Jorge Casillas and Francisco J. Martínez-López (Eds.)

Marketing Intelligent Systems Using Soft Computing: Managerial and Research Applications

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Springer

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Foreword

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When I first heard the general topic of this book, Marketing Intelligent Systems or what I'll refer to as Marketing Intelligence, it sounded quite intriguing. Certainly, the marketing field is laden with numeric and symbolic data, ripe for various types of mining—data, text, multimedia, and web mining. It's an open laboratory for applying numerous forms of intelligentsia—neural networks, data mining, expert systems, intelligent agents, genetic algorithms, support vector machines, hidden Markov models, fuzzy logic, hybrid intelligent systems, and other techniques. I always felt that the marketing and finance domains are wonderful application areas for intelligent systems, and this book demonstrates the synergy between marketing and intelligent systems, especially soft computing.

Interactive advertising is a complementary field to marketing where intelligent systems can play a role. I had the pleasure of working on a summer faculty fellowship with R/GA in New York City—they have been ranked as the top interactive advertising agency worldwide. I quickly learned that interactive advertising also takes advantage of data visualization and intelligent systems technologies to help inform the Chief Marketing Officer of various companies. Having improved ways to present information for strategic decision making through use of these technologies is a great benefit. A number of interactive advertising agencies have groups working on "data intelligence" in order to present different views of sales and other data in order to help their clients make better marketing decisions.

Let's explore the term "marketing intelligence". The *Marketing Intelligence & Planning* journal, published by Emerald Publishers, "aims to provide a vehicle that will help marketing managers put research and plans into action." In its aims and scope, the editors further explain, "Within that broad description lies a wealth of skills encompassing information-gathering, data interpretation, consumer psychology, technological resource knowledge, demographics and the marshalling of human and technical resources to create a powerful strategy." Data interpretation seems to be at the intersection of "marketing" and "intelligence". By applying advanced technologies, data can be interpreted and visualized in order to enhance the decision making ability of the marketing executives. Certainly, blogs and social networking sites are rich forums for applying mining techniques to look for hidden

patterns and relationships. These patterns may enrich the discovery process and allow different views, perhaps those unexpected, from those initially conceived.

In Inderscience's *International Journal of Business Forecasting and Marketing Intelligence*, the focus is on applying innovative intelligence methodologies, such as rule-based forecasting, fuzzy logic forecasting, and other intelligent system techniques, to improve forecasting and marketing decisions. In looking at the Winter 2010 Marketing Educator's American Marketing Association Conference, there are a number of tracks presented where the use of intelligent systems could be helpful: Consumer behavior, global marketing, brand marketing, business-to-business marketing, research methods, marketing strategy, sales and customer relationship management, service science, retailing, and marketing & technology. Digital-centered marketing where one takes advantage of such digital marketing elements as mobile, viral, and social marketing channels is a growing field that can apply the synergies of marketing and intelligent systems. Positions for Directors of Marketing Intelligence are also appearing to be the champions of new marketing methods. Gartner Group reports, such as the August 2008 report on "Social Media Delivers Marketing Intelligence", are further evidence of this evolving field.

In a recent report of "hot topics" for college undergraduates to select as majors in the coming years, the fields of service science, sustainability, health informatics, and computational sciences were cited as the key emerging fields. Certainly, marketing intelligence can play a key role in the service science field, as well as perhaps some of the other fields noted. In May 2008, there was even a special issue on "Service Intelligence and Service Science" published in the Springer *Service-Oriented Computing and Applications* Journal. In July 2009, there was the 3rd International Workshop on Service Intelligence and Computing to look at the synergies between the service intelligence and service sciences fields. In the years ahead, advanced computational technologies will be applied to the service science domain to enhance marketing types of decisions.

