



The influence of e-services on customer online purchasing behavior toward remanufactured products



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ABSTRACT

Remarketing and reselling remanufactured electronic products is one of the effective and sustainable approaches to deal with the rapidly increasing e-waste. Studying customer purchasing intention and behavior toward remanufactured products can help businesses better understand customers' needs and improve closed-loop supply chain performance. Via an empirical study based on new, manufacturer remanufactured, seller remanufactured, and used products transaction data from eBay, one of the most popular online markets, this paper investigates the impact of e-service offerings in four online transaction phases (i.e., information, agreement, fulfillment, and after-sales phase) on customer purchasing intention toward remanufactured products in both auctions and fixed price transactions. The results indicate that e-service offerings in the information phase are most influential on customers' willingness to pay (WTP) in both types of transactions. In addition, we find e-services in auctions has higher positive influence on customers' WTP compared to fixed price transactions, as demonstrated by the results that e-services in all four online transaction phases significantly influence customers' WTP in auctions, but not in fixed price transactions. The results also show that in both types of transactions, customers are willing to pay a premium for seller remanufactured products, and even more for manufacturer remanufactured products and new products, compared with used products. Furthermore, we discuss the managerial implications on customer online purchasing intention toward remanufactured products and online sellers' sales strategies.

1. Introduction

Climate change is real, and our society is realizing the urgency of actions for sustainable development. As of August 2016, 180 UNFCCC (United Nations Framework Convention on Climate Change) members have signed the PARIS treaty aiming to reduce the adverse impacts of climate change, foster climate resilience, and reduce greenhouse gas emissions. Significant changes are also being made in various industries. One of the areas that attract major research attention is how to deal with the rapid increase of electrical and electronic equipment waste (e-waste). In the European Union alone, e-waste grows at a rate of 3–5% annually, which is about three times faster than average waste (Wakolbinger et al., 2014). In United States, the total weight of e-waste in the first decade of the 21st century is more than 120% over the e-waste generated during the last decade of the 20th century (Wang et al., 2017). However, about 90% of e-waste is still landfilled or incinerated, which damages both environment and human health (Wakolbinger

et al., 2014).

At the same time, e-waste can be a treasure trove through sustainable development approaches such as closed-loop supply chain (CLSC) management. By recycling, remanufacturing, remarketing, and reusing used materials or parts, circle of materials usage may be created. Hence, closed-loop supply chains help creating the newly defined “circular economy” (MacArthur, 2013). With the rapid development of technology, remanufacturing in the CLSC management has been advocated as an important approach to reduce the e-waste disposal and the associated costs (Wang et al., 2017).

Remanufacturing can be implemented by either original equipment manufacturers (OEMs), certified manufacturers, or the retailers. Despite the economic and environmental merits of remanufacturing, reselling and remarketing of remanufactured products can be challenging. From the consumers' perspective, there may be low incentive to purchase remanufactured products due to a variety of reasons including concerns on quality, trust on CLSC processes, trust on resellers,

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perceived risk in online environment, and concerns on reselling prices and related costs (Subramanian and Subramanyam, 2012). Therefore, how to promote remanufactured products through remarketing and reselling processes to enhance customer purchase intention on remanufactured products is critical for the success of CLSCs.

Online retailing through e-commerce has become one of the most active channels for remanufactured products (Neto et al., 2016). E-commerce channels are different from traditional retailing channels in terms of overall sales turnover and characteristics of customer order flows (Canetta et al., 2013). E-service offerings, defined as services offered by online sellers during the four transaction phases of online shopping process (Xu et al., 2017), can enhance customers' perceived quality of products and customer perception including retention, satisfaction, and loyalty (Cristobal et al., 2007). E-service offerings normally cover all the online transaction phases: information services, agreement services, fulfillment services, and after-sales services (Bauer et al., 2006; Xu et al., 2017). Thus, it is of particular importance to understand the role of e-services in influencing the consumer purchasing intention toward remanufactured products, and to improve corresponding e-services provided through e-commerce channels.

Some recent studies explored the influential factors of customer purchasing intention and behavior toward remanufactured products (e.g., Subramanian and Subramanyam, 2012; Neto et al., 2016). However, a systematic view of the roles of e-service offerings in all online transaction phases on customer purchasing intention toward remanufactured products is lacking. Also, previous studies focused on customer perception toward limited product conditions only in auctions such as remanufactured products in C2C auctions (e.g., Pang et al., 2015). Our study provides a more comprehensive view on customer perception toward products of various conditions (i.e., new, manufacturer remanufactured, seller remanufactured, and used products) in both auctions and fixed price transactions in online markets.

Specifically, the objective of this study is to investigate the factors influencing consumer purchasing intention, in terms of willingness to pay (WTP), toward remanufactured products from the perspective of e-services provided in the four online transaction phases (i.e. information phase, agreement phase, fulfillment phase, and after-sales phase) in both auctions and fixed price transactions. Our study aims to answer the following research questions. First, how e-service offerings in each online shopping transaction phase impact customers' WTP toward remanufactured products? Second, how customers' WTP differs between products of various conditions? Third, how do different types of online transactions environments (i.e. auctions and fixed price transactions) influence customers' WTP? Finally, how should reselling and remarketing decision makers improve e-services to enhance the CLSC performance? In order to address these research questions, data of completed transactions are collected from eBay - one of the leading online markets in the U.S., and multiple regression is used to analyze the data.

Our study has four major contributions to the current literature. First, it is among one of the first few papers to investigate the impact of e-service offerings on customers' WTP in all four online transaction phases. Second, our analysis considers more product conditions (new, manufacturer remanufactured, seller remanufactured, and used) comparing with previous studies on remanufactured products reselling. Third, additional new influential variables such as autopay, expedited shipping, and bid count are considered in our study to test for customers' WTP under different product conditions. Lastly, we examine the role of the type of online transactions environment (i.e., auctions and fixed price transactions) in the impact of e-service offerings on customers' WTP for products of various conditions. We further provide the managerial implications for improving corresponding e-services offerings in both types of transactions.

The rest of the paper is organized as follows. Relevant literature is reviewed in Section 2. In Section 3, the hypotheses are presented. Section 4 introduces data and methodology. Section 5 elaborates the

model and analysis. Regression results are discussed in Section 6. Section 7 explores the theoretical and managerial implications of the results. In the end, Section 8 concludes the paper, and discusses the limitation and future research directions.

2. Literature review

2.1. Sustainable and CLSC

Sustainable supply chain management (SSCM) and CLSC literature has developed rapidly during the past two decades. Previous survey papers about SSCM focus on the three dimensions of sustainability: environmental, social, and economic sustainability (e.g., Kleindorfer et al., 2005; Seuring and Muller, 2008; Ashby et al., 2012; Malviya and Kant, 2015; Xu and Gursoy, 2015). Within the scope of sustainable supply chain management literature, our study investigates the economics in remanufactured product selling, which generates managerial insights on enhancing the efficiency and incentivizing the innovation in closed-loop supply chains. The current main methodologies (survey and case study) used in sustainable supply chain management literature are still at the descriptive level (Ashby et al., 2012; Touboulic and Walker, 2015). This paper applies predictive analytic tools by investigating data collected from eBay. In this sense, our paper contributes to the broader sustainable supply chain management literature by investigating the economic dimension of closed loop supply chains and applies predictive analytical tools.

For CLSC management, Govindan et al. (2015) reviewed 382 papers related to reverse logistics and CLSC from 2007 to 2013, categorized the CLSC problems into 12 main streams, and identified the gaps for future research. Our study can be considered as contributing to one of streams - quantitative analysis of customer behavior in CLSC. And our study fills one of the gaps identified by Govindan et al. (2015) by forecasting customer behaviors in CLSC through examining uncertain parameters. Atasu et al. (2008a) classified the CLSC research into four streams: industrial engineering/operations research, design, strategy, and behavioral; and presented a framework linking these streams. According to Atasu et al. (2008a), remarketing and reselling of remanufactured products are related to both CLSC strategy and CLSC design. Our study follows this research stream on reselling and remarketing of remanufactured products.

2.2. Remarketing and reselling of remanufactured products in CLSC

Remanufacturing can be used as a marketing strategy for various purposes such as providing the opportunities for businesses to defend markets through pricing discrimination strategy (Atasu et al., 2008b). The profitability of remanufacturing processes strongly depends on remanufacturing cost savings, green segment size, market growth rate, and consumer valuations for the remanufactured products (Atasu et al., 2008b).

One of the main streams of CLSC research focuses on the reselling and remarketing of remanufactured products (e.g., McConocha and Speh, 1991; Debo et al., 2005). Remarketing is the commercialization of remanufacturing technology (McConocha and Speh, 1991). Remarketing and reselling are among the important activities in the evolution of CLSC (Guide and Van Wassenhove, 2009). However, the remarketing process can be a bottleneck preventing the whole CLSC from realizing the potential value from remanufacturing (Guide and Li, 2010).

Previous studies analyzed the production, remarketing, and reselling of remanufactured products with the existence of new products (i.e., market cannibalization between new and remanufactured products) (e.g., Ferrer and Swaminathan, 2006; Ovchinnikov, 2011). The important issues of remarketing and reselling remanufactured product include pricing and sales channel decisions.

In terms of pricing issues, dynamic pricing decision of remanufactured

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