



Text Mining Enabled CEET@I Methodology for Business Model Analysis with the Case of Sharing Bicycle

Wei Li

Research Center for Contemporary
Commercial Services, School of
Business, Hebei University of
Economics and Business,
Shijiazhuang, China, 050061
weilee@heuet.edu.cn

Yanpeng He

Research Center for Contemporary
Commercial Services, School of
Business, Hebei University of
Economics and Business,
Shijiazhuang, China, 050061
hyplqq@sina.com

Shugang Ma

Research Center for Contemporary
Commercial Services, School of
Business, Hebei University of
Economics and Business,
Shijiazhuang, China, 050061,
mashugang@126.com (Corresponding
Author)

ABSTRACT

The problem that “the successful business models fail to be duplicated easily” confuses the academia and industry. The CET@I methodology is the significant theoretical result about the problem. However, the CET@I methodology needs to be improved for it is unable to analyze the case of shared bicycle perfectly. Therefore, we investigate the documents about the shared bicycle through the text mining experiments which are basing on the Nature Language Processing technology. The results show that, the entrepreneurship is an important dimension of the tacit knowledge within business model. We incorporate the dimension of entrepreneurship into CET@I model to develop the CEET@I methodology; and then we demonstrate the validity of the proposed methodology. The current work provides a new perspective for the business model analysis in the context of sharing economy.

CCS CONCEPTS

• Computing methodologies; • Applied computing; • Social and professional topics;

KEYWORDS

Business Model, Sharing Economy, Integrative Analysis, Text Mining, Nature Language Processing

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1 INTRODUCTION

The business model is of vital importance to the production, operation, and profitability of an enterprise [1], a part of scholars even believe that the essence of a business model is the core logic of creating value for an enterprise [2]. It is precisely because of

its important role that the business model has attracted extensive attention from academics. At present, academics believe that a business model is a transaction and operation system composed of multiple elements [3-5]. Therefore, in their research on business models, many scholars try to explore the internal logic of corporate profitability by analyzing the elements of the business model.

Hamel (2001) held that the business model is composed of four elements: core strategy, strategic resources, value network, and customer interface [6]. Weill and Vitale (2001) believed that a business model should include three elements: infrastructure, critical success factors, and core capabilities [7]. Afuah & Tucci (2003) further refined the composition of the business model into multiple dimensions, such as customer value, business scope, price mechanism, connected activities, and economic core capabilities [8]. Johnson et al. (2008) believed that a business model is a complete system consisting of four interlocking elements: customer value proposition, profit formula, key resources, and key processes, among which the customer value proposition is the foundation [9]. Wei et al. (2012) argued that the business model is essentially a transaction structure of stakeholders, which includes six elements, namely, business systems, positioning, profit models, key resources and capabilities, free cash flow structure, and enterprise value. Among them, enterprise value is not only a constituent element, but also the purpose of an enterprise adopting a certain business model [10]. The academically influential Business Model Canvas proposed by Osterwalder (2004) covered key aspects such as value propositions, key activities, cost structure, customer relationships, and revenue streams that can affect the profitability of enterprises [11].

The above literature attempts to deconstruct the business model from the micro level, so as to explore the path for enterprises to create customer value and realize their own value. However, these studies fail to provide a good answer to the question that has long plagued academia and industry: why is a successful business model difficult to replicate? Among existing studies, one theory that can be used for an in-depth analysis of this problem is the CET@I methodology proposed by Wang et al. (2015) on the basis of the Iceberg Principle of the business model [12]. It describes the tacit knowledge of business models through the three dimensions of industry category, environment, and technology, and integrates with the explicit knowledge of business models (i.e., the aforementioned cost structure, profit model, customer relationship, etc.) to obtain a clear picture. The CET@I methodology asserts that successful business models are difficult to replicate because followers (that

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is, companies that try to replicate business models) have only paid attention to the explicit knowledge of business models, but have ignored the tacit knowledge of industry category, environment, and technology.

A CET@I methodology analysis of the case of sharing bicycle reveals that although the business models of followers and pioneers are the same in terms of explicit knowledge and tacit knowledge, followers cannot replicate the successful model of pioneers. In terms of explicit knowledge, bicycle-sharing companies share the same customer segments, revenue streams, and cost structures; in terms of tacit knowledge, bicycle-sharing companies belong to the same industry, face the same environment, and adopt the same technology. Thus, according to the CET@I methodology, bicycle-sharing companies can be considered to have the same business model; thus, these companies should have achieved similar business performance. However, in reality, the business performance of these companies varies: some companies have gained a big market share (e.g., Mobike), some companies have developed relatively slowly (e.g., Bluegogo), and some companies have even withdrawn from the market (e.g., Kuqi Bike). Therefore, there is still room for further extension of the CET@I methodology, that is, the CET@I Model has not covered other elements, and such elements can greatly affect the business model of shared bicycles and the business performance of bicycle-sharing companies.

