

# A case-based method for service-oriented value chain and sustainable network design



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## ABSTRACT

**Purpose:** The purpose of this research is to present a case-based analytic method for a service-oriented value chain and a sustainable network design considering customer, environmental and social values. Enterprises can enhance competitive advantage by providing more values to all stakeholders in the network.

**Design/methodology/approach:** Our model employs a stylized database to identify successful cases of value chain application under similar company marketing conditions, illustrating potential value chains and sustainable networks as references. This work first identifies economic benefits, environmental friendliness and social contribution values based on prior studies. Next, a search engine which is developed based on the rough set theory will search and map similarities to find similar or parallel cases in the database. Finally, a visualized network mapping will be automatically generated to possible value chains.

**Findings:** This study applies a case-based methodology to assist enterprises in developing a service-oriented value chain design. For decision makers, this can reduce survey time and inspire innovative works based on previous successful experience. Besides, successful ideas from prior cases can be reused. In addition to customer values, this methodology incorporates environment and social values that may encourage a company to build their value chain in a more comprehensive and sustainable manner.

**Research implications:** This is a pilot study which attempts to utilize computer-aided methodology to assist in service or value-related design. The pertinent existing solutions can be filtered from an array of cases to engage the advantages from both product-oriented and service-oriented companies. Finally, the visualized display of value network is formed to illustrate the results.

**Practical implications:** A customized service-oriented value chains which incorporates environment and social values can be designed according to different conditions. Also, this system engages the advantages from both product-oriented and service-oriented companies to build a more comprehensive value network. Apart from this, the system can be utilized as a benchmarking tool, and it could remind the decision makers to consider potential value from a more multifaceted perspective.

**Originality/value:** This is the first paper that applied a computer-aided method to design service-oriented value chains. This work also can serve as a decision support and benchmarking system because decision makers can develop different value networks according to various emphasized values. Finally, the visualized display of value network can improve the communication among stakeholders.

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## 1. Introduction

Nowadays, many companies are confronted with fierce market competition. Some companies adopt a low-price or a high-quality strategy to remain competitive, while others endeavor to extract

a profit through cost reduction. However, the benefits derived from these approaches have certain limits since around 70% of product cost [1] and 80% of quality are determined in the design stage [2], and there is often no resulting significant difference in customer perception or purchase intention.

When entrepreneurs recognize that internal improvements might not help them achieve success, they begin to look outward. As early as 1954, Drucker [3] pointed out that what customers buy is not the product itself, but rather the value that customers perceive with that purchase. Shifting the business mindset from being

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product-oriented to being service-oriented has become the mainstream. The concepts of servitization and the service-oriented value chain have evolved as a direct result of that shift. Apart from the customer value, environmental and social values are also taken into consideration in the concepts of servitization and the service-oriented value chain. With these three perspectives, a sustainable value system can be constructed.

Using Manzini and Vezzoli [4] as an example, consider an AMG solar heat selling service. This is a service about selling heat instead of selling water heaters as the final product. With this service, customers no longer need to deal with any maintenance problem, because the service provider will take care of those chores. The company can attract interesting suppliers or partners to build a network, while also looking for efficient ways to properly manage existing resources and reduce any of the environmental impacts.

However, while servitization, service-orientation concepts, and their relations to sustainability have been introduced, many companies still have difficulty in identifying, creating and delivering the sought-after value to their customers and partners. Besides, there are too many ill-defined variables such as comfort, equity, and health involved in the sustainable value system. The way for companies to achieve sustainability is unknown and the most of variables are hard to precisely define.

Therefore, the purpose of this research is to create a case-based system that can be used to inform and instruct decision makers to help them with developing a sustainable network (including both environmental and social sustainability) linked by a value chain. Case-based system is a decision-making procedure which can suggest a decision based on past experience. Case-based reasoning is a fundamental problem solving paradigm which can utilize the specific experience to generate solutions. With this system, fundamental and repetitive search work is executed automatically. The decision makers can capture and employ solutions from previous successful cases as guideline to inspire value creation and innovation through a case-based system. This paper includes a visualized network display framework that shows the results of final decisions, allowing the value network design process to interactively use a what-if analysis.

The organization of the paper is as follows: Section 2 presents a literature review of three main topics: Section 2.1 describes case-based reasoning, its background, supported methodology and applications; Section 2.2 addresses value chain and value network analysis; and Section 2.3 introduces values identification. Section 3 proposes a case-based method illustrating how to devise a service-oriented value chain design, while taking environmental and social values into consideration. In Section 4, data from a car rental business is used to demonstrate the system's operation. In the last Section, conclusions and contributions are addressed.

