ONLINE ENGAGEMENT INVESTMENTS OF ONLINE TRAVEL AGENCIES: A GAME-THEORETIC APPROACH

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ABSTRACT

The widespread prevalence of the Internet has led to the increasing dependence of customers on online travel agencies (OTAs) in their making purchasing decisions. OTAs that aim to increase market share and obtain higher profits need to find ways of maintaining loyal customers and at the same time attracting new ones. This study examines customer loyalty from the perspective of online engagement investment of OTAs. Although many studies in the marketing literature have described the influence of customer engagement on customer loyalty, the majority of these studies rely on theoretical conceptual frameworks or empirical research, and do not provide any solutions for optimizing engagement investment. Thus, in this study, we examined how OTAs make investment decisions with regard to encouraging online engagement of customers. In addition, we analyzed the market evolution and game equilibrium of a given online travel market with respect to the results of the optimal decisions. We believe that the findings of this study have important implications for e-commerce researchers and practitioners, particularly for operators of OTAs.

Keywords: Online engagement investment; Online travel agencies; Customer loyalty; Market evolution

1. Introduction

In view of the rising prevalence of the Internet, online travel agencies (OTAs) have emerged as a key modality for managing the increasing tourism demand of customers. The rapid growth of the tourism industry coupled with the perceived advantages of information technology, such as its sophisticated and multifunctional nature, has driven OTAs as new communication and distribution channels for customers and travel products/services. In other words, OTAs provide customers with electronic platforms for purchasing travel products/services, particularly customized ones, without any limitations of time and place [Anderson 2011; Clemons et al. 2002; Guo & He 2012; Ling et al. 2011].

To encourage competition in the market, OTAs devise ways to improve their performance, such as providing customized service. In recent years, an increasing number of customers are utilizing OTAs in designing their travel itineraries [Guo et al. 2013]. The bookings made in the OTA market in the United States exceeded $150 billion in 2013 [Trefis 2015]. In China, travel products purchased from OTAs reached 56.42 billion in the first quarter of 2014 [iResearch 2014]. These statistics show that the online travel market offers profitable business opportunities for online travel companies. Numerous OTAs, such as Priceline, Expedia, Orbitz, and Ctrip, have flourished on the Internet around the world. As leading OTAs, Expedia and Priceline are forming an alliance in the global OTA market. OTAs that wish to obtain a high revenue and maintain a large market share need to make more investments to attract new customers and maintain loyal ones.

In marketing research, engagement has been receiving increasing attention in recent years [Bowden 2009; Brodie et al. 2011b; Stibe et al. 2013]. With the growing prevalence of the Internet, researchers have begun analyzing the role of engagement in enhancing customer loyalty in the online environment. For instance, Cheung et al. [2012] demonstrated that customer engagement behavior influences loyalty intentions (repurchase intention and intention to recommend). The current study conceptualizes engagement as the manifestation of user experience on online

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platforms [Brodie et al. 2011a]. In other words, engagement refers to the psychological state that represents the extent of pleasure and involvement in an activity or interaction within OTAs. Highly engaged customers tend to exhibit enjoyable and pleasant preference for user experience with OTAs, which ultimately translates to customer loyalty [Cha 2011; Shim et al. 2015]. Therefore, OTAs need to increase their investments for online engagement to maintain a consistent stream of online reservations. In this study, online engagement investment refers to the investments that encourage the pleasant/enjoyable preference for user experience with OTAs. Examples of such investments include providing various tools that support interactions and effective communications (e.g. rating buttons, online reviews, and pictures sharing), offering customized service to loyal users (e.g. tour route design), allowing customers to express their opinions and share their experiences (e.g. feedback ratings). Furthermore, OTAs could perhaps recognize the contribution of customers and reward engaging ones with coupons and vacation packages.

Although researchers have highlighted the need to explore the concept of engagement in the context of an online environment [Nambisan & Baron 2007; Zheng et al. 2015], limited studies have focused on the investment decision-making progress of OTAs for enhancing customer engagement in online platforms, particularly, the optimal decision of engagement investment.