Therefore, on the basis of the classic CET@I Methodology, this study extends the CET@I Model to incorporate entrepreneurship, which is an important dimension that depicts the tacit knowledge of business models. Moreover, this study proposes the CEET@I Methodology for business model analysis, and discusses its practical application through the case of bicycle sharing. Compared with the existing literature, this study is innovative: it examines a real case of the sharing economy, and on the basis of system integration, adopts the text mining technology to derive the hidden elements of business models, so as to extend the classic business model analysis method, thereby contributing a new perspective and methodology to the research on business models.

The rest of this study is organized as follows: the second part, based on the CET@I Methodology, applies text mining technology to construct a theoretical model of the CEET@I Methodology, which is an extension of the classic CET@I Methodology in the field of sharing economy; the third part discusses the application of the CEET@I Methodology through a typical case of bicycle sharing, and then elaborates why replicating successful business models is difficult; the fourth part provides the conclusions and suggestions for future research.

2 CET@I METHODOLOGY

2.1 Theoretical basis: CET@I Methodology

Academics have shared a common understanding that a business model is a complex system consisting of multiple elements. Although some of these elements are explicit knowledge that can be replicated across companies (e.g. value propositions, customer segments, key activities, and revenue streams as mentioned in the Business Model Canvas), some elements are tacit knowledge, which is subject to application scenarios and cannot be directly replicated

across companies (e.g., the environment in which a company operates). Therefore, Literature [12] believed that integrating explicit knowledge and tacit knowledge is necessary to obtain a clear business model structure. It is also believed that the tacit knowledge of business models includes industry category, environment, and technology, and then proposed the CET@I Methodology, where @I stands for Integration. Figure 1 shows the CET@I Methodology.

2.2 Extension of the classic methodology: theoretical model of the CEET@I Methodology

The CET@I Methodology provides a new paradigm for the study of business models, as it enables a refined analysis of business models from the two aspects of explicit knowledge and tacit knowledge. The CET@I Methodology helps answer the question of why replicating a successful business model is difficult: followers tend to focus only on the explicit knowledge of successful business models, while ignoring the differences in tacit knowledge between themselves and successful companies.

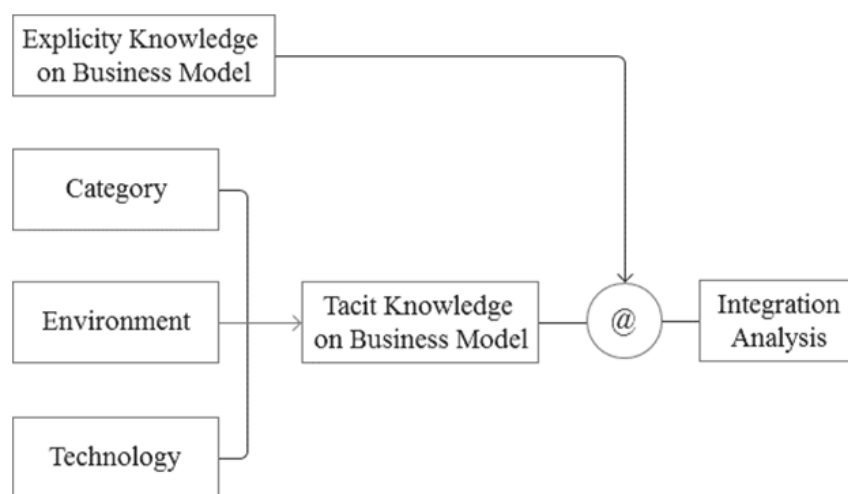
However, from the perspective of the sharing economy, the CET@I Methodology needs to be further extended. The sharing economy, also known as collaborative consumption (2018), is conducive to increasing consumer surplus of the whole society and achieving win-win outcomes between companies and consumers (2019). The development of China's bicycle-sharing industry can be summarized in three stages: pioneers entered the market, followed by the influx of competitors (Mobike, Kuqi, etc.), and then the business performance of bicycle-sharing companies started to vary. In this process, although the business behavior of each company is public (including the attraction of investment, the adoption of technology, and product launch, etc.), the business model of successful companies cannot be replicated by the entire industry. The CET@I Methodology is hereby used to analyze the shared bicycle business model.

First, the explicit knowledge of the bicycle-sharing business model is analyzed by using the Business Model Canvas proposed by literature [11]. By analyzing the 2017 China's Bike-Sharing Sector Report released by iResearch [13] and relevant online materials, the nine elements of the bicycle-sharing business model canvas are obtained, as shown in Table 1.

After the analysis of the explicit knowledge, the tacit knowledge of the bicycle-sharing business model is analyzed from the three dimensions of industry category, environment, and technology, as shown in Table 2.

An analysis of the bicycle-sharing business model using the CET@I Methodology shows that no significant difference is found in explicit knowledge or tacit knowledge between the business models of bicycle-sharing companies; however, in reality, the business performance of bicycle-sharing companies varies greatly. Therefore, some elements that have not yet been discovered can also greatly impact the business model. According to the Iceberg Principle of the business model [12], these elements are like the hidden part of the iceberg underwater and fall into the tacit knowledge of business models.

To explore the hidden elements of the CET@I Methodology, this study uses a text mining experiment to find elements from

**Figure 1: CET@I Model****Table 1: The Business Model Canvas**

Elements	Description
Customer Segmentation	Users for short distance riding
Value Propositions	Solving “the last mile problem”
Channels	Mobile Apps or platforms
Customer Relationship	B2C & B2B2C
Revenue Streams	Fee paid by users or advertisers
Key Resources	User base, Information Communication Technology
Key Activities	Bicycles rent
Key Partnership	Suppliers of bicycles, advertisers, investors
Cost Structure	Purchasing and maintaining bicycles, adoption of technology

Table 2: Tacit Knowledge on the

Dimensions	Description
Category	Sharing Economy, e.g. Uber &
Environment	Support from Chinese government to the development of sharing economy; Population of smart phone and mobile devices; Needs for improving air quality and easing traffic congestion
Technology	Mobile Computation; Big Data, Internet of Things, Artificial Intelligence

text data that can have a substantial impact on the operation of bicycle-sharing companies. The adoption of the text mining method is inspired by the TEI @I Methodology proposed by literature [14], who argued that text mining technology can be applied to the analysis of complex scenarios, especially when unstructured data are involved. The steps of the text mining experiment in this study are as follows:

Step 1: Text data collection

Using “shared bicycle” and “sharing economy” as the keywords, relevant academic materials from authoritative sources (e.g., academic publications) were retrieved from CNKI; using

“shared bicycle” as the keyword, the NLPIR-Parser software (<https://github.com/NLPIR-team/NLPIR>) was used to retrieve information from portal websites such as People’s Daily Online, China Youth Network, and China News Service; and 294 online materials, represented by academic publications, were obtained (those materials used in text mining could be obtained by contacting the corresponding author).

Step 2: Text data cleaning

The content of the above materials related to the lessons learned from the operation of bicycle-sharing companies was consolidated as the original corpus of text mining.

Step 3: Keyword analysis

With the NLP-Parser software as the text mining tool, keyword analysis was performed on the original corpus. Define each words or phrase as x_i , and the frequency of x_i (denoted as $Fr(x_i)$) could be calculated through Equation (1) in which x_{ij} represents the frequency of in each sentence.

$$Fr(x_i) = \sum_j x_{ij}$$

The result is the keywords (i.e., the 50 words with the highest frequency) that representing the key factor behind the success or failure of bicycle-sharing companies.

Step 4: Tracing back in the original corpus

In the word cloud chart, the font size of a keyword represents the frequency of this word in the original corpus. The more frequent the keyword is, the larger it appears. Often, words (herein refers to content words with substantive meaning) that appear frequently tend to be more important. Therefore, the larger the keyword appears, the more important it is to the operation of the bicycle-sharing company. The word cloud chart shows that keywords that have a great impact on the operation of bicycle-sharing companies are “distribution,” “deposit,” “credit,” “capital,” “cost,” “turnover,” and “competition.” These keywords were then traced back in the original corpus to obtain the key factors affecting the operation of bicycle-sharing companies. The three main factors identified were: satiating the user demand for convenient and cheap transportation, holding a large market share, and obtaining huge financing support.

The results of the text mining experiments show that satisfying user needs to create user value, expanding market share to achieve economies of scale, and obtaining financing support to ensure sufficient cash flow have a significant impact on the operation of bicycle-sharing companies. In reality, however, whether user needs can be satisfied depends on whether the company manager has a deep understanding of the user needs, and it is actually a test of the manager’s insight. Given the high degree of homogeneity across shared bicycle services, expanding market share has become an important way for bicycle-sharing companies to gain a competitive advantage; in addition, against the background of homogeneity, the key to win over users is to innovate in products and services, so as to stand out in the competition in a homogeneous market. This challenge is a test of the manager’s innovation capability. Whether a company can gain financing support depends on whether the manager dares to communicate with venture capital firms, and it is a test of the manager’s ability to take risks and to communicate. Profound insight, daring to innovate, daring to take risks, and good communication skills are all major examples of entrepreneurship [15]. Thus, the results of text mining reveals that the key factor affecting the operation of bicycle-sharing companies is the entrepreneurial acumen of the manager.

Therefore, this study argues that entrepreneurship is also a key component of the tacit knowledge of business models, and it is then integrated into the classic CET@I Model to construct the CEET@I Model for business model analysis, as shown in Figure 2. Among the dimensions shown in the model, “category” and “entrepreneurship” are the attribute dimensions, “environment” is the spatial dimension, and “technology” is the time dimension.

3 APPLICATION OF THE CEET@I METHODOLOGY

After the establishment of the theoretical model of the CEET@I Methodology, the practical application of this method in bicycle sharing is analyzed. The explicit knowledge and the three dimensions, namely, industry category, environment, and technology of the tacit knowledge of the bicycle-sharing business model have been discussed in detail above and will not be repeated here. On the basis of the case of bicycle sharing, this study focuses on how the entrepreneurship dimension in the tacit knowledge of the bicycle-sharing business model affects the business performance of bicycle-sharing companies.

(1) Bluegogo: Compared with other shared bicycles, Bluegogo has more functions, such as variable speed and electronic navigation, which provide a better cycling experience for users; hence, it is also known as “the best shared bike for users.” However, the rich set of functions, although they create a good cycling experience, increases the cost for the company. In fact, the managers of Bluegogo fail to have a deep understanding of user demands for shared bicycles; users only choose to ride shared bicycles for short-distance trips, and accordingly, the core of user demands lies in affordability and convenience (including ease of pick-up and return) rather than in variable speed and electronic navigation. Therefore, from the perspective of entrepreneurship, Bluegogo fails to have a precise insight into user demands, resulting in an improper business model of the company.

(2) Xiaoming Bike: Xiaoming Bike developed very rapidly shortly after it was launched. It completed two rounds of financing in only one year, attracting a total of 4 million users and holding over 800 million yuan in deposited funds. However, Xiaoming Bike’s business performance declined rapidly after that and became the first shared bicycle to withdraw from the market. From the perspective of entrepreneurship, Xiaoming Bike failed soon after experiencing rapid development due to the lack of innovation. Specifically, after obtaining venture capital financing, Xiaoming Bike, instead of seeking innovative and delicate development, turned to blind expansion, that is, expanding the market size through distribution of more bicycles into the market. In addition, Xiaoming Bike focused only on short-term profits and even used deposits to conduct related-party transactions. By sharp contrast, Mobike has launched a deposit-free service and cooperated with partner companies to serve its users (for example, Mobike works with theaters and users who have completed certain tasks within a specified time are rewarded with free tickets). Through these innovative services, Mobike has gained high user loyalty and a steady market share.

(3) Kuqi Bike: The reason for Kuqi Bike’s failure is the lack of financing, which led to capital chain rupture. Owing to the large amount of money required for the operation and maintenance of shared bicycles, managers of bicycle-sharing companies often have to negotiate with venture capital firms for several times to complete multiple rounds of financing. For example, according to the data on Mobike’s official website (<https://mobike.com/cn/news/>), Mobike has completed its Series E financing, accumulating a total of US\$1 billion. By contrast, Kuqi Bike, instead of proactively seeking financing, used registered users’ deposits for production and operation. Currently, bicycle sharing is the most sought-after

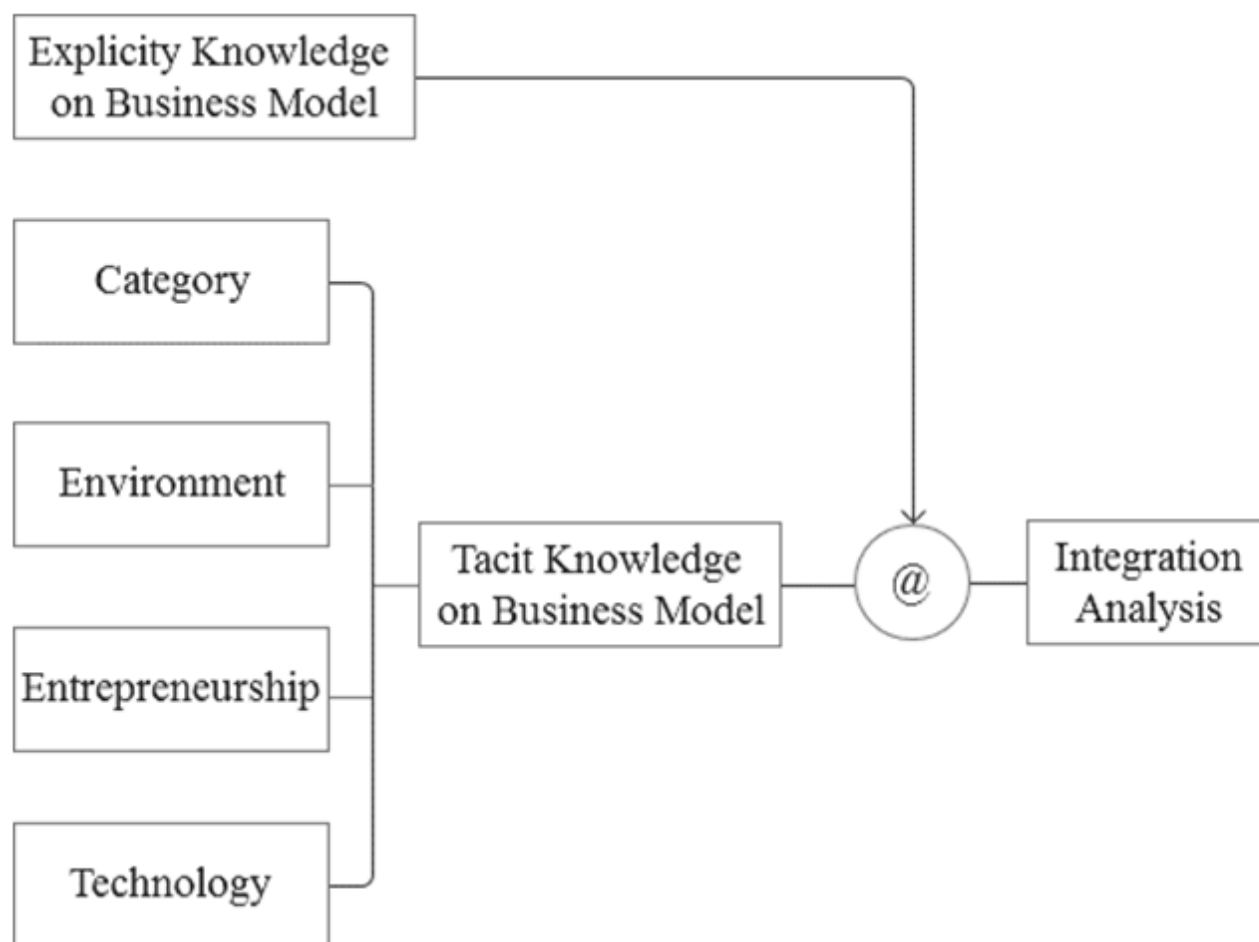


Figure 2: CEET@I Model

business for entrepreneurs, and has attracted many venture capital firms such as Sequoia Capital, Temasek, and Hillhouse. Under such accommodative financing conditions, Kuqi Bike failed to obtain funds to maintain its operations. Thus, the managers of Kuqi Bike lacked the entrepreneurship of being adventurous and enterprising, which ultimately led to the capital chain rupture.

The above case analysis of bicycle sharing from the perspective of entrepreneurship reveals that it is precisely because of the differences in the managers' insight into user demands and entrepreneurship such as innovation and risk-taking that, despite the similarities in value propositions, revenue streams, customer relationships, channels, industry category, environment, and technology, the business performance varies greatly across bicycle-sharing companies. Thus, the dimension of entrepreneurship in the tacit knowledge of the business model makes it difficult for other bicycle-sharing companies to replicate the business models of a few successful companies such as Mobike. This challenge has contributed to the current oligopolistic bicycle-sharing market.

4 CONCLUSION

The problem of why a successful business model is difficult to replicate has long plagued scholars and entrepreneurs. On the basis of the classic business model analysis method, the CET@I Methodology, and through text mining and analysis of relevant text data on the operation of shared bicycles, this study believes that entrepreneurship is an important dimension of the tacit knowledge of business models. Hence, this study incorporates entrepreneurship into the CET@I Model to establish the CEET@I Methodology for business model analysis, and discusses why, in the bicycle-sharing market, the followers cannot replicate the business models of successful companies. Follow-up research is planned to be conducted in the three aspects:

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