

COMPETITIVE INTELLIGENCE THROUGH SENTIMENT ANALYSIS

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Abstract

Purpose – The aim of our research is to identify new emerging technologies that could be used to gain competitive intelligence and to present a systematic literature review related to this topic.

Methodology/approach – Our methodology consists of a literature review for evaluating the validity of the proposed theory, namely quantifying the potential competitive gain generated by using sentiment analysis tools. Our methodology uses a mixed design of both qualitative and quantitative reviews and represents a cornerstone in the initial design of a more complex business approach.

Findings – Our main findings are related to the discovery of a limited research in this field, with few academic papers addressing the theme of improving a company's competitive advantage through the use of automated sentiment analysis techniques. Concurrently, the advantages of using these technologies in different businesses are clearly emphasized throughout the selected papers, which highlight its applicability in moderating challenges of business competitiveness in a global context.

Research limitations/implications – The research is limited to consider advantages of sentiment analysis implementation in gaining competitive intelligence. Moreover, literature is collected from selected databases and journals from 2010 to 2020.

Practical implications – The comprehensive literature review can provide the basis for a better understanding of the implications of using customers' opinion for developing competitive advantages, as well as encountered drawbacks or limitations.

Originality/value – Our paper constitutes a structured analysis of existing literature and it identifies key inquiries on subjects that require further research. Also, we identify key matter experts on the topic for a deeper understanding and study on the subject. At the same time, our literature review presents a merge of business analysis, management and technology, building an argumentation of how innovations in technology and science can improve businesses and provide solutions in usually disregarded areas.

Keywords: competitiveness, globalization, sentiment analysis

Introduction

In the current business environment one of the main resources is knowledge and thriving in a global market could depend on the development of strategies that have to take into consideration present and future competition at a world wide scale. If a few decades ago information about competitors was limited to market share and merchandise and it was satisfactory for the time being, the complexity and swift changes that modern times imposed to businesses determines broader directions of information gathering. It becomes important a better knowledge of opinions of one's own clients, or competitors' clients, services quality-price relations, sales volume and so on (Gracanin, S., Kalac, E., Jovanovic, D., 2015).

The increase in competitiveness levels has been determined by globalization, which is mediated by fast developing technologies. On one hand, technology facilitates innovation and research, but on the other hand it imposes challenges throughout organizations and managerial environments. The encountered challenges in a global economy are extremely diverse and range from conflicting corporate cultures, to mitigating risks from various areas. In this context, competitiveness at a global scale can be seen as an

opportunity, but also an impediment forcing management to consider differentiators in terms of innovation, efficiency, and customer responsiveness.

For identifying potential risks that may affect the proper development of a business it is necessary to collect and analyze information related to the plans and offers of competitors. Based on the resulted analysis a company could learn what its strengths and weaknesses are in relation to the market on which it operates. Conventionally, the sources for insights regarding competitors were mainly press releases, trade journals report and more recently companies' websites and news sites, but having only these sources has some downsides, because in the most cases the information is generated by the company itself. Hence, the existing information is limited and questionable in terms of objectivity. (Xu, K., Liao, S. S., Li, J., Song, Y., 2010).

Nevertheless, the emerging of second-generation web-based technologies (Web 2.0) represented by online media, online communities, social networking sites or blogospheres delivered and continues to do so, countless user generated content which encompasses valuable market intelligence and business insights (Kim, Y., Jeong, S., R., 2018). All of this information, coming directly from the targeted audience, becomes a chaotic but natural source for competitive intelligence, missing just the rights tools for extracting the necessary data.

According to some recent research studies, it has been observed that organizations where a competitive intelligence process is implemented are more successful in a competitive environment (Oraee,N., Sanatjoo,A., Ahanchian, R., M., 2020).

Throughout our research we gain knowledge over the usage of sentiment analysis tools for gaining a competitive edge by conducting a systematic literature review on existing studies and research papers linking competitiveness and sentiment analysis. Our analysis opens up the possibility of new research topics and contributions on the subject.

For example, Wang, H., and Gao, S., (2017) believe that extracting comparative opinions and product features in order to analyze competitiveness is in the interest of business for discovering weak points or strength of products.

Also, a research of He, W. and Zha, S., (2013) shows that competitive analysis using data extracted from social media through sentiment analysis help companies in understanding customer – generated content in order to improve their business.

