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A PSO-based intelligent service dispatching mechanism for customer expectation management

Yen-Hao Hsieh [a,*], Soe-Tsyr Yuan [b], Ruei-Lin Kuo [c]

[a] Department of Information Management, Chia Nan University of Pharmacy and Science, Tainan, Taiwan
[b] Department of Management Information Systems, National Chengchi University, Taipei, Taiwan
[c] Value-Added Service, Department of Data Communication, Business Group, Chunghwa Telecom, Taipei, Taiwan

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ABSTRACT

In the era of experience economy, service providers have to provide customers with high quality service experience in order to attract more customers and achieve higher customer satisfaction. Managing customer expectation is a critical approach for service providers to consider. Although customer expectation has been discussed across different research disciplines, to our knowledge, there is still no systematical and feasible way to apply customer expectation management into real environments. This study attempts to establish an intelligent service dispatching mechanism by using particle swarm optimization for customer expectation management. This mechanism can help service providers design and deliver satisfactory service experience to customers. In order to evaluate the effectiveness and robustness of this mechanism, this study employs micro- and macro-simulation experiments to confer and analyze its performance. The simulation results show service providers can gain benefit and raise customer satisfaction by managing customer expectation during service experience delivery. Meanwhile, customers can also receive memorable experiences and have positive responses to service providers and other customers. Consequently, a high performance ecosystem within service providers and customers can be formed.

1. Introduction

The service industry has been key to driving economic growth. Businesses need to pay attention to customer feedback to better provide service (Berry, Carbone, & Haeckel, 2002; Meyer & Schwager, 2007). A memorable service experience could improve customer loyalty and reputation of service providers leading to greater profit. The experience the consumer has during a service encounter significantly influences their assessment of the service provider (Lewis & Entwistle, 1990; Soloman, Surprenant, Czepiel, & Gutman, 1985). Svensson (2006) indicated previous research is seldom from service provider perspective (mainly emphasizing customer perspective), thus no sophisticated approach to dynamic service encounters exists for service providers to ensure effective services. How to provide high quality experiences for customers is critical.

Parasuraman, Berry, and Zeithaml (1991) noted that service providers must recognize customer needs in order to fulfill expectations to achieve high customer satisfaction during the service experience. Managing customer expectation is an important approach to enable customers to have a satisfactory experience (Kurtz & Clow, 1992–93; Pitt & Jeantrout, 1994; Clow & Beisel, 1995; Coye, 2004). Service providers can provide customers with appropriate services according to their expectations. Competent service providers can raise customer expectations in order to achieve a customer franchise and build a threshold that competitors must achieve to enter the market (Parasuraman et al., 1991). For instance, FedEx uses information technology to offer tracking of packages, where customers can use computers for real time tracking of their package. Consequently, customer expectation management is a strategic way to deliver a high quality service experience and enhance the service provider's competence.

Previous research suggests understanding customer expectation is essential for the service experience. These investigations have been collected by empirical methods, such as conducting surveys. There are potential biases from customers who may not have a clear memory of their experience (Homer, 1993). Lessons learned from the survey method may be insufficient to provide the most current and accurate knowledge required to guide the service practices. We argue that there is a need for a systematic and quantitative approach to understanding customer expectations with adequate service during delivery, especially in real time environments. However, the context of the interaction is complex and variable; service providers can encounter many difficulties in managing customer expectations, offering sufficient service and creating a satisfying experience in a dynamic environment (Ho &

* Corresponding author. Tel.: +886 229393091x85024; fax: +886 2 29393754.
E-mail addresses: yhhsiehs@mail.chna.edu.tw (Y.-H. Hsieh), yuans@mis.nccu.edu.tw (S.-T. Yuan), sunnysray@cht.com.tw (R.-L. Kuo).

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Zheng, 2004; Hubbert, Sehorn, & Brown, 1995). For example, service providers should first consider customer needs, resource arrangement and market reports to make appropriate decisions for delivering existing services within a dynamic service context. Moreover, service providers should also collect customer responses, especially for satisfaction compared with expectations after the interaction. This study attempts to explore the following research questions and thereby set the stage for future service research.

- What kinds of approaches can help service providers effectively design and deliver high quality service experience within the dynamic service contexts?
- How can service providers systematically combine customer expectation management with service experience delivery in practice?