In 2006, I edited a book titled Strategic Intelligence: Business Intelligence, Competitive Intelligence, and Knowledge Management (Taylor & Francis). I defined strategic intelligence as the aggregation of the other types of intelligentsia to provide value-added information and knowledge toward making organizational strategic decisions. I see strategic intelligence as the intersection of business intelligence, competitive intelligence, and knowledge management, whereby business intelligence and knowledge management have a more internal focus and competitive intelligence has a greater external view. Marketing intelligence seems to contribute to both business and competitive intelligence—helping to identify hidden patterns and relationships of large masses of data and text and also assisting in developing a systematic program for collecting, analyzing, and managing external information relating to an organization's decision making process.

I believe that this book sheds important light on how marketing intelligence, through the use of complementary marketing and intelligent systems techniques, can add to the strategic intelligence of an organization. The chapters present both a marketing and soft computing/intelligent systems perspective, respectively. I commend the editors and authors towards filling the vacuum in providing a key reference text in the marketing intelligence field. Enjoy!

Preface

The development of *ad hoc* Knowledge Discovery in Databases (KDD) applications for the resolution of information and decision-taking problems in marketing is more necessary than ever. If we observe the evolution of so-called Marketing Management Support Systems (MkMSS) through time, it is easy to see how the new categories of systems which have appeared over the last two decades have led in that direction. In fact, during the eighties, the inflection point was set that marked a transition stage from what are known as Data-driven Systems to Knowledge-based Systems, i.e. MkMSS based on Artificial Intelligent (AI) methods. The popular Marketing Expert Systems were the first type in this MkMSS category. Then, other new types within this category appeared, such as Case-based Reasoning Marketing Systems, Systems for the Improvement of Creativity in Marketing, Marketing Systems based on Artificial Neural Networks, Fuzzy Rules, etc.

Most of these systems have been recent proposals and, in any case, their application is still scarce in marketing practical and, specially, academic domains. Anyhow, we have noticed a clear greater interest and use of these Knowledge-based Systems among marketing professionals than among marketing academics. Indeed, we perceive a notable disconnection of the latter from these systems, who still base most of their analytical methods on techniques belonging to statistics. Doubtless, this fact contributes to these two dimensions of marketing—i.e. the professional and the academic—grow apart.

During the years that we have been working on this research stream, we have realized the significant lack of papers, especially in marketing journals, which focus on developing *ad hoc* AI-based methods and tools to solve marketing problems. Obviously, this also implies a lack of involvement by marketing academics in this promising research stream in marketing. Among the reasons that can be argued to justify the residual use that marketing academics make of AI, we highlight a generalized ignorance of what some branches of the AI discipline (such as knowledge-based systems, machine learning, soft computing, search and optimization algorithms, etc.) can offer. Of course, we encourage marketing academics to show a strong determination to approximate AI to the marketing discipline. When we talk about approximation, we refer to going far beyond a superficial knowledge of what these AI concepts are. On the contrary, we believe that multidisciplinary research projects, formed by hybrid teams of marketing and artificial intelligence people, are more than necessary.

In essence, the AI discipline has a notable number of good researchers who are interested in applying their proposals, where business in general, management

and, in particular, marketing are target areas for application. However, the quality of such applications necessarily depends on how well described the marketing problem to be solved is, as well as how well developed and applied the AI-based methods are. This means having the support and involvement of people belonging to marketing, the users of such applications.

Considering the above, this editorial project has two strategic aims:

1. Contribute and encourage the worldwide take-off of what we have called Marketing Intelligent Systems. These are, in general, AI-based systems applied to aid decision-taking in marketing. Moreover, when we recently proposed this term of Marketing Intelligent Systems, we specifically related it to the development and application of intelligent systems based on Soft Computing and other machine-learning methods for marketing. This is the main scope of interest.
2. Promote the idea of interdisciplinary research projects, with members belonging to AI and marketing, in order to develop better applications thanks to the collaboration of both disciplines.

This book volume presented here is a worthy start for these purposes. Next, we briefly comment on its structural parts.

Prior to the presentation of the manuscripts selected after a competitive call for chapters, the first block of this book is dedicated to introducing diverse leading marketing academics' reflections on the potential of Soft Computing and other AI-based methods for the marketing domain.

Following these essays, the book is structured in five main parts, in order to articulate in a more congruent manner the rest of the chapters. In this regard, the reader should be aware of the fact that some of the chapters could be reasonably assigned to more than one part, though they have been finally grouped as follows.

The first part deals with segmentation and targeting. Duran *et al.* analyze the use of different clustering techniques such as k-means, fuzzy c-means, genetic k-means and neural-gas algorithms to identify common characteristics and segment customers. Next, Markic and Tomic investigate the integration of crisp and fuzzy clustering techniques with knowledge-based expert systems for customer segmentation. Thirdly, Van der Putten and Kok develop predictive data mining for behavioral targeting by data fusion and analyze different techniques such as neural networks, linear regression, k-nearest neighbor and naive Bayes to deal with targeting. Finally, Bruckhaus reviews collective intelligent techniques which allow marketing managers to discover and approach behaviors, preferences and ideas of groups of people. These techniques are useful for new insights into firms' customer portfolios so they can be better identified and targeted.

The second part contains several contributions grouped around marketing modeling. Bhattacharyya explores the use of multi-objective genetic programming to derive predictive models from a marketing-related dataset. Orriols-Puig *et al.* propose an unsupervised genetic learning approach based on fuzzy association rules to extract causal patterns from consumer behavior databases. Finally, Pereira

and Tettamanzi introduce a distributed evolutionary algorithm to optimize fuzzy rule-based predictive models of various types of customer behavior.

Next, there are two parts devoted to elements of the marketing-mix, specifically applications and solutions for Communication and Product policies.

In the third part, Hsu *et al.* show how a fuzzy analytic hierarchy process helps to reduce imprecision and improve judgment when evaluating the preference of customer opinions about customer relationship management. López and López propose a distributed intelligent system based on multi-agent systems, an analytic hierarchy process and fuzzy c-means to analyze customers' preferences for direct marketing. Wong also addresses direct marketing but using evolutionary algorithms that describe Bayesian networks from incomplete databases.

The fourth part consists of two chapters directly related to Product policy, plus a third dealing with a problem of consumer's choice based on diverse criteria, mainly functional characteristics of products, though this contribution also has implications for strategic and other marketing-mix areas. Genetic algorithms have proved to be effective in optimizing product line design, according to both Tsafarakis-Matsatsinis and Balakrishnan *et al.* in their chapters. A dynamic programming algorithm is also used in the second case to seed the genetic algorithm with promising initial solutions. In Beynon *et al.*'s chapter, probabilistic reasoning is hybridized with analytic hierarchy processes to approach the problem of consumer judgment and the grouping of the preference criteria that drive their product/brand choices.

The final part is a set of contributions grouped under e-commerce applications. Sun *et al.* propose a multiagent system based on case-based reasoning and fuzzy logic for web service composition and recommendation. Dass *et al.* investigate the use of functional data analysis for the dynamic forecasting of price prediction in simultaneous online auctions. Finally, Beynon and Page deploy probabilistic reasoning and differential evolution to deal with incomplete data for measuring consumer web purchasing attitudes.

This book is useful for technicians who apply intelligent systems to marketing, as well as for those marketing academics and professionals interested in the application of advanced intelligent systems. Synthetically, it is especially recommended for the following groups:

- Computer Science engineers working on intelligent systems applications, especially Soft-Computing-based Intelligent Systems.
- Marketers and business managers of firms working with complex information systems.
- Computer Science and Marketing academics, in particular those investigating synergies between the AI and Marketing.
- PhD students studying intelligent systems applications and advanced analytical methods for marketing.

Finally, we wish to thank Springer and in particular Prof. J. Kacprzyk, for having given us the opportunity to make real this fascinating and challenging dream. We are also honored and privileged to have received help and encouragement from several notable world marketing academics; we thank you for your support, smart ideas and thoughts. Likewise, we offer our most sincere acknowledgment and gratitude to all the contributors for their rigor and generosity in producing such high quality papers. Last but not least, we especially thank the team of reviewers for their great work.

March 2010 Granada (Spain)

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