## 2. Literature review

### 2.1. Case-based reasoning

When people learn how to do something new, they may rely on previous knowledge or experience [5]. Case-based reasoning (CBR) is a decision-making procedure that mimics the human decision-making process. It is based on the premise that although people can make a decision based on experience, they cannot always access the most appropriate information they need to make that decision. CBR is applied to solve a new problem based on previous similar situation, and to reuse the knowledge and experience from that situation [6]. Its definition was stated by Watson [7], 'A case-based reasoner solves problems by using or adapting solutions to old problems.' A CBR-cycle is often used to describe the system framework and features with active elements: retrieve, reuse,

revise and retain [6]. Fig. 1 illustrates the typical CBR process. After entering the problem description of a new case, a CBR system retrieves cases from a database and screens out the relevant cases according to their similarity to the new concept. Second, it reuses the solution or relevant information from the most similar screened-out cases, and third, it revises the provided solution if necessary. Fourth and the last, the CBR system retains the experience related to the new cases to increase the system's knowledge base as the reference for future problem solving.

While there are various types of AI decision-making methodology, CBR is appropriate when knowledge is incomplete or sparse. In contrast to a traditional AI system that provides a deterministic solution, a CBR system attempts to provide users with solutions based on past experience. Regardless of whether the solutions are always optimal or even correct, the CBR system provides users with answers in a simple and straightforward way [5].

CBR systems have been widely applied in many areas, and in medical field, CBR system is recognized to solve the tasks by previous studies. Numerous studies have utilized CBR to support the diagnosis process. Garrell i Guiu et al. [8] combined CBR and Genetic Algorithms to diagnose breast cancer automatically. Huang et al. [9] integrated CBR with data mining techniques to develop a model of chronic disease prognosis and diagnosis. Begum et al. [10] summarized 34 CBR systems or projects in the health science, and revealed the recent trend that multiple-purpose CBR has become necessary. Besides, AI techniques and other methods should be combined to improve the system, such as Artificial Neural Networks, Genetic Algorithms, and Fuzzy. Furthermore, in innovative design domain, CBR can serve as a consulting system to assist users. Yang and Chen [11] integrated CBR system and TRIZ inventive principles to accelerate eco-innovation

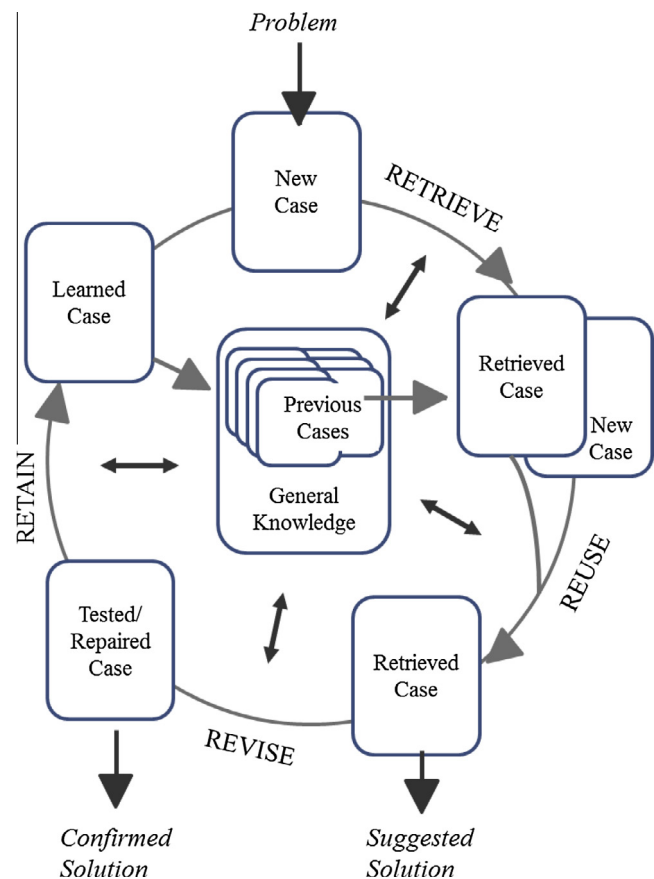


Fig. 1. Case-based reasoning (CBR) cycle [6].

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