The current study attempts to analyze how OTAs make investment decisions as regards encouraging the online engagement of customers in online travel platforms. By analyzing a two-OTA online travel market, we first emphasize the important role of online engagement in retaining loyal customers and preventing switching ones, and then provide the optimal decisions of online engagement investment for each OTA. Furthermore, we investigate the stable market status of the two-OTA online travel market as well as the market evolution in the presence of a game equilibrium between the two OTAs.

The rest of this paper is organized as follows. In the following section, we provide a review of the related literature. In Section 3, we describe the details of the research problem. In Section 4, we enumerate the optimal decisions of online engagement investment for the OTAs, as well as analyze the market evolution and game equilibrium of a given online travel market. Finally, we conclude this paper by discussing managerial insights and providing future research directions in Section 5.

2. Literature Review

Although many researchers have highlighted the need to study engagement [Cheung et al. 2011; Christian et al. 2011; O'Brien 2010; Rich et al. 2010; van Doorn et al. 2010] and despite the huge demand to explore engagement research from different perspectives, limited studies have been conducted on the optimal decision of online engagement. The concept of engagement has been explored in several disciplines, including management, education, and marketing. For example, Shaw [2005] conceptualized work engagement as an emotional and intellectual commitment to an organization, whereas London et al. [2007] defined education engagement as the reflection of academic investment and psychological connection to an institution. In marketing, Patterson et al. [2006] defined customer engagement as "*the level of a customer's physical, cognitive, and emotional presence in their relationship with a service organization*". Vivek et al. [2012] focused on the behavioral aspects of engagement and defined the concept as "*the intensity of an individual's participation and connection with the organization's offerings and activities initiated by either the customer or the organization* (Page 4)". In line with this perspective of engagement that emphasized the notion of interactivity and experience, Mollen and Wilson [2010] explored online brand engagement in relation to sustained cognitive processing, perceived instrumental value, and experiential value [Mollen & Wilson 2010]. Webster and Ahuja [2006] characterized user engagement as a subset of flow and a more passive state representing the extent of pleasure and involvement in an activity. Following these definitions, the present study refers to online engagement in OTAs as the *psychological state representing the extent of pleasure and involvement in an activity or interaction* within OTAs. Furthermore, this study distinguishes between the levels of online engagement in different OTAs through the customer preference of experience from different OTAs.

Engagement has been found to be associated with positive outcomes. In the organization literature, engagement is closely related to organizational citizenship behavior and organizational commitment [Macey & Schneider 2008; Saks 2006]. In the service literature, Patterson [2006] argued that customer engagement is a superior predictor of customer loyalty. In the marketing literature, Algesheimer et al. [2005] empirically proved how community engagement affects membership continuance intentions, community recommendation intentions, and community participation intentions. Pöyry et al. [2013] demonstrated the hedonic motivation for using "Like" in Facebook pages in relation to purchase intention. In other words, engagement is considered as a retention and acquisition strategy for establishing and maintaining competitive advantages, as well as a predictor of future business [Sedley 2008]. In line with these viewpoints, we believe that online engagement improves the loyalty level of customers. That is, if a higher

extent of engagement toward a particular OTA is exhibited, customers would be more willing to purchase or repeat purchasing products or services from it.

Although recent studies have addressed the topic of engagement, limited research effort has been exerted to examine the optimal decisions of online engagement investment for e-commerce platforms. To fill this gap and gain deeper insight into online engagement investment, this paper studies the optimal investment decisions by taking online travel agencies as examples.

The study of optimal decisions is vital in e-commerce research, as it can broaden the view on customer engagement and guide future studies on analytical modeling. Similar to the study of Chiu et al. [2014], our study considers one situation in which two service providers (OTAs) compete in one market (online travel market). In terms of optimal decision-analyzing research related to the service industry, many studies have explored the situation within two competitors. For example, Tsay and Agrawal [2000] explored a supply chain in which two retailers are competing for price and service level. Cheng et al. [2003] analyzed the price and capacity competition within two application service providers. Guo and Hassin [2013] studied a two-server pricing game and explored first-mover advantage. Thus, our study simply assumes that the market has two competitors only, and examines the optimal investment decisions of each service providers with respect to engagement. To the best of our knowledge, this study is the first to examine online engagement investment through game-theoretic analysis.

