How Signaling Strategy Moderates the Strategic Signaling-Seller Performance Relationship in E-marketplace

Research-in-Progress

Huifang LI

USTC-CityU Joint Advanced Research Center, University of Science and Technology of China, City University of Hong Kong, Suzhou, China

14A To Yuen Building, City University of Hong Kong, 31 To Yuen Street, Kowloon, Hong Kong

huifangli3@gmail.com

Abstract

We propose that e-marketplace sellers’ performances are shaped by how sellers deploy signals. Recent research on the signal-performance relationship proposes variety of signal attributes to create a more robust link. However, few of them explore the role of the signaling strategy, let alone empirically testing its effect. Drawing on signaling theory and literatures on strategic management, we argue that when a seller deploys more observable and costly signals that are easy-to-verify, highly correlated with unobservable quality and consistent with each other, their performance will be enhanced. We plan to apply Bayesian Decision-Theoretic framework to analyze signaling decision-making situations in terms of their preference signaling strategy structures and posterior performance. The findings can (1) help sellers obtain better signaling outcomes through the active use of varied signaling strategies and (2) inform transaction platform providers to improve their policies about seller information disclosure.

Keywords: Signaling theory, signaling strategy, signal observability, signal cost, ease of verification, signal fit, signal frequency, signal consistency
E-Business and Competitive Strategy

Introduction

In recent years, the e-marketplace has gained significant development momentum. The e-marketplace is a transaction platform provided by a third party, such as Amazon and Taobao, for both sellers and buyers. It has greatly expanded the consumer base for sellers by breaking down geographical boundaries. As such, consumers have access to convenient and novel shopping experiences. However, the geographical distance and time zone add to the information asymmetry problem between sellers and buyers. Sellers must often go to great lengths to draw support from some extrinsic cues (i.e., signal), such as warranties and reputation, to convince consumers of product quality and distinguish themselves from other sellers. In spite of such measures, the relationship between strategic signaling and seller performance remains unstable after decades of research. As of this writing, most research has focused on defining signal attributes that affect the strategic signaling-seller performance relationship. However, few researches have systematically considered these attributes. The review of Connelly et al. (2011), which provides a concept carding of some attributes, is the only exception. But considering some new attributes displayed in recent studies (e.g. ease of verification), their list of signal attribute seems to be incomplete. More importantly, no empirical studies have tested the effects of these signal attributes. These important managerial and research concerns motivate us to investigate the following two research questions:

1. What signaling strategies do e-marketplace sellers deploy?
2. How do signaling strategies moderate the strategic signaling-seller performance relationship in the e-marketplace?

We develop a research model drawn from strategic management literature and signaling theory to answer these questions. More specifically, we first define “signaling strategy” through strategic management literature. Based on signaling theory, we conceptualize signaling strategy as a multidimensional formative construct with six sub-dimensions. These dimensions include signal observability, signal cost, ease of verification, signal fit, signal frequency, and signal consistence. We propose that signaling strategy positively affects signal effects on seller performance. Finally, we apply the Bayesian Decision-Theoretic framework to analyze signaling decision-making situations in terms of their preference strategy structures and posterior performance.

We believe that this paper is a timely contribution to signaling research and strategic management literature, as well as literature on the application of the Bayesian Method in strategy research.

First, research has examined how e-marketplace sellers' signals influence trust (Aiken et al. 2006; Kim et al. 2004; Wang et al. 2004) and purchase intentions (Chu et al. 2005; Wells et al. 2011; Yen 2006) with an online seller, which may ultimately affect their financial performance. However, the majority of the studies focused on a single type of signal. In practice, sellers usually undertake multiple signals. These various signals affect the financial performance of a seller. Compared with knowing the effect of one signal type, understanding how to combine these effects is more practical for sellers in terms of performance enhancement in the midst of fierce competition. Thus, this study adds to the current trend of examining signaling actions through a more dynamic perspective.

Second, existing studies on strategic management treat actions of firms as homogeneous. For example, action volume is calculated by adding the number of actions in different categories (Smith et al. 2001). Differences do exist among these actions in practice. For instance, firm signaling actions through warranties (i.e., announcement of warranties) may have differential effects on financial performance. The effect depends on the duration of the validity period and the amount of compensation. Thus, we develop unique measures for such heterogeneous actions in this study.

Third, the application of the Bayesian Decision-Theoretic framework in this study may provide some insights for the extension of the Bayesian Methods in strategy research. Such an endeavor allows the analysis of signaling decision-making situations in terms of strategy structures and posterior performance preferences.

