a sports facility can be viewed from different perspectives [18]. Economic performance is the most commonly used indicator in the private sector. Performance can also be considered from the perspective of "Efficiency", which focuses on achieving objectives and targets at minimum cost and considers the best possible relationships between inputs and outputs. "Effectiveness" is solely concerned with the achievement of output targets. It is an important performance aspect in public sector leisure services, as they are concerned with social objectives that are largely non-financial in nature.

In an analysis of the performance of aquatic facilities in England over the period of 2005–2016 along these three dimensions, Ramchandani, Shibli, and Kung [18] (p. 12) concluded as follows: "Our results also show that the improvement in the overall financial efficiency of public sport facilities has not been achieved as a result of cost savings, but rather by focusing on revenue generation" (which depends on attendance). Iversen [17] adopted the same position, considering that the objective of publicly funded facilities is to provide a place for physical activity in order to meet societal objectives (sports health and social demand). Consequently, the objective of public policy is that the facilities should benefit as many people as possible. Therefore, operational performance should aim to maximise attendance at the facility [17] (competitiveness for maximising utilisation).

Ramchandani, Shibli, and Kung [18] also identified another dimension of performance that is increasingly common, customer/user satisfaction, which is indicated by the comparison between consumers' initial expectation and their final opinion on the service rendered [24]. Several studies on this topic have used a managerial approach to identify

the impact of operating methods on quality, overall satisfaction, and loyalty. The final objective is to determine the operating methods that influence attendance at leisure sports facilities [3][25][26] and aquatic facilities in particular [24][27][28][29]. Recent studies have shown the impact of the quality of the processes linked to the operating methods on the one hand, and the quality of the results on the other, on the creation of value, overall satisfaction, and the conditions for loyalty. They have focused on fitness centres in Malaysia [30] and Spain [31][32] and on aquatic facilities in Australia [33][34] and Hong Kong [24]. All these studies used indicators related to the operational phase within the structure. Only Lau et al. [24] analysed customer satisfaction based on a grid co-constructed with users, including architectural elements (size, pool tank, pool wall, and pool deck) in addition to building service aspect factors (air, temperature, lighting, water, and acoustics). However, they showed that the latter elements were largely predominant in user satisfaction.

The question of analysing the determinants of attendance has been the subject of numerous publications in the case of professional sports facilities [21][22], allowing researchers to identify four categories of variables that have an impact on attendance at these facilities. The first category comprises the criteria related to the appeal of the proposed activity. The second category includes economic variables, such as ticket prices. The third category groups together the socio-demographic data of the population, such as market size, age, sex, ethnic origin, profession, education, and location of the event. Moreover, the fourth category concerns public preferences and refers to consumption habits, which include time of the event, ease of access, amenities, weather, and the overall quality of the stadium. These studies statistically analyse the link between variables that could potentially explain attendance and attendance at these facilities.

The only study that used this methodology in the context of leisure sports facilities concerned Australian aquatic centres [19]. The authors constructed an explanatory model of aquatic centre attendance (number of entries per year) using four variables: the population of the catchment area within a radius of 5 km around the facility, communication expenses, the number of activities offered per week, and the entrance fee. The model explained 54.6% of attendance. However, they did not include socio-demographic variables in their work.

Moreover, Schreyer and Ansari [21] pointed out the lack of studies on the determinants of attendance at athletics and swimming competitions, and the scarcity of studies dealing with this issue in recreational sports facilities.

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