3. Problem Description

This paper considers two OTAs of the online travel market, because the two largest OTAs in one area account for almost the entire market share, as demonstrated by eLong, Inc. and Ctrip.com International, Ltd. in Mainland China as well as Expedia, Inc. and Princeline, LLC. in the US. Accordingly, both OTAs from the same area target the same online travel market, and they market similar products and services to the same group of customers. In addition, given that customers can easily obtain price information in an online environment with very low searching cost, the two OTAs may market their products and services at similar or the same retail prices to survive the business competition [Guo et al. 2013; Guo et al. 2014; Toh et al. 2011]. To simplify the presentation of the problem, we assume that the two OTAs distribute only one kind of product and service, such as rooms from the same hotel, with the basic utility v at the same room rate p. Furthermore, for convenience, we denote one of them as OTA1, from which customers can obtain a purchasing experience of s_1, and the other one is denoted as OTA2, which provides its customers with a purchasing experience of s_2. Without loss of generality, we further suppose that $s_1 > s_2$. Considering that individual customers hold different preferences for purchasing experiences, we assume that the customer preference for the experience from any given OTA is uniformly distributed in $[0,1]$ [García & Tugores 2006; Song et al. 2009].

According to their purchasing behaviors, customers can be divided into three groups:

- G1: the customers who make reservations from OTA1 in their most recent purchases;
- G2: the customers who make reservations from OTA2 in their most recent purchases;
- G3: the customers who never purchase any travel product from the two OTAs.

According to Patterson [2006] and practice, online engagement is positively associated with customer loyalty. We reserve the customer preference for purchasing experience from an OTA to represent a customer's online engagement level. Therefore, the customer preference for purchasing experience can be improved by the online engagement investment of OTAs. To describe the effects of the online engagement of OTAs and their customer demands, we introduce the relationships between the customers and the two OTAs on the basis of the customer preferences for each OTA. In this setting, the preference of a customer from group G1 toward OTA1, θ_{11}, can be improved by the online engagement of OTA1 such as providing tools that support interactions and effective communications, offering tour route design, and allowing customers to express their opinions and share their experiences. We denote that θ_{11} follows a uniform distribution on $[\alpha_1,1]$, where α_1 is the benchmark of engagement level of OTA1. The preference of a customer from group G1 toward OTA2, θ_{12}, is not affected by the online engagement investment of OTA2 because they only engage in OTA1's activities but not in OTA2's. As a result, we denote that θ_{12} follows a uniform distribution on $[0,1]$. Similarly, the preference of a customer from group G2 toward OTA1, θ_{21}, follows a uniform distribution on $[0,1]$; the preference of a customer from group G2 toward OTA2, θ_{22}, follows a uniform distribution on $[\alpha_2,1]$, where α_2 is the benchmark of the engagement level of OTA2. The relations are shown in Figure 1(a). Given that the customers from group G3 do not engage in either OTA1 or

OTA2's engagement activities, they have an identical preference $\theta_3 \in [0,1]$ toward both OTAs. That is, their preference does not influence any OTA's online engagement investment decision because they have never purchased any travel products from the two OTAs beforehand. In addition, given that the purpose of this paper is to provide decision directions regarding online engagement investment, we assume that the customer number of group G3 is zero does not affect the result. Therefore, the relationship between the customers and the OTAs can be simplified as Figure 1(b).

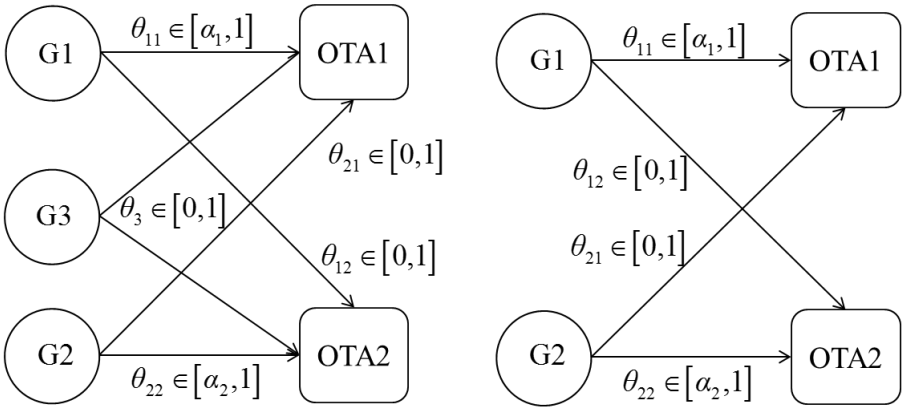

Figure 1 Relationship between customers and OTAs

Given the abovementioned descriptions and assumptions, a customer from group i ($i = 1, 2$) has the following purchasing utility from OTA j:

$$U_{ij} = v + \theta_{ij} s_j - p. \tag{1}$$

As we are only interested in the loyalty retention and switching behavior of customers under the influence of online engagement, without any effect on the results, we further assume that $v > p$ to ensure that all customers would make a reservation through one of the two OTAs. Consequently, by comparing the purchasing utilities from the two OTAs (purchasing utility value of U_{11} and U_{12}), the customer choice of group G1 is described in Figure 2(a). Similarly, the customer choice of group G2 is presented in Figure 2(b) by comparing the purchasing utilities from the two OTAs (purchasing utility value of U_{21} and U_{22}).

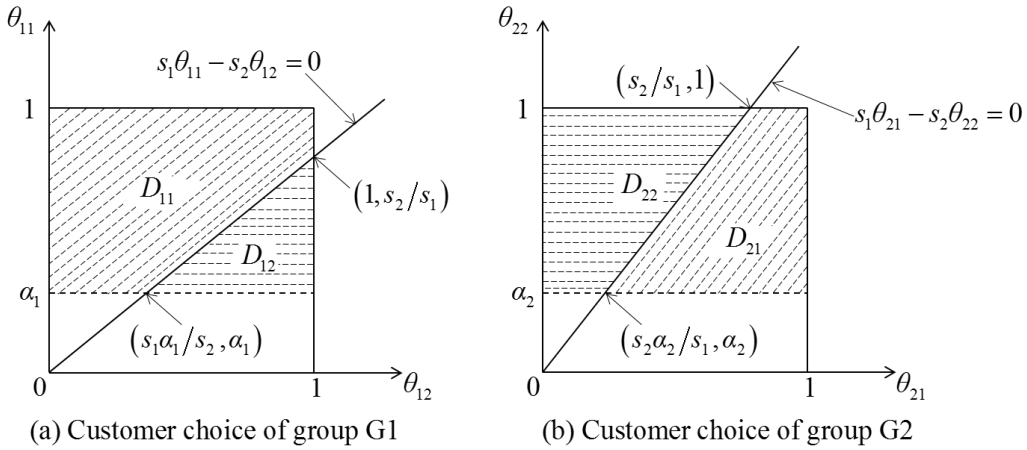

Figure 2 Customer choice and demands of the two OTAs

From Figure 2 we know that, in group G1, D_{11} represents the customers who still make reservations from OTA1, whereas D_{12} represents the ones that switch from OTA1 to OTA2 because they prefer the purchasing experience of OTA2. Similarly, within group G2, only D_{22} customers stay at OTA2 and D_{21} customers switch from OTA2 to OTA1. By denoting the customer amount of group G1 as a and that of group G2 as b, the number of customers for the two OTAs can be realized as follows:

$$D_1 = D_{11} + D_{21} = \frac{\left(2s_1s_2 - s_2^2 - s_1^2\alpha_1^2\right)a}{2s_1s_2\left(1-\alpha_1\right)} + \frac{\left(2s_1 - \left(1+\alpha_2\right)s_2\right)b}{2s_1}, \tag{2}$$

$$D_2 = D_{12} + D_{22} = \frac{\left(s_2 - s_1\alpha_1\right)^2 a}{2s_1s_2\left(1-\alpha_1\right)} + \frac{\left(1+\alpha_2\right)s_2 b}{2s_1}. \tag{3}$$

Lemma 1: *Suppose* $0 \le \alpha_1 \le s_2/s_1$ *and* $0 \le \alpha_2 \le 1$. *There is* $\partial D_j/\partial\alpha_j > 0$ *for* $j = 1, 2$.

The result of Lemma 1 suggests that the number of customers for each OTA increases with its online engagement benchmark level as a result of the given OTA's engagement investment. That is, the online engagement investment of the OTAs contributes to the improvement of customer loyalty and ultimately leads to the retention of customers and the prevention of customers from switching to other OTAs.

However, to maintain its online engagement benchmark level at α_j, OTA j incurs a corresponding cost, $f_j\left(\alpha_j\right)$, which is convex increasing with α_j ($f_j'\left(\alpha_j\right) > 0$ and $f_j''\left(\alpha_j\right) > 0$) and $f_j(0) = 0$. In the sequel, we introduce a quadratic functional form $f_j\left(\alpha_j\right) = k_j\alpha_j^2/2$ to represent the corresponding investment for the online engagement of OTA j, where $k_j > 0$ is the investment factor between engagement investment input and engagement effect output. This function is widely used in the literature to represent the relationship between investment and outcome [Chen 2005; Huang & Li 2001; Little 1979].

According to the analysis discussed above, the expected profit of OTA j with online engagement investment can be realized as follows:

$$\pi_j = \rho_j D_j - k_j\alpha_j^2/2, \tag{4}$$

where ρ_j is the unit revenue of OTA j obtained from selling products and services, and it can be explained as a unit commission fee imposed by the service provider (e.g. hotels or airlines) for each sold product and service through the given OTA [Guo et al. 2013; Wu et al. 2013].

4. Analysis

In this section, we first evaluate the optimal decisions of the two OTAs in Subsection 4.1. We then analyze the game interaction between them in Subsection 4.2 by presenting a numerical example.

4.1. Optimal Decisions

This subsection analyzes the optimal decisions of online engagement investment for OTA1 and OTA2. One OTA's engagement investment level can encourage customers to reach the benchmark engagement level at the very least. From the profit function given in Equation (4), we know that $\partial^2\pi_j/\partial\alpha_j^2 < 0$. Therefore, according to the first-order condition, the optimal investment level of the two OTAs can be obtained as Proposition 1.

Proposition 1: *Suppose the conditions in Lemma 1 hold. Then,*

(i) For OTA1, the optimal investment level $\alpha_1^* \in \left[0, s_2/s_1\right]$ *can be uniquely determined by the following equation:*

$$\alpha_1^* = \underset{\alpha_1 \in [0, s_2/s_1]}{\arg} \left\{ a\rho_1 s_1^2\left(1-\alpha_1\right)^2 - 2s_1s_2k_1\alpha_1\left(1-\alpha_1\right)^2 = a\rho_1\left(s_1 - s_2\right)^2 \right\}. \tag{5}$$

(ii) For OTA2, the optimal investment level $\alpha_1^* \in \left[0,1\right]$ *can be uniquely determined as follows:*

$$\alpha_2^* = b\rho_2 s_2/\left(2s_1k_2\right). \tag{6}$$

In particular, given that the first-order condition of OTA1 is a high degree function of α_1, we cannot find the closed form solution for the optimal α_1^*. Fortunately, however, the uniqueness of the optimal solution can be proven. The first-order derivative of π_1 with respect to α_1 is

$$\frac{\partial \pi_1}{\partial \alpha_1} = \frac{a\rho_1}{2s_1 s_2} \frac{(s_2 - s_1\alpha_1)(2s_1 - (s_1\alpha_1 + s_2))}{(1-\alpha_1)^2} - k_1\alpha_1. \quad (7)$$

Then, for $\alpha_1 = 0$ and $\alpha_1 = s_2/s_1$, we have $\partial\pi_1/\partial\alpha_1|_{\alpha_1=0} = a\rho_1(2s_1 - s_2)/(2s_1) > 0$ and $\partial\pi_1/\partial\alpha_1|_{\alpha_1=s_2/s_1} = -k_1 s_2/s_1 < 0$. According to the second-order derivative of OTA1's profit, π_1, with respect to α_1, we know that the profit is a concave function of α_1 ($\partial^2\pi_j/\partial\alpha_j^2 < 0$). Consequently, we can confirm that there is a unique optimal solution of $\alpha_1^* \in [0, s_2/s_1]$ for maximizing the profit of OTA1.

4.2. Numerical Illustrations

In this subsection, we numerically illustrate the results presented in the previous subsection, as well as show the game interaction and the market evolution between the two OTAs. According to the basic parameters given in Table 1 and the optimal decision provided in Proposition 1, the optimal results of the two OTAs, including optimal decisions, investment inputs and profits, are shown in Table 2.

Table 1 Basic parameter values of the two OTAs

	Customer amount	Purchasing experience (s_j)	Unit revenue (ρ_j)	Investment factor (k_j)
OTA1	$a = 150$	100	10	$20a$
OTA2	$b = 100$	80	7	$20b$

Table 2 Results of the two OTAs with the optimal decisions

	α_j^*	D_{1j}^*	D_{2j}^*	$D_j^* = D_{1j}^* + D_{2j}^*$	π_j^*	$f_j(\alpha_j^*)$
OTA1	0.2879	115.47	54.40	169.87	1574.42	124.29
OTA2	0.1400	34.53	45.60	80.13	541.31	19.60

According to the parameters, OTA1 provides customers with a higher purchasing experience than OTA2. Therefore, OTA1 has a greater number of customers and a higher unit revenue than OTA2. The optimal results show that OTA1 would like to invest more on building online engagement with its customers to improve customer loyalty until customer preferences of experience reach the optimal benchmark engagement level. To investigate the effects of inputs parameters, Table 3 presents the sensitivity analysis results.

The results presented in Table 3 are based on the basic parameter values given in Table 1 and the varied values of each parameter given in the first two columns of Table 3. The results indicate that the optimal investment amount of OTA1 increases with the group size of G1(a), the purchasing experience (s_1), and the unit revenue (ρ_1) of its product; however, it decreases with its investment factor (k_1). Although the optimal decision of OTA2 is not affected by the group size, unit revenue, and investment factor of OTA1 (i.e., a, ρ_1, and k_1), it decreases with the purchasing experience of OTA1 (s_1) as a result of the increase in experience difference when s_1 increases and s_2 is kept constant.

Table 3 Sensitivity analysis

Parameter						D_1^*		D_2^*			
Notation	Value	α_1^*	α_2^*	$f_1(\alpha_1^*)$	$f_2(\alpha_2^*)$	D_{11}^*	D_{21}^*	D_{12}^*	D_{22}^*	π_1^*	π_2^*
a	130	0.2879	0.1400	107.72	19.60	100.07	54.40	29.93	45.60	1437.03	509.08
	170	0.2879	0.1400	140.86	19.60	130.87	54.40	39.13	45.60	1711.80	573.54
s_1	90	0.2747	0.1556	113.15	24.20	106.11	48.64	43.89	51.36	1434.40	642.52
	110	0.2927	0.1273	128.47	16.20	122.46	59.01	27.54	40.99	1686.22	463.52
ρ_1	8	0.2330	0.1400	81.43	19.60	110.70	54.40	39.30	45.60	1239.40	574.67
	12	0.3405	0.1400	173.92	19.60	119.99	54.40	30.01	46.60	1918.72	509.69
k_1	$15a$	0.3741	0.1400	157.46	19.60	122.83	54.40	27.17	45.60	1614.86	489.78
	$25a$	0.2330	0.1400	101.79	19.60	110.70	54.40	39.30	45.60	1549.25	574.67

Moreover, the results in Tables 2 and 3 suggest that $D_{12}^{*} < D_{21}^{*}$ at the equilibrium. That is, the number of switching customers from OTA1 to OTA2 is smaller than that from OTA2 to OTA1. This finding suggests that the demand status between the two OTAs is unstable. In other words, the numbers of customers for both OTAs are dynamically changing along with time. To detect the stable status of the market demand between the two OTAs, we discuss the online market evolution and the game equilibrium between the OTAs in the next subsection.

4.3. Market Evolution and the Stable Equilibrium between the Two OTAs

As indicated by the numerical results, the market status is unstable because the numbers of switching customers from both OTAs are not balanced. Nonetheless, after a sufficient long-term operation and a number of decision rounds by adjusting the optimal investment level, a stable status can be achieved between the two OTAs.

Observation 1: *Based on the basic parameters given in Table 1, a stable status between the two OTAs can be achieved when the number of customers for OTA1 equals 175.67, and the numbers of switching customers from both OTAs are balanced as* $D_{12} = D_{21}$.

Observation 1 suggests the stable status of the online market will be achieved after a number of decision rounds in the evolution process. That is, for the given online market with 250 customers in total, whatever the beginning demand status for the OTAs, after enough evolution iterations, the demand for both OTAs will reach a stable level with 175.67 customers for OTA1 and the other 74.33 for OTA2.

For each OTA at the stable market status, its online engagement investment only exchanges the customers with the other OTA of the given online travel market not its total demand. Thus, why does the OTA still invest on online engagement? This can be explained by the game equilibrium between the two OTAs obtained from the decision process. Within this game, both OTAs have two choices: do or do not do the online engagement investment. The corresponding stable market status and OTA-payoffs (profits) are shown in Fig. 3: part (a) provides the stable market status and part (b) represents the corresponding optimal OTA payoffs.

As shown in the payoffs in Fig. 3, the strategy profile at the game equilibrium when the OTAs both choose "*do*" the online engagement investment is the worst combination for the market among the strategy set. This combination results from the scenario that for each OTA, "*do*" the online engagement investment is the *strictly dominant strategy* because doing the investment always brings the OTA higher profit and this investment reduces the total profit of the market. That is, the competition between the two OTAs will reduce the profitability of the market because of their selfish profit maximization. Nevertheless, the investment does increase customer utility and enhance customer loyalty toward the corresponding OTA. This can be easily verified according to the utility function of the customers shown in Equation (1). In other words, the online engagement investment of the OTAs will increase the customers' willingness to purchase. Driven by the profit maximization, the OTAs can increase the retail price of their products to recover the online engagement investments and achieve profits.

(a)

OTA2 \ OTA1	Do	Don't
Do	(175.67, 74.33)	(144.07, 105.93)
Don't	(180.68, 69.32)	(150, 100)

(b)

OTA2 \ OTA1	Do	Don't
Do	(1611.10, 505.77)	(1440.68, 720.76)
Don't	(1657.09, 485.24)	(1500, 700)

Fig. 3 Market stable status and OTA-payoffs with different actions

5. Conclusions, Limitations and Future Research

This paper studies the optimal decisions of online engagement investment for OTAs in a competitive online travel marketplace. From a two-OTA online travel market place, we first analyze the important role of online engagement in retaining loyal customers and decreasing switching ones. We then provide the optimal online engagement investment decisions of each OTA, and ultimately introduce the game equilibrium for the marketplace by analyzing the market evolution between the OTAs.

As shown in the results of game equilibrium, devoting the investment to increasing online engagement will reduce the profitability of the entire online travel market, a scenario akin to the Prisoners' Dilemma [Kreps et al. 1982; Ouksel & Eruysal 2011], as both OTAs doing nothing to enhance online engagement would bring the maximal profit for the entire market. However, the OTAs' online engagement investments will increasingly enhance the customer preference of experience of the given OTA, which will ultimately positively influence the customer purchasing utilities lead to customer loyalty. This evolution of the game equilibrium not only brings the OTAs' maximum profit in the competitive online market but also builds a foundation for developing higher preference of online purchasing experience, expanding market size, and ultimately increasing profit. Consequently, the online engagement investment does not harm the market benefit but is actually conducive to market development. The model utilized in this paper can be easily extended to other e-business enterprises, such as airlines.

To the best of our knowledge, this paper is the first to find the optimal decision of online engagement investment for OTAs, and the findings will be valid in the online marketing environment for the majority of service providers/agencies. Future studies on online engagement may expand on the following aspects. First, in this paper, we considered engagement investment only. However, the OTA-investment on improving the purchasing experience (such as improving webpage vision and operational friendliness) is also noteworthy. Second, retail price is considered as a constant value in our model. Making it a variable that depends on the decision of the OTA may yield interesting findings. Third, this study considers only the two largest OTAs in a particular online travel market. Although they share most of the market profit, including a third OTA may provide interesting findings that can guide the decision making of managers. Finally, the unit revenue (unit commission fee) from distributing products online is an exogenous variable in the model. By involving the supplier (such as hotels/airlines for OTAs) into the game with OTAs, more unexpected results will be obtained because of the extended supply chain network.

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