To examine these questions, this study employs the particle swarm optimization (PSO) approach to intelligently and effectively select appropriate services for managing customer expectations and offering high quality service in a dynamic environment. The particle swarm optimization approach can simulate human behaviors underlying different requirements and goals. To maximize value for customers from the perspective of expectations and minimizing costs of service providers, the PSO-based mechanism is utilized. We propose an intelligent service dispatching mechanism which can ensure a high quality service experience and select suitable services for customers by analyzing and computing customer expectations, service encounter situations and strategic goals of service providers. The objectives of this study are to: (1) provide a PSO-based approach that can select appropriate services for customers in different situations through calculations to maximize expectation-based customer value and by minimizing service costs of the provider, (2) to study in detail the feasibility and process of implementing customer expectation management in a real time and dynamic environment.

This paper is structured as follows. Section 2 describes the conceptual framework of customer expectation management. Section 3 further delineates the PSO-based service dispatching mechanism. Section 4 then details the simulation experiments and the result analysis. Finally, the conclusion remarks are provided in Section 5.

2. A conceptual framework for customer expectation management

This study proposes a conceptual framework of customer expectation management (as shown in Fig. 1) to delineate how service providers can employ particular tactics to influence customer expectations during the encounter to achieve high quality service experience. The conceptual framework will serve as the basic foundation for building the PSO-based intelligent service dispatching mechanism. The details of the framework are provided in Section 2.2.

2.1. Theoretical foundations

2.1.1. Expectation theory

The nature of customer expectations concerns what customers expect and determines what should be happening during the service encounter (Zeithaml, Berry, & Parasuraman, 1993; Boulding, Kalra, Staelin, & Zeithaml, 1993). Customer expectations can also be viewed as the anticipation of how excellent the service can be offered by service provider. Parasuraman et al. (1991) proposed that customer expectations have two levels: the desired expectation and the adequate expectation. Desired expectations represent the level of service a customer hopes to receive, defined as the level at which a customer wants the service performed. It is a combination of what the customer believes "can be" and "should be", while adequate expectations, a lower level of expectation, are considered to be customer's acceptable level of performance. This relies on the customer's assessment of what the service "will be" (Zeithaml et al., 1993).

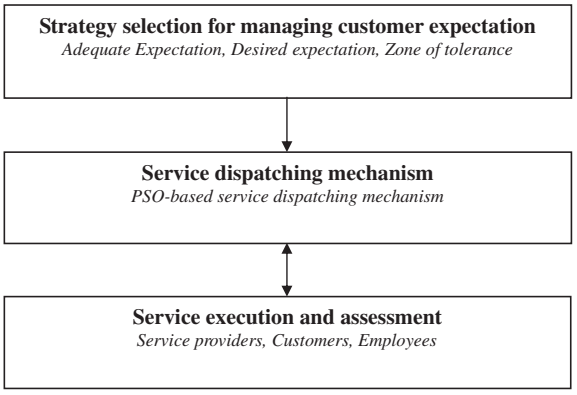

Fig. 1. Conceptual framework of customer expectation management.

The zone of tolerance for customers is influenced by several complex factors during the encounter (Zeithaml et al., 1993). Zeithaml et al. (1993) proposed a comprehensive framework of service expectations and defined eleven antecedent factors which could affect the desired and adequate expectations (as depicted in Fig. 2). Parasuraman et al. (1991) specified that service providers with higher competence can raise customer expectations to narrow the zone of tolerance by providing proper services in order for achieving the customer franchise. Consequently, recognizing these determinants can lead to an operational design strategy to achieve customer expectations.

This study attempts to propose a PSO-based intelligent service dispatching mechanism to provide effective services at the right time and in the right situation, which can influence the adequate expectation, the desired expectation and the zone of tolerance of customers. In this way expectation-based values can be maximized for customers while minimizing cost for providers.

2.1.2. Particle swarm optimization

Particle swarm optimization (PSO) is inspired by the social behavior of natural swarms. By computing patterns in nature, results can be applied to complex optimization domains, and provide an alternative to conventional evolutionary computation approaches.

Each solution is referred to as a "particle" and each moving particle in the multi-dimensional solution space with its own fitness value through mapping the fitness function. Each particle also has a velocity to determine distance of movement and next direction. Consequently, moving each particle in a multi-dimensional solution space is decided by the local best value and global best value. In other words, each particle selects the next direction based on the best value of its own experience (Cognition-only Model), simultaneously comparing the best value for the whole swarm (Social-only Model). Each particle is constantly updated for best values to decide the appropriate direction find an optimized solution (Kennedy & Eberhart, 2001).

The steps of the PSO algorithm are:

(1) *Initiation:* Choosing the position and velocity of each particle randomly.
(2) *Evaluation:* Calculating the fitness value for each particle according to the fitness function.