Available online at www.sciencedirect.com
ScienceDirect
Expert Systems with Applications 33 (2007) 923–935
Expert Systems with Applications
www.elsevier.com/locate/eswa

Activity and value orientated decision support for the development planning of a theme park

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Abstract

The development of a large theme park usually includes multiple phases. The combination and development ordering of facilities in these phases have a great impact on the attractiveness of the theme park. Examples of such facilities are attractions, food service, accommodation, and supporting facilities. Some of these facilities although highly profitable, cannot attract visitors on their own, while others may boost the visitor count, yet by themselves do not make a profit. This research considers the values that each development activity brings to the project, and prioritizes feasible alternatives based on their net present values. Based on the integration of simulation and the genetic algorithm, a decision support system has been developed to determine the combination and ordering of facilities, and the resources needed for each development step. This development plan will provide investors with systematic and quantitative information that will help them to determine the development portfolio of each facility under the constraint of the funding program.

Keywords: Theme park; Development plan; Genetic algorithms; Simulation

1. Introduction

Developing a theme park may often span decades, requiring a high level of capital investment, and a large parcel of land to build a large number of facilities on. Consequently, the project scheduling is usually contracted out to a consulting firm, and includes: (1) a project feasibility study and an estimate of the development scale; (2) the initial design concept of the facilities; (3) a stage-based development progress and a financial model; and (4) a list of the detailed designs of facilities that need to be developed.

Inappropriate strategy as well as incorrect scheduling may cause the failure of any development project, and especially that of a theme park. Disneyland Resort Paris is a case in point. Within eighteen months after its opening, it had lost 10 billion US dollars. Up to December 1993, less than two years after the opening, not only was the initial capital consumed, but they had to raise an additional loan of 1.75 billion US dollars to maintain the operation (Spencer, 1995). Three months later, a new crisis threatened its survival. Two major oversights attributed to the failure of this development project. First, Paris is located at about 48° latitude, and relatively close to the North Atlantic Ocean, resulting in cold and wet winters. This fact alone will drastically decrease the enthusiasm of people to participation in the outdoor activities offered by the theme park. However, this fact was simply neglected. Second, even though the visitor count was expected to decrease in the cold wintry months, excessive shows and activities kept being launched, resulting in an even further waste of capital. An additional issue that was not considered or investigated was the fact that there is a fair amount of "anti-Americanism" in France, and Disney is seen as the epiphany of US commercialism by many French as well as many Europeans.

The case of Disneyland Resort Paris shows the vital importance of having the right strategy and a correct schedule prior to even executing such large a project. During the extensive period of project development, continuously changing risks become embedded in the construction cost

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doi:10.1016/j.eswa.2006.08.002

affecting the operation of each facility, as well as the relationship between facilities, especially those involving the supply of resources. The fact that the planner will have to consider multiple variable factors simultaneously is inevitable. This will make it very difficult to settle on an optimal development strategy among the multitude of combinations of potential facilities and scheduling plans. Therefore, support in the decision making process of the development schedule will aid the planner to better understand the influence of each variant on the project outcome, as well as the effectiveness of each schedule combinations, allowing him to determine the optimal development strategy.

Various researches have focused on the issue of modeling the project decision-making and plan optimization, such as the Multi-Criteria Decision Model (e.g., Hsieh & Liu, 1997), Resource-Constrained Scheduling (e.g., Leu & Hwang, 2002), and the Ranking and Combination of the Project Investment Model (e.g., Ghasemzadeh & Archer, 2000). These models are unsuitable for theme park development projects because they cannot simultaneously deal with selection, ordering, and scheduling of feasible investment items.

For example, Hsieh and Liu's Time-series Combinatorial Planning Model in Infrastructure Plan (Hsieh & Liu, 1997) has two assumptions: (1) sub-projects are independent to each other, and (2) activities cannot be separated or partially completed. These two assumptions are unsatisfactory for a theme park development. Example 2, Most Resource-Constrained Scheduling models fail to consider the selection of activities (i.e., not every activity must be executed) but can only provide solutions with specified activities and resources. Example 3, Ghasemzadeh and Archer's supporting system for decision making of a portfolio with multiple items (Ghasemzadeh & Archer, 2000) fails to consider potential situations when the start and finish dates of items are movable.

This study is aimed at constructing a decision support system for the decision-making process when laying out the order of a development plan. The project planner inputs the activities, their start and finish dates, estimated costs and revenues, and resource relationships. All these data are simulated and analyzed in order to predict the overall effectiveness of the project. Various schedule combinations will be calculated to determine the best development strategy so as to provide the planner with a point of reference. This will help overcome the complexities of the decision-making in the development of a theme park facility. This study attempts to achieve its goal through the following approaches:

(1) Investigate the characteristics of a theme park development project, the different types of facilities and their features, characteristics of different types of strategies and scheduling systems, and the demand, supply, and the effect of different facilities.
(2) Construct a simulation network model of a theme park development project, that includes all the features and correlations of the activities involved in the planning, construction, and operation.
(3) Integrate the polyploidy genetic algorithm (GA) and the simulation analysis to design a decision support system for determining the project strategy and schedule plan with the maximum net present value (NPV) for the reference of project investors and planners.

2. Characteristics of a theme park

2.1. Type of project

A theme park development project is a subcategory of land development. While other development projects are intended to be rented, sold or used as an operating facility, a theme park facility is constructed and has a cost efficiency model that are aimed at recreation and entertainment. It has 3 main characteristics:

(1) It requires a large investment of resources: A comparatively large parcel of land is required for a theme park, such as 105 hectares for the Six Flags Magic Mountain, Los Angeles, USA. In addition, very large capital investments are needed for the construction of facilities; for example, "Floorless Coaster" in Janfusun Fancyworld of Taiwan costs $ US 13 million, which is similar to other roller coasters in other theme parks. Also, the need for human labor to operate the facilities once they are built is enormous, such as Disneyland Resort Paris with as many as 12000 employees (Wylson & Wylson, 1994).
(2) Simultaneous progress of construction and operation: Due to the huge scale of theme parks, the development project is often decomposed into several segments to be executed in different periods or locations, resulting in the construction of one set of facilities while operating another set. The revenue gained from operating the facilities already built becomes an essential source of capital for financing the construction of the other facilities. A properly staged development project can drastically reduce the initial capital requirements, as well as restrain the cash flow within a secure condition.
(3) Multiple variable factors and risks: As a result of the extended length of time and the large number of facilities involved in the development of theme parks, many of the factors that may impact upon the overall performance of the project tend to vary with time, such as the preferences of the customers (old facilities tend to gradually lose favor) and risks from the natural environment (such as, seasonal climatic variations or acts of God like earthquake). Some factors may influence only specific facilities, such as water slide, boating, and other outdoor water activities which are subject to the impact of the weather. Also, construction costs and the costs to operate a facility vary with the fluctuation of the price index.