



Research paper

Identifying competitors through comparative relation mining of online reviews in the restaurant industry[☆]Song Gao^{a,b}, Ou Tang^b, Hongwei Wang^{a,*}, Pei Yin^c^a School of Economics and Management, Tongji University, Shanghai, China^b Division of Production Economics, Department of Management and Engineering, SE58183, Linköping, Linköping University, Sweden^c Business School, University of Shanghai for Science and Technology, Shanghai, China

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ABSTRACT

It is of importance for restaurants to identify their competitors to gain competitiveness. Meanwhile, opinion-rich resources like online reviews sites can be used to understand others opinion toward restaurant services. We thus propose a novel model to extract comparative relations from online reviews, and then construct three types of comparison relation networks, enabling competitiveness analysis for three tasks. The first network help restaurants analyze market structure for their positioning. The second network enables to identify top competitors using *competitive index* and *dissimilarity index*. The third network help restaurants identify strengths and weaknesses through aspects-comparison relation mining. Finally, the market environment is illustrated in a visual way according to the three types of networks. Experimental results reveal the effectiveness of the proposed competitiveness analysis using text analytics, which can identify top competitors and evaluate the market environment, as well as help the focal restaurant effectively develop a service improvement strategy.

1. Introduction

As a highly competitive industry, it is essential for restaurants to identify competitors and gain competitive advantages in the marketplace. Traditionally, information on competitors is obtained through printed media in the forms of news reports and surveys (Clark and Montgomery, 1999; Netzer et al., 2012). With the rapid development of mobile and web technology, social media has become a prevalent channel of communication for consumers and businesses. As a primary form of social media, online reviews, especially those embedded in mobile apps, allow consumers to share their consumption opinions and experiences at an unprecedented pace and scale (Mudambi and Schuff, 2010; Archak et al., 2011) and contain a large amount of competitor-rich information, especially in the form of product comparisons. Therefore, it is of great significance to develop a method and framework in order to facilitate the analysis of competitiveness of a restaurant and identification of its competitors through online reviews.

Enabled by the development of text mining technology, opinion mining of online reviews extracts product attributes and the corresponding opinions, based on which sentiment analysis can further assign sentiment scores to each aspects-opinion pair (Xu et al., 2011; Jindal and Liu, 2006). However, extant research mainly concentrates

on single-entity (product) opinion, whereas competitive information has to be conveyed through multi-entity (products) opinion, especially the comparative opinion. To tackle this research problem, in this paper a graph-based comparative relation mining method is proposed to extract comparative opinion and further construct a comparison network. To test the validity and verify the utility of the proposed method, experiments are conducted in the restaurant industry, and the results are analyzed to evaluate competitiveness and to identify competitors of the selected restaurants. Current study fills the research gap by developing a method to analyze restaurant competitive advantages through text analytics. It allows the decision-maker of a focal restaurant to identify the possible top competitors, understand market environment and the strengths and weaknesses concerning the focal restaurant and the competitors. More specifically, our contribution includes three aspects: (i) We construct different comparison networks based on three graphs so as to observe restaurants' competitive environment. It is a method of identifying competitors and market environment by mining consumers' opinions; (ii) As the comparison opinions often reflect actual evaluation information (Qazi et al., 2016), we provide a less ambiguous method for decision-maker to identify the possible top competitors and understand market competitive environment, as well as the restaurant's strength and weakness, based on which a better strategic decision can be made;

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(iii) Our method provides the opportunity of dynamic analysis of competitor identification using text mining. It can timely monitor the variation of competitors and other market changes using updated information about consumers' attitude.

The remainder of this paper is organized as follows: Section 2 reviews the related literature. Section 3 proposes our research design for competitor identification and market environment surveillance using online reviews information. Section 4 conducts the experiments using the data of consumer reviews in *Dianping.com*. Section 5 concludes our study and discusses some future directions for research.

2. Related studies

In this section, we review the most relevant literature according to the following areas: competitor identification, competitiveness of restaurants and tourism industry, service improvement strategy based on consumer perception, online reviews in restaurant industry, comparison opinion mining in restaurant industry.