The remainder of this paper is organized as follows. We first explain why signaling strategy is necessary. This explanation is followed by the conceptualization of signaling strategy. We then establish the theoretical background of this study. Thereafter, we present the research model, hypotheses development, and methodology. Finally, the limitations of the article and further implications for future research are discussed.
Why is Signaling Strategy Needed?

The reasons behind signaling strategy are twofold. First, although e-marketplace sellers have begun to use extrinsic cues as signals to convey information on products and services for encouraging consumer spending, a lack of knowledge on signal deployment still remains. The disadvantage of this shortage becomes especially prominent in consideration of the usually tight budgets of the main e-marketplace body, namely, the medium- and small-sized sellers, as well as the costly attribute of signals. Second, according to strategic management literature, signaling action belongs to the category of competitive actions. Prior studies in this domain assume they are homogeneous upon the examination of their effects on firm performance (i.e., simply summing the number of signaling actions). However, these actions are actually heterogeneous. This simplification process may overshadow several interesting and significant facts. With regard to managerial implication concerns, heterogeneous treatment of these actions may provide practitioners with more insights. Thus, this study focuses on signaling strategy to develop unique measures for such heterogeneous actions.

Theoretical Background

In this section, we define and conceptualize signaling strategy by drawing on strategic management literature and signaling theory.

Strategic Management Literature

“Strategy” is derived from the Greek word “strategos,” which means “the art of the general.” Strategy is defined in strategic management literature as a pattern in the organization’s important decisions and actions, which are typically directed at (1) maintaining the organization’s alignment with its environment and (2) managing the organization’s major internal inter-dependencies (Miles et al. 1978; Mintzberg 1978; Snow et al. 1980). Firm strategies are further divided into different categories based on certain principles. We take competitive strategy as an example. According to a firm's response to changing environmental conditions, four types of competitive strategy, namely, (1) defenders, (2) prospectors, (3) analyzers, and (4) reactors are defined (Karimi et al. 1996). Similarly, we define signaling strategy as a pattern in the e-marketplace seller’s important signaling decisions and actions. This pattern is typically directed at improving overall signaling efficaciousness and ultimately influencing the consumer purchasing behavior.

Signaling Theory

Signaling theory (Spence 2002), which emerged from the study of information economics and is fundamentally concerned with information asymmetry reduction between two parties, has been studied extensively in various disciplines, such as management, marketing, and finance (Casterella et al. 2009; Connelly et al. 2011; Kirmani et al. 2000). In our study, signaling theory is a framework for understanding how online sellers can use extrinsic cues to convey product quality information to consumers, reduce consumer uncertainty, and facilitate purchases or exchanges in the e-marketplace in the context of high asymmetry of information (Wells et al. 2011). Prior studies have examined the relationships among a single signal type, trust, and purchase intentions with an online seller, which may all ultimately influence the financial performance of a seller (Aiken et al. 2006; Chu et al. 2005; Kim et al. 2004; Wang et al. 2004; Wells et al. 2011; Yen 2006). Their findings suggested that signals, such as warranty, reputation, and website quality, positively affect the financial performance of a seller. Specifically, warranty, which is a form of insurance against product failure, is well accepted for its signal ability (Spence 1977). Reputation, which emerges from consumer feedback and convinces potential consumers of product quality through signaling, is also one of the most studied signal forms for product quality and risk reduction (Biswas et al. 2004). Finally, website quality, which conveys information about the store, products, and store services, serves as another signal type (Gregg et al. 2008).

Previous researchers identified several signal attributes upon studying the effects of signals, such as signal cost (i.e., the transaction costs associated with signal implementation) (Bhattacharya 1979; Certo 2003) and signal observability (i.e., the extent to which outsiders are able to detect the signal) (Lampel et al. 2000; Ramaswami et al. 2010; Warner et al. 2006). Table 1 shows these key signal attributes.
Table 1. Key Signal Attributes (Adapted from Connelly et al. (2011))

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Cost</td>
<td>Transaction costs associated with signal implementation.</td>
<td>(Bhattacharya 1979; Certo 2003)</td>
</tr>
<tr>
<td>Signal Observability</td>
<td>A.K.A. signal-intensity, strength, clarity, or visibility. The extent to which outsiders are able to notice the signal.</td>
<td>(Lampel et al. 2000; Ramaswami et al. 2010; Warner et al. 2006)</td>
</tr>
<tr>
<td>Ease of verification</td>
<td>The extent to which a displayed fake signal is easily verified as false.</td>
<td>(Mavlanova et al. 2012)</td>
</tr>
<tr>
<td>Signal Fit</td>
<td>A.K.A. signal-value or quality. The extent to which the signal is correlated with unobservable quality.</td>
<td>(Busenitz et al. 2005; Zhang et al. 2009)</td>
</tr>
<tr>
<td>Signal Frequency</td>
<td>Number of times signals are transmitted.</td>
<td>(Baum et al. 1999; Carter 2006)</td>
</tr>
<tr>
<td>Signal Consistency</td>
<td>Agreement between signals from one source.</td>
<td>(Chung et al. 2001; Fischer et al. 2007)</td>
</tr>
</tbody>
</table>

**Signaling Strategy**

In this study, we conceptualize signaling strategy as a multidimensional formative construct with six sub-dimensions. These six sub-dimensions refer to the aforementioned six key signal attributes in Figure 1. The reasons for (1) choosing these six dimensions and (2) using the formative model are as follows.

Why Choose These Six Attributes of Signal?

The reasons behind the selection of these six attributes of signal (i.e., signal observability, signal cost, ease of verification, signal fit, signal frequency, and signal consistency) as signaling strategy sub-dimensions are twofold. On the one hand, using signal attributes as signaling strategy sub-dimensions could indicate the overall characteristics of these intentional combinations through signal attribute combination than singular attribute usage. Furthermore, this measure may provide sellers with various signal combination choices and similar sub-dimensions. Thus, sellers optimize their signaling strategies for profit maximization. On the other hand, these six signal attributes are the most important signal characteristics for efficaciousness, and can be integrated to represent completely the domain of a construct. In particular, *signal observability*, which is also known as signal intensity, signal strength, signal clarity, and signal visibility (Lampel et al. 2000; Ramaswami et al. 2010; Warner et al. 2006), refers to the extent to which outsiders are able to detect the signal. If buyers do not readily observe or perceive the signals sent by sellers, the use of such signals proves difficult for seller-buyer communication. Thus, signal observability is essential for signal efficaciousness. *Signal cost* (i.e., the transaction costs associated with signal implementation) is central to signaling theory. Some refer to this dimension as the “theory of costly signaling” (Bhattacharya 1979; Bird et al. 2005; Certo 2003). *Ease of verification*, which refers to the extent to which a displayed fake signal is easily verified as false, is an essential attribute for sellers to consider when making decisions about the use or non-use of a signal (Mavlanova et al. 2012). **Signal fit**,
which is also known as signal value or signal quality (Busenitz et al. 2005; Zhang et al. 2009), refers to the extent to which the signal is correlated with unobservable quality and is also essential for signal efficaciousness. Signal frequency (i.e., the number of times signals are transmitted) and signal consistency (i.e., the agreement between signals from one source) capture the overall characteristics of the use of these signals by e-marketplace sellers.

In sum, signaling strategy is a pattern involved in the e-marketplace seller’s important signaling decisions and actions. These decisions and actions are typically directed at improving overall signaling efficaciousness and ultimately influencing consumer purchasing behavior. We re-conceptualize these attributes as sub-dimensions of signaling strategy because these six signal attributes represent different aspects of efficacious signals, and all these attributes can form a pattern in the signaling actions of a seller.

Why Use a Formative Model?

Prior studies suggested that the choice of modeling and analyzing a construct as reflective or formative largely depends on the construct under study and the generality or specificity of one’s theoretical interest (MacKenzie et al. 2005; Petter et al. 2007). Signaling strategy is central to the present study, and our theoretical interest lies in developing measures that can indicate the heterogeneous nature of firm actions. Given that multiple sub-constructs are necessary to capture the entire signaling strategy, we model the sub-constructs as a multidimensional construct to permit more thorough measurements and analyses. Thus, we refer to the decision rules provided by Petter et al. (2007) for identifying formative constructs. For example, the directions of causality are derived from constructive sub-dimensions, and the requirement is satisfied. Other requirements are similarly examined and satisfy the aforementioned prerequisite. Therefore, we conceptualize signaling strategy as a multidimensional formative construct with six sub-dimensions. In the subsequent section, the theoretical background of this study is established.

Overall, extensive theoretical literature on signaling theory provides a broad conceptual framework in which to analyze the moderator effects of e-marketplace sellers’ signaling strategies. The hypotheses are developed in the next section.

Hypotheses Development

The proposed research model is shown in Figure 2. In this model, the e-marketplace sellers’ performance serves as the dependent variable. Three signal types, namely, warranty, reputation, and website quality are independent variables. Signaling strