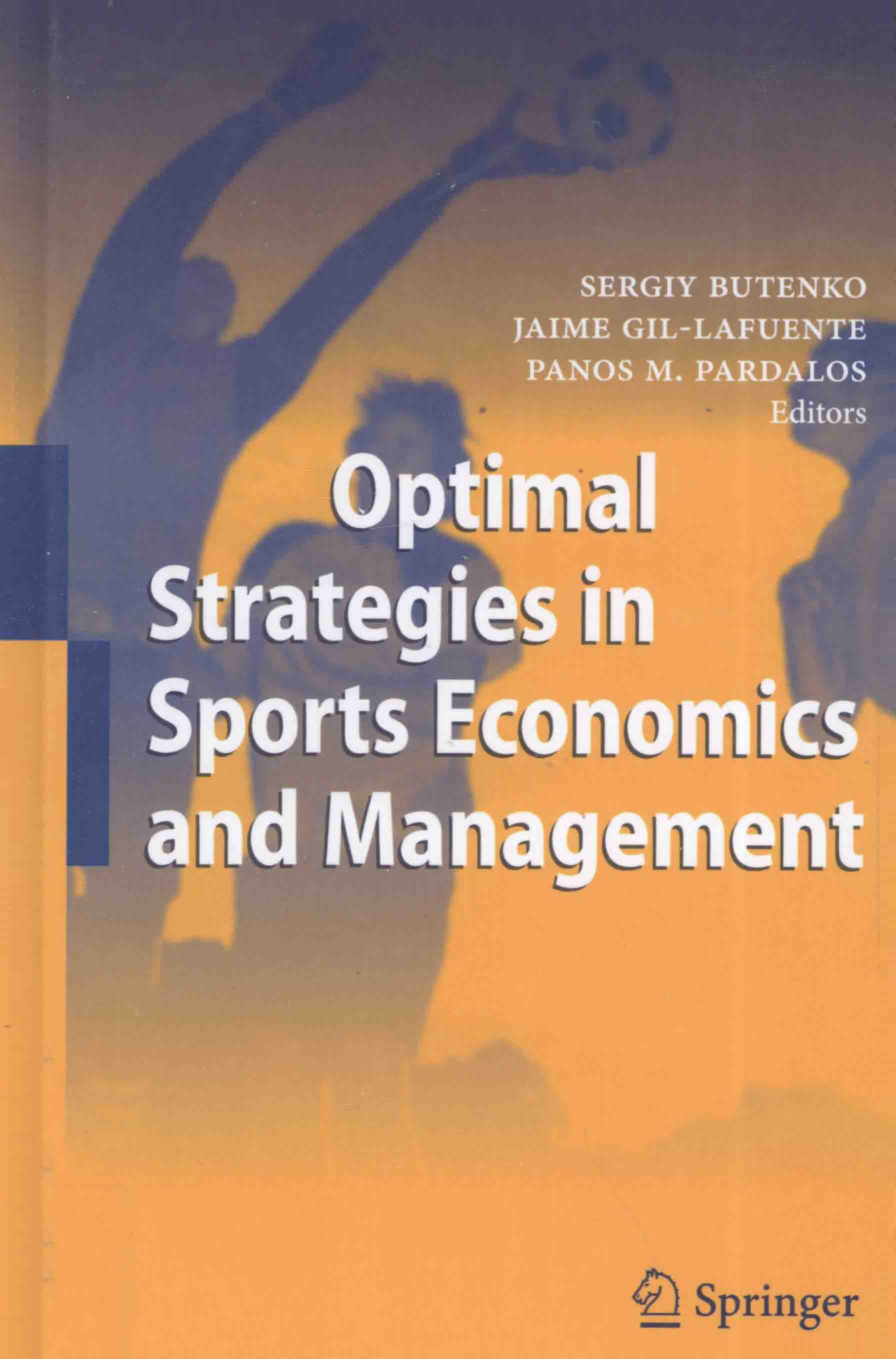

SERGIY BUTENKO
JAIME GIL-LAFUENTE
PANOS M. PARDALOS
Editors

Optimal Strategies in Sports Economics and Management

Springer

Sergiy Butenko · Jaime Gil-Lafuente ·
Panos M. Pardalos
Editors

Optimal Strategies in Sports Economics and Management

Foreword by Jaime Gil-Aluja

Springer

Editors
Dr. Sergiy Butenko
Texas A & M University
Department of Industrial and
Systems Engineering
236E Zachry Engineering Center
College Station, TX 77843-3131
USA
Butenko@tamu.edu

Prof. Dr. Jaime Gil-Lafuente
University of Barcelona
Department of Economics
Av. Diagonal 690
08034 Barcelona
Spain
j-gil@ub.edu

Prof. Panos M. Pardalos
University of Florida
Department of Industrial and
Systems Engineering
303 Weil Hall
P. O. Box 116595
Gainesville, FL 32611-6595
USA
pardalos@ufl.edu

ISBN 978-3-642-13204-9 e-ISBN 978-3-642-13205-6
DOI 10.1007/978-3-642-13205-6
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2010930921

Cover design: WMXDesign GmbH, Heidelberg

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Optimal Strategies in Sports Economics and Management

To our families

O mother of gold-crowned contests, Olympia, queen of truth; where men that are diviners observing burnt-offerings make trial of Zeus the wielder of white lightnings, whether he hath any word concerning men who seek in their hearts to attain unto great prowess and a breathing-space from toil; for it is given in answer to the reverent prayers of men–do thou, O tree-clad precinct of Pisa by Alpheos, receive this triumph and the carrying of the crown.

Pindar (522 BC – 443 BC)
Greek lyric poet

Foreword

During the last century, we have witnessed the birth and evolution of sport as an economic activity, which has created jobs on the one hand, but also problems of management on the other. This process has not been immune from the particular characteristics associated with sport, typically united here more than in other activities: technique, physical effort, entertainment and passion. And all this within a framework of ever-increasing consumption of financial resources. It is not surprising, therefore, that commonly-used economic models, based on mechanistic approaches, do not provide a viable solution to increasingly complex and increasingly frequent problems. Any attempt to apply such an approach in this technical, economic and financial context can only result in failure. The high degree of subjectivity inherent in sporting activity requires new tools, in which remodeled conceptual, theoretical and technical elements should play an important role. Complexity, uncertainty and subjectivity are therefore basic to understand, and deal with, the phenomenon of sport.

The necessity of resorting to these elements was identified over a quarter of a century ago by a small group of professors and researchers at the University of Barcelona. Together we started the first postgraduate courses and organized seminars to alert sports centre managers, as well as to make private and public organizations aware of the increasing importance of a proper, specific management for sports organizations. For that reason we created the first course in "Economic Management for Sports Organizations" in 1991. Some years later, in 1995, Professor Ana María Gil-Lafuente started the course "Law, Finance and Taxation in Sports Organizations". Later, in 2000, Professor Jaime Gil-Lafuente, from the same research group, led a new course on "Strategic Marketing Management in Sports Organizations". These three courses are still given today as university extension courses. These teaching activities were made possible at that time thanks to the decisive support of the then Barcelona Football Club president, José Luís Núñez. His long-term vision enabled the publication of two works which opened the way for cutting-edge techniques for the analysis and management of sports organizations and activities. The first work, "The Universities in the Centenary of Football Club Barcelona", consists of a series of works written by researchers from Catalan universities, which were collected together in a book published in 1999, in the context of studies in the field of sport. The second is, in our opinion, a more advanced piece of research, using techniques related to uncertainty. In this work, multivalent logics are applied for the first time ever to the study of uncertain phenomena inherent in the practice and management of sport. We are referring here to the book written by Professor Jaime Gil-Lafuente, "Algorithms for Excellence. Keys to success in sports management". This teaching and research activity has been accompanied by articles in important journals, presentations, seminars and discussions.

The Royal Academy of Economic and Financial Sciences of Spain, always open to proposals of collaboration containing new ideas in economic research, could not ignore a call to support an initiative to hold a meeting in its headquarters, organized by a Spanish group headed by Dr. Jaime Gil-Lafuente and a group from the University of Florida, led by Dr. Panos Pardalos, with an important and active participation of Dr. Sergiy Butenko of Texas A&M University. The purpose of the meeting was to exchange suitable ideas, concepts, methods and techniques to apply to the complex problems generated by both amateur and professional sport, or, to put it in another way, active sport and sport as entertainment. The result has been the book we now have the pleasure of presenting. The content of the work is mainly based on the conference titled "Economics, Management and Optimization in Sports After the Impact of the Financial Crisis" (EMOS), together with the achievements of the constant research activities carried out by the The Royal Academy of Economic and Financial Sciences of Spain for more than two and a half centuries in response to its primary vocation to serve the society. The first handful of researchers, of whom we may consider ourselves to be descendants and followers, began the first scientific tasks with ideals which have survived intact to the beginning of the new millenium.

We would also like to recognize the collaboration of the academician Llorenç Gascón, Vice-President of the Royal Academy of Economic and Financial Sciences, and the sports critic Josep Pons, for their excellent work in the leading and coordination of discussion groups that highlighted the conference. The different nature of these discussions, the first having scientific content, and the second centered on the human and social context, added to the diversity and enriched the contributions of the two research groups.

However, above all, the Royal Academy of Economic and Financial Sciences of Spain would like to express its acknowledgement to the authors of the chapters that contributed to this work. They have facilitated the multi-faceted vision of a social context, sport seen from different points of view and from different countries. From France, Professors Lionel Maltese and Lucien Veron; from Canada, Professors Brad R. Humphrey and Daniel S. Mason; from Italy, Professors Francesco Carlo Morabito and Domenico Marino; from Sweden, Mr. Patrick Siegbahn; from England, Professors Rob Simmons and Stefan Szymanski; from the USA, Professors Panos M. Pardalos, Qijpeng P. Zheng, Yingyan Lou and Donald Hearn and finally, from Spain, Professors Ana María Gil-Lafuente, Jaime Gil-Lafuente and Jaime Gil-Aluja. To all of them, our Royal Corporation wishes to express its gratitude for their efforts and also to congratulate them on their brilliant and unselfish work.

Barcelona, Spain Jaime Gil-Aluja

Preface

This volume comprises a collection of papers, most of which are based on selected presentations at the international conference "Economics, Management and Optimization in Sports. After the Impact of the Financial Crisis" that took place in Barcelona, Spain, on December 1–3, 2009, enriched by several additional invited contributions from distinguished researchers around the world. The topics covered by the papers in this collection include

- strategies for player selection in team sports;
- a framework for formal description of game systems;
- analysis of the impact of the financial crisis on professional sports in North America;
- resource allocation strategies in professional sports;
- top European football clubs after the crisis;
- pros and cons of building a new stadium in an uncertain environment;
- use of complex networks in sports applications;
- examining fairness in fourball golf competition;
- study of the impact of revenue sharing in English football;
- analysis of the relation of the financial structure of football clubs to the economic cycle;
- gambling strategies based on stochastic optimization techniques.

We would like to thank The Royal Academy of Economic and Financial Sciences of Spain for organizing the memorable conference in Barcelona; the authors of the chapters for their dedication to this project that resulted in this excellent collection; the anonymous referees for their timely and constructive reports; and Springer management and staff for the support and technical assistance.

College Station, TX — Sergiy Butenko
Barcelona, Spain — Jaime Gil-Lafuente
Gainesville, FL — Panos M. Pardalos

Contributors

Jaime Gil-Aluja University of Barcelona, 08034 Barcelona, Spain, jaigil@far.ub.es

Anna M. Gil-Lafuente University of Barcelona, 08034 Barcelona, Spain, amgil@ub.edu

Jaime Gil-Lafuente Department of Business Administration, University of Barcelona, 08034 Barcelona, Spain, j.gil@ub.edu

Donald Hearn University of Florida, Gainesville, FL, USA, hearn@ise.ufl.edu

Brad R. Humphreys Department of Economics, University of Alberta, Edmonton, AB, Canada T6G 2H4, brad.humphreys@ualberta.ca

Yingyan Lou Department of Civil, Construction and Environmental Engineering, The University of Alabama, Tuscaloosa, AL 35487, USA, ylou@eng.ua.edu

Lionel Maltese Paul Cezanne University, Aix-Marseille, France; Euromed Management, Marseille, France, lionel.maltese@univ-cezanne.fr

Domenico Marino Mediterranea University of Reggio Calabria, Reggio Di Calabria, Italy, dmarino@unirc.it

Daniel S. Mason Faculty of Physical Education & Recreation, University of Alberta, Edmonton, AB, Canada T6G 2H9, dmason@ualberta.ca

Francesco Carlo Morabito University Mediterranea of Reggio Calabria – DIMET, Reggio Di Calabria, Italy, morabito@unirc.it

Panos M. Pardalos Center for Applied Optimization, Department of Industrial & Systems Engineering, University of Florida, Gainesville, FL 32611, USA, pardalos@ufl.edu

Patrick Siegbahn Royal Institute of Technology, Stockholm, Sweden, patrick@siegbahn.com

Rob Simmons Lancaster University, Lancaster, UK, r.simmons@lancaster.ac.uk

Stefan Szymanski Cass Business School, City University London, 106 Bunhill Row, London EC1Y 8TZ, UK, szy@city.ac.uk

Lucien Veran Paul Cezanne University, Aix-Marseille, France; Euromed Management, Marseille, France, veran.lucien@wanadoo.fr

Ian Walker Lancaster University, Lancaster, UK, ian.walker@lancaster.ac.uk

Qipeng P. Zheng Center for Applied Optimization, Department of Industrial & Systems Engineering, University of Florida, Gainesville, FL 32611, USA, zqp@ufl.edu

Contents

Affinity in the Selection of a Player

Jaime Gil-Aluja and Anna M. Gil-Lafuente

Abstract In recent research on sports management, Gil-Lafuente (2002) puts forward a set of algorithms that are capable of resolving, from a scientific point of view, the problems faced by every person responsible for allocation of financial resources of a sports club. One of the questions of interest is the formation of groups of players who are substitutable among each other within the framework of team play. This is an essential matter that should be addressed prior to obtaining an order of preference among them. The proposed algorithms that are capable of providing a good solution to the problem were based on the theory of affinities. Inspired by these results, we propose an extension of the algorithm for the selection of a player, contributing elements that allow us to arrive at more general results. With this, and with no modification whatsoever, we have opened up a new path in the treatment of the proposed problem, in the event of a certain amount of uncertainty in the information. To address this case, we have started out with estimates made by means of intervals and also triplets or quadruples of confidence. Finally we have presented, within the extended concept of affinity, an algorithm based on the product of relations. We conclude by pointing out some alternative approaches to the concept of affinity, which we plan to develop in future works.

1 Similarities and Affinities

The notions of similarity and affinity represent different ways of expressing the concept of neighborliness. Similarity indicates a specific resemblance, either partial or total, between two physical or imaginary objects, in our case players. Affinity refers to a collective behavior of objects with respect to certain specific criteria, even when these criteria are not particularly well specified. But both of these notions indicate whether two or more objects (players), are related under adequate conditions with respect to explicit criteria for affinity.

J. Gil-Aluja (✉)
University of Barcelona, 08034 Barcelona, Spain
e-mail: jaigil@far.ub.es

S. Butenko et al. (eds.), *Optimal Strategies in Sports Economics and Management*,
DOI 10.1007/978-3-642-13205-6_1,

Similarity is based in the notion of distance. It is well known that distance can be defined in many different ways. From the mathematical point of view, the definition of distance that is best adapted to the problem under treatment is selected. The smaller is the distance between two objects, the greater is their similarity. Our objective consists in defining a relationship of similarity between n different objects (players) in order to be able to determine those objects that are similar at a given level α of similarity, by means of maximum sub-relations. This is done in the same manner as for affinities, however, in this case the maximum sub-relations are relations of resemblance, that is to say they are transitive. The word transitive at this juncture has a great importance since it is essential to distinguish between similarity and resemblance.

It is for this reason that, unlike with similarity, the notion of resemblance introduces the notion of *disjointed classes*. There are many reasons, which make it important to carry out the decomposition of a relation of similarity into maximum sub-relations of resemblance. In the particular case of a relation of similarity there exists an algorithm known as the Pichat algorithm (see, e.g., (Gil-Lafuente, 2002)).

Let us recall the *algorithm of maximum inverse correspondence* developed by Gil-Lafuente (2002) for finding affinities in sports applications. It consists of the following steps. Let E_1 represent the set of players and E_2 represent the set of criteria that a player may be evaluated on.

1. Select among E_1 and E_2 the set with a smaller number of elements. Without loss of generality, assume that this is set E_1.
2. For the smaller set (E_1), its *power set* is constructed, that is to say, the set of all its subsets.
3. Make every set-element of the *power set* to correspond to the set of criteria that are satisfied by each member of this set-element. This is the so-called "*connection to the right*".
4. For every set of criteria that is not void of the connection to the right, select the corresponding set of the power set with the greatest number of elements.
5. The relations between the sets that are arrived at form a Galois lattice, which, apart from showing the different homogeneous groupings, allows for the perfect structuring of the same.

The use of the notion of distance and the concept of affinity yield different results. By means of the distances we arrive at the group of players such that the players within the group are closer to one another. On the other hand, by means of affinities the players are grouped according to the selected criteria. We are therefore dealing with different notions. One of these allows us obtain an approximation of resemblance mathematically speaking, while with the other we arrive at affinities relative to certain criteria.

2 Affinities with Imprecise Preferences

In this section, we aim to extend the work of Gil-Lafuente (2002) described above. Given the very high level of subjectivity that exists in the assignment of values to the criteria by means of a number $x \in [0, 1]$ in the study on player selection, we now propose a model that consists in starting out from information expressed by means of confidence intervals (segment) $[x_1, x_2] \subset [0, 1]$. In this case the algorithm can still be applied for seeking affinities, but taking into account a very slight variation.

To explain this, we will use an example, in which the group of players is given by

$$E_1 = \{a, b, c, d\}$$

and the set if criteria consists of the following elements:

$$E_2 = \{A, B, C, D, E, F\}.$$

Let us assume that after consulting with the corresponding experts we have the following matrix:

	A	B	C	D	E	F
a	0.8	[0.3, 0.5]	[0.0, 0.2]	[0.6, 0.9]	0.8	[0.3, 0.5]
b	0.2	[0.5, 0.6]	[0.5, 0.8]	1	0.6	[0.9, 1]
c	[0.3, 0.5]	0.5	[0.7, 0.9]	[0.8, 1]	[0.5, 0.6]	0.9
d	0	[0.3, 0.5]	[0.6, 0.8]	0.7	[0.3, 0.7]	[0.8, 1]

We will apply the algorithm of affinities of the maximum inverse correspondence with each number $x \in [x_1, x_2]$ defined by the introduced level α. For example, let us take $\alpha = 0.7$. Then we obtain the following matrix:

	A	B	C	D	E	F
a	1			1	1	
b			1	1		1
c			1	1		1
d			1	1	1	1

$$\begin{array}{rcl} {}^*a & \longrightarrow & ADE \\ b & \longrightarrow & CDF \\ c & \longrightarrow & CDF \\ {}^*d & \longrightarrow & CDEF \\ ab & \longrightarrow & D \\ ac & \longrightarrow & D \\ {}^*ad & \longrightarrow & DE \\ bc & \longrightarrow & CDF \\ bd & \longrightarrow & CDF \\ cd & \longrightarrow & CDF \end{array} \qquad \begin{array}{rcl} abc & \longrightarrow & D \\ abd & \longrightarrow & D \\ acd & \longrightarrow & D \\ {}^*bcd & \longrightarrow & CDF \\ {}^*abcd & \longrightarrow & D \end{array}$$

resulting in:

$$\begin{array}{rcl} a & \longrightarrow & ADE \\ d & \longrightarrow & CDEF \\ ad & \longrightarrow & DE \\ bcd & \longrightarrow & CDF \\ abcd & \longrightarrow & D \end{array}$$

Therefore:

	A	D	E
a	0.8	[0.7, 0.9]	0.8

	C	D	E	F
d	[0.7, 0.8]	0.7	0.7	[0.8, 1]

	D	E
a	[0.7, 0.9]	0.8
d	0.7	0.7

	C	D	F
b	[0.7, 0.8]	1	[0.9, 1]
c	[0.7, 0.9]	[0.8, 1]	0.9
d	[0.7, 0.8]	0.7	[0.8, 1]

	D
a	[0.7, 0.9]
b	1
c	[0.8, 1]
d	0.7

The corresponding Galois lattice is shown below.