2.1. Competitor identification

Identifying competitors has a great value for a restaurant, since it helps managers understand the changing marketing environment so as to adjust the market strategy and enhance profitability. Early studies also indicate that competitor identification plays an important role in competitive intelligence (Xu et al., 2011), for a better understanding of market structure (Netzer et al., 2012) and thus better strategic decisions.

Previous studies of competitor identification are summarized in Table 1. Most studies analyze competitors by using a survey method combined with content analysis. Chen (1996) and Peteraf and Bergen (2003) combine the resource and market information to identify the existing competitors, whereas neglect the threats and innovations of potential competitors. Wu and Olk (2014), Lederman et al. (2014), Peng and Liang (2016) suggest the importance of customers in the market environment, and they use an effective path to identify competitors. However, these studies only focus on a specific field or selected issues, thus the proposed methods and study conclusions are not applicable to other industries. However, in a study of market analysis, the competitor identification is seldom the final purpose, but instead enhancing competitiveness is often the intentions, i.e. through analyzing competitive strengths and weakness among all competitors. The above-mentioned studies lack the analysis of the latter issue. The above disadvantages can also be seen from Table 1.

2.2. Competitiveness of restaurant & tourism industry

Understanding the competitive advantages will facilitate the success of businesses. Many efforts are dedicated to set up strategies and operating procedures to obtain the competitive advantage and enhance performance against competitors (Kozak and Rimmington, 1999). In the restaurant and tourism industries, most research focus on three aspects: (i) What attributes really matter for competitiveness improvement (Enright and Newton, 2004)? (ii) How is the competitiveness assessed (Heung et al., 2003)? (iii) What is the likely relationship between competitiveness and firm performance or consumer behavior (Liu and Jang, 2009)?

Peng and Liang (2016), Xu et al. (2011) conduct a competitive analysis by using publicly available data in social media to mine strengths and weaknesses, as well as opportunities and threats among competitors. Fan and Gordon (2014) examine how social media analytics support competitive intelligence to help organizations understand their suppliers, competitors, environments, and overall business trends. It is also possible to use text analytics of online reviews to discover competitive strategy, which is in-depth information hidden within social media (Wu and Olk, 2014). The related studies are summarized in

Table 1
Summary of past studies of competitor identification.

Reference	Research	Approach	Advantages	Shortages
Chen, 1996	Proposing a framework for competitor analysis based on resource similarity and market commonality	Survey	<ul style="list-style-type: none"> ● Conceptualize the competitor analysis ● Finding the competitive advantage 	<ul style="list-style-type: none"> ● Only for existing competitors ● Insufficient comprehensive
Peteraf and Bergen, 2003	Providing a market-based and resource-based framework for scanning complex competitive fields	Survey	<ul style="list-style-type: none"> ● Facilitating the design of strategies ● Scanning dynamic competitive environments 	<ul style="list-style-type: none"> ● Limited range of solutions for competitive problems ● Not commonly applicable
Wu and Olk, 2014	Combining a relational view, a capability-based approach, and a managerial cognition view to predict competitor identification	Survey, statistical model	<ul style="list-style-type: none"> ● Dynamic competitor identification ● Finding strong customer ties have a positive impact on competitor identification 	<ul style="list-style-type: none"> ● Limited conclusions ● Some biases, i.e. no suppliers' data
Lederman et al., 2014	Developing a method to identify competitors in markets where spatial location is an important factor of differentiation.	Customer choice model	<ul style="list-style-type: none"> ● Characterize customer heterogeneity ● Providing a more finely detailed depiction of competitive interactions 	<ul style="list-style-type: none"> ● Complex ● Not commonly applicable in other industries
Peng and Liang, 2016	Developing a framework by using the similarities of capabilities and markets between the focal firm and its competitors, and particularly the influences of the emergence of a dominant design to delineate the competitive dynamics of inter-firm rivalry.	Case study	<ul style="list-style-type: none"> ● Finding the importance of development process of a dominant design ● Explaining motives for competitive threats from the market and the value chain 	<ul style="list-style-type: none"> ● Only focus on technology-driven firms ● Limited data source

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