The following sections present a comprehensive analysis of relevant discovered works related to competitive intelligence and sentiment analysis from specialized journals and databases.

Method

Research Question

The current paper aims to address a question regarding the extent of research related to using sentiment analysis to gather information and generate business-level competitiveness.

A detailed representation of the method used is presented in below., with each stage detailed in the following subsections. The selected papers are related to our research objectives

After defining our research question, we started with the formulation of a formal search strategy to analyze all available materials specific to the topic of this literature review which is described in the following sub-sections.

Search query

After establishing our research question and our objectives, we defined a formal search strategy for analysing the available papers that fits the objectives of the present work.

The terms selected for identify papers related to the subject refer to both sentiment analysis and competitive intelligence. Our searches included also some terms in the field in order to have a broader

view on the existing research. The search query used for the purpose of obtaining the list of articles in the online databases is the following:

("Competitive Intelligence" OR "Competitiveness" OR "Business Intelligence" OR "Competitive Knowledge") AND ("sentiment analysis" OR "opinion mining")

Although the above search query was the one meant to be used in all data sources, each search engine of the databases had a different configuration and there were sometimes restrictions related to the length of the query, the place in which the search will be applied (e.g. only title, full text, metadata etc.).

Data Sources

The papers analyzed during our research were extracted from several electronic international databases, as follows: Science Direct, IEEE Xplore Digital Library, Emerald Insight, ACM Digital Library, JSTOR. These data sources are typically used for conducting researches and they are acknowledged for integrating a large number of articles.

The results returned during our search for relevant articles in the previous mentioned data sources are described below, as well as the search queries used and adapted for each of the databases, including the number of articles found and their duplicates.

*ScienceDirect*¹ has an advanced search function that allows addressing a query in the Title, abstract or author-specified keywords. In order to identify the accurate articles for our literature review, we did an initial search using the full search query "competitive intelligence sentiment analysis" followed by several splits of the initial query into smaller sub-queries using the terms "sentiment analysis" OR "opinion mining" which were paired with either "competitive" OR "intelligence" OR "business". Although, some queries resulted in a large number of articles (e.g. sentiment analysis intelligence), the papers were on broader subjects related to sentiment analysis and not what we were trying to identify. Table 1 below presents the summary of ScienceDirect database inquiries

*IEEE Xplore Digital Library*² has the most complex search function of the queried databases which allows users to search in Metadata, Full text and Metadata, Document Title or many others. Also, there is the possibility of exporting the search results in a .csv format which can be very useful in conducting a thorough research.

Nevertheless, the query was modified and split so that it could match the restrictions in the platform interface for searching directly in a specific part of an article and due to the elaborated search function, the results were fewer but more relevant to the subject.

The results and the detailed sub-queries are presented in Table 1 below.

*ACM Digital Library*³ has a similar interface to IEEE Xplore and a similar function of advanced search, users being able to search the specific terms in Full text, Abstract, Keywords and many others article parts. Thus, search words were grouped so that relevant article could be found. The results are presented in Table 1 below.

*Emerald Insight*⁴ is one of the world's leading digital first publishers, with a broad possibility of research due to its advanced search function which makes possible to apply the search terms in different parts of an article. All the results and search queries used are described below in Table 1.

¹ <https://www.sciencedirect.com/>

² <https://ieeexplore.ieee.org/Xplore/home.jsp>

³ <https://dl.acm.org/>

⁴ <https://www.emerald.com/insight/>

Table 1. Centralized list of databases search queries and results

ScienceDirect			
	<i>Search query</i>	<i>Articles resulted</i>	<i>Articles relevant to the research</i>
	Title, abstract, keywords: sentiment analysis competitive	42	4
	Title, abstract, keywords: sentiment analysis intelligence	71	2
	Title, abstract, keywords: competitive intelligence sentiment analysis	8	1
	Title, abstract, keywords: opinion mining competitive	20	3
	Title, abstract, keywords: Opinion mining intelligence	29	2
IEEE Xplore digital library	((("Document Title":sentiment analysis) AND "Full Text & Metadata":competitive intelligence)	93	5
	("Abstract":competitive intelligence sentiment analysis)	5	1
	("Abstract":opinion mining competitive intelligence)	4	1
	((("All Metadata":competitive intelligence sentiment analysis) AND "Abstract":competitive)	44	1
ACM digital library	(title: "competitive intelligence" AND abstract: "sentiment analysis competitive intelligence")	6	1
	(title: "sentiment analysis" AND keywords: "sentiment analysis competitive intelligence")	32	0
	(all: "sentiment analysis competitive intelligence" AND abstract: "competitive intelligence")	3	0
	(abstract: "opinion mining" AND all: "competitive intelligence")	0	0
Emerald Insight	(all fields:"sentiment analysis competitive intelligence" AND title:"competitive")	4	1
	(all fields:"sentiment analysis competitive intelligence" AND abstract:"competitive")	85	3
	(title:"sentiment analysis" AND all fields:"competitive intelligence")	12	1
	(abstract:"opinion mining competitive intelligence")	2	1

Inclusion/exclusion criteria

The focus for our research was to find adequate papers in the field of sentiment analysis with applications in business and management through competitive intelligence. In order to ensure a relevant selection of articles we have chosen only the papers that had as a main subject either the advantages of competitive intelligence or applications of it and were from the sentiment analysis field.

Also, the period of time in which the papers were published was selected to be the last ten years, for having a literature review on recent researches.

We have excluded papers that were incomplete or only study cases together with articles which appeared as a result only because they had a subject in the sentiment analysis field, but studied a different subject on that matter.

Quality assessment

The next stage of our research method implied a full reading of the selected papers and a final selection of relevant work is presented in Table 2 below.

Table 2. Detailed list of selected articles

Paper name	Year published	Results
A global supply chain risk management framework: An application of text-mining to identify region-specific supply chain risks (Chu, C-Y., Park, K., 2020)	2020	A risk categorization (hierarchy) containing a total of seven global supply chain risk types and underlying risk factors was developed.
A generic framework for sentiment analysis: Leveraging opinion-bearing data to inform decision making (Kazmaier, J., Vuuren, J.H., 2020)	2020	Developed a framework to aid organisations in successfully leveraging unstructured, opinion-bearing data in combination with structured data sources to facilitate decision making.
Identifying comparative customer requirements from product online reviews for competitor analysis (Jin, J., Ji, P., Gu, R., 2016)	2016	Opinionated sentences referring to a specific feature are first identified from product online review and used on large amount of real data from Amazon.com in order to identify comparative features of a product.
Product Opinion Mining for Competitive Intelligence (Amarouche, K., Benbrahim, H., 2015)	2015	This article presents a new source that helps and leads the company to identify, analyze and manage the various risks associated with its business/products.
Mining comparative opinions from customer reviews for Competitive Intelligence (Xu, K., Liao, S.S., Li, J., Song, Y., 2011)	2011	The experiments on a corpus of Amazon customer reviews show that the proposed method can extract comparative relations more accurately than the benchmark methods.
Identifying competitors through comparative relation mining of online reviews in the restaurant industry (Gao, S., Tang, O., 2018)	2018	Proposing a novel model for extracting comparative relations from online reviews, and then constructing three types of comparison relation networks.
SoMEST: a model for detecting competitive intelligence from social media (Dai, Y., Kakkonen, T., 2011)	2011	Integrating a competitive intelligence analysis method, event timeline analysis, with natural language processing technologies which results in a novel social media analysis model, SoMES.
A Sentiment Analysis of Online Reviews Based on the Word Alignment Model: A Product Improvement Perspective (Li, S., Li, Y., 2018)	2018	Developed a word alignment model to analyze the customer's emotional response to product attributes in online comments, from the perspective of product designers and a method is applied to analyze online comments and develop appropriate product improvement strategies.

Conclusion

As expected, literature in the field of Sentiment Analysis applied to Competitive Intelligence is not vast, even though the initial search queries were showing hundreds of results; this gap was caused by the frequency of the term "Sentiment Analysis," and its many applications in research and development.

Once relevant articles were identified, an in-depth analysis showed that, there are many proofs in favor of the assumption that every business could benefit of the advantages that competitive intelligence

generates and using sentiment analysis for acquiring intelligence from the market offers more accurate data than traditional methods.

Further practical research and clear market insights after competitive intelligence processes integration is needed.

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