A New Analytic Framework for Identifying Tour Routes Service Innovation Using Knowledge Graph

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Abstract: In recent years, the innovation of service products in the e-commerce Red Sea area is still facing challenges due to their own content heterogeneity and indivisibility. Identifying innovation based on the characteristics of service components can help companies improve product competitiveness in increasingly intense market competition. In this paper, we present a new analytic framework to identify service innovation of tour routes that tackles the challenges of product similarity measurement. A knowledge graph-based method of service products is developed to obtain the dynamic weight of each dimension, and aiming to calculate the importance of graph network nodes through entity definition and attribute extraction after dimension division. Furthermore, we construct a small-scale knowledge graph of tour routes in the Ctrip. The results show the effectiveness of the proposed approach in terms of accurately identifying the level of service innovation, and provide a benchmark for exploring the difference in product unstructured attributes.

Keywords: Service innovation, E-commerce platform, Tour routes, Analytic framework, Knowledge graph

1. INTRODUCTION

In the context of increasingly fierce market competition, online sellers are constantly innovating and iterating their products to improve core competitiveness. Service innovation refers to the innovation taking place in the various contexts of services, including the introduction of new services or incremental improvements of existing services[1]. Compared with tangible products, service products have four distinct characteristics: intangibility, inseparability, non-storability, and variability in quality[2]. Meanwhile, the key components that constitute attribute characteristics of service products can't be identified like physical products, such as cell phones, refrigerators, laptops, and so on. One of the major challenges companies currently are facing is how to use a quantitative method to make reasonable and precise decisions when a large amount of text content is presented.

The calculation method of text similarity is a measure of product innovation in the field of text mining and sentiment analysis, but it is difficult to give a refined similarity judgment according to products contents available in e-commerce platform. This raises the need for a more flexible and hierarchical framework that can be used to analyze service products. The following research work collects the product data of outbound travel routes in the Ctrip platform to construct a small-scale knowledge graph and focuses on the question: ***How to identify the service innovation of tour routes through the analytic framework using a knowledge graph method?***

2. METHODOLOGY

A knowledge graph is a kind of semantic network and has a good representation of structured knowledge which provides a good idea for our research. To express the multi-dimensional information of products, the innovative identification of service products needs to be established based on product structure segmentation[3]. Accordingly, we transform the service characteristics of tour routes into relatively structured and quantifiable attributes. As shown in figure1, we develop a new analytic framework based on the knowledge graph to decompose the service features of the product into components and propose a new method for calculating the

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importance of graph nodes to weigh the dimensions extracted by the product.
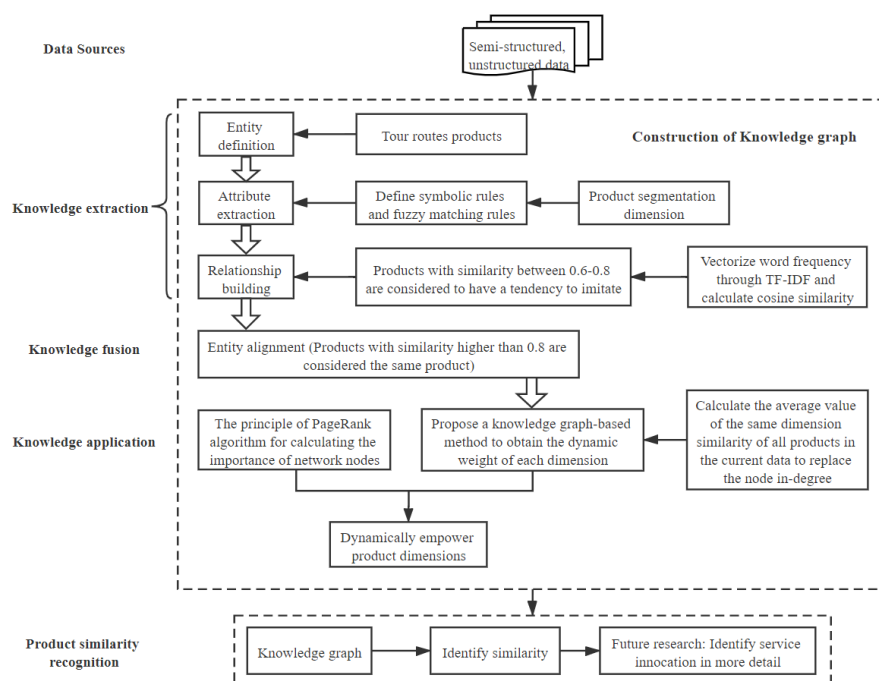

Figure 1.   Analytic Framework

3.   RESULTS AND IMPLICATIONS

In the actual calculation process, compared with products with obvious imitation behaviors identified by TF-IDF method, the similarity obtained by the dynamic weight similarity calculation method is more accurate. By comparing the similarity of all tour routes data in December 2017, we select the data with the similarity between 0.2-1.0, 0.4-1.0, 0.6-1.0, and 0.8-1.0 to calculate the average value. Within the same similarity range, the knowledge graph method can identify more dimensional features than the TD-IDF method, and get richer service innovation characteristics.

The identification of service product innovation in our study is closely linked to the unbundling of service products into separate components. Modularization has in turn served as a catalyst for innovation in the Ctrip platform, by providing new insights into how the individual components can be rearranged into new products. In addition, this study use the knowledge graph to obtain more accurate similarity recognition. The analytic framework of weighting the dimensions of unstructured features break through the previous method of quantifying product innovation. What's more, identifying service innovation of tour routes based on the analytic framework of the knowledge graph has the following two advantages:

(1) Dimensional division narrows the scope of innovation identification.

(2) Establish the connection between the service attributes of the tour routes.

REFERENCES

[1]   Durst S, Mention A L,Poutanen P. (2012).Service innovation and its impact: What do we know about?.Investigaciones Europeas de Dirección y Economía de la Empresa,21(02):65-72.

[2]   Martínez T. (2013). Application of evolutionary computation techniques for the identification of innovators in open innovation communitie. Expert Systems with Applications.

[3]   Abrahams A.S., Fan W., Wang G.A., Zhang Z, Jiao J. (2015), An Integrated Text Analytic Framework for Product Defect Discovery. Production and Operations Management, 24: 975-990.