Artificial intelligence-based systems applied in industrial marketing: An historical overview, current and future insights

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ABSTRACT

Intelligent systems have particular potentialities and strengths to support decisional situations faced by companies, especially those of a strategic nature, where good strategic intelligence is necessary. In this paper, we carry out an historical literature review of artificial intelligence-based systems applied to marketing, covering a time period of several decades (from the 1970s to the present day), with special focus on applications to industrial marketing. A detailed review is presented, along with conclusions and some future insights. Then, we briefly introduce the set of papers in this special issue.

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1. Introduction

The artificial intelligence (AI) core focuses on the development of valuable, automated solutions (i.e. intelligent agents/systems) to problems which would require the intervention of intelligence if done by humans (Negnevitsky, 2004). In a business context, there are problems to be tackled that require this particular characteristic, which need human judgement and analysis to assess and solve these problems with guarantees of success. These decisional situations frequently relate to strategic issues in firms, where problems are far from being well-structured. Developing and applying ad-hoc intelligent systems, due to their particular strengths, to process data and provide valuable information either with a data-driven or, especially, with a knowledge-driven approach, might be of interest to managers in their decision-making (see Casillas, Martínez-López, & Corchado, 2012; Martínez-López & Casillas, 2009).

However, in spite of their potentialities to contribute to companies' strategic intelligence (i.e. business intelligence + competitive intelligence + knowledge management) (see Liebowitz, 2006), this research theme has received scarce attention in journals that primarily deal with business and management issues. A basic search in Scopus[1]

(i.e. article title, abstract and keywords) reveals that the total number of papers published on both business and AI/intelligent systems in business/management-focused journals is less than 150.

With this special issue, we have aimed to promote, stimulate and publish high-quality contributions on applied-intelligent systems to support the management of any marketing issue among businesses. The particular and interesting areas of applications within the industrial/business marketing framework are numerous. Some of them might be, but are not limited to, the following:

- Segmenting and targeting business markets.
- Managing customers' relationships.
- Marketing channel relationships.
- Organizational buying and supply chain management processes.
- Business intelligence and knowledge management.
- Managing personal selling.
- B2B communications decisions.
- B2B pricing strategies.
- Product development, innovation and creativity.
- Services management in business markets.
- Web intelligence and B2B e-commerce applications.

Although some of these areas have been covered in the set of papers accepted for publication, as a whole they represent a good starting point and, maybe, a seminal reference for future research efforts and proposals that can build on this topic. The remainder of this paper is as follows. First, we present the results of a literature review for the general topic of intelligent systems applied to marketing and, more specifically, for industrial marketing. Obviously, greater

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   [1] Search results are not static, so figures reported here on the number of papers after Scopus searches will vary over time.

attention has been paid to the latter, which contains a detailed description of each paper that matched the search criteria we set: basically, a paper which applies an intelligent system proposal to an industrial marketing issue. To our knowledge, this is the first review on this specific topic. Its interest lies not only in its novelty but also in the overall view that it offers regarding what has been done to date. Then, there is a brief overview of the set of papers in this special issue. Finally, the paper ends with some acknowledgements.

2. Background

2.1. Artificial intelligent-based solutions applied to marketing: a brief overview

In a basic search in Scopus for the terms *marketing* and *AI/intelligent systems* in business/management-related journals, the number of papers found is below 50. In Wierenga (2010), some reflections are made on the motives that might explain the limited materialization of such potentialities; e.g., the hegemony of Operations Research and econometrics-based methods as the traditional techniques used by managers to support decision-making on quantitative problems, or the insufficient attention paid to marketing applications in the AI field, among others. In this regard, the overall number of published articles, also considering more technical-oriented subjects (e.g., Computer Science, Decision Sciences, or Engineering, among others) treating issues on AI/intelligent systems applied to marketing, is below 300 (see Scopus). Fig. 1 shows the historical evolution (1972–2011) of published papers, from any source (e.g., journals, conferences, research book chapters, etc.) and source subject (e.g., business, economics, computer science, etc.), on AI and/or intelligent systems applied to marketing, based on the results of a basic search in Scopus.

Likewise, there is a lack of advanced research books with a clear focus on AI methods and applications for marketing, although there are some notable introductory books (e.g., Berry & Linoff, 1997; Matsatsinis & Siskos, 2002). By contrast, though specific books on the subject are scarce, there are books whose general scope touches on AI applications for management/business that contain chapters on marketing (e.g., Aliev, Fazlollahi, & Aliev, 2004; Bidgoli, 1998; Carlsson, Fedrizzi, & Fuller, 2003; Prasad, 2008). Recently, we edited a book volume titled "Marketing Intelligent Systems using Soft Computing: Managerial and Research Applications" (Casillas and Martínez-López, 2010), containing reflections of various renowned marketing and management scholars on the potentialities of AI-based methods for marketing, as well as a collection of advanced research works devoted to a variety of marketing issues.

We concluded that (see, also: Casillas & Martínez-López, 2009) the AI discipline offers real opportunities for advancing the analytical methods and systems used by firms to manage a variety of marketing issues. Furthermore, well-conceived and designed intelligent systems are expected to outperform statistical-based supporting tools in complex, qualitative and/or difficult-to-program marketing problems and decisional scenarios; secondly, these opportunities still need to be truly materialized by researchers and practitioners. More interdisciplinary and applied contributions are necessary for this promising research stream to really take off.

2.2. Intelligent systems applications for industrial marketing issues

This section focuses on analysing the current background on the specific topic of this special issue, i.e., intelligent systems applied to industrial marketing issues, and we have selected 10 representative papers for this purpose. Indeed, the literature is quite scarce, but we assume that the positive synergy of the two fields that make up this interdisciplinary topic and its great potential is a good omen for this emerging discipline.

We defined several fields for the analysis, with a business or a technical focus. The business-related fields are three: first, the topic of the article within the industrial marketing framework. We mostly based our analysis on the categorization that emerged in the extensive literature review on industrial marketing published in *Industrial Marketing Management* done by Laplaca (1997), though we added the new category of "e-commerce"; second, a description of the objectives/aims of the article's research; and third, a résumé of its main conclusions. The technical-related fields are three: a brief explanation of the researchers' motivations for using AI-based methods; information on whether the methods used were ad-hoc developed, already existing (e.g., a software package) or both; and, finally, a description of the typology of intelligent systems applied in such research.

In addition to the detailed description of each paper for this set of fields, which is shown in the Appendix, some conclusive ideas reached are that:

- The application of intelligent systems to manage industrial marketing issues has been scarce and mostly concentrated in the last decade.
- A consequence of the above question is that some industrial marketing topics are as yet unexplored, as a primary focus of attention in terms of ad-hoc applied intelligent systems; e.g., promotion.
- Topics of management and pricing account for about half the intelligent systems applications.

Fig. 1. Published papers (1972–2011) on artificial intelligence/intelligent systems applied to marketing (Source: Scopus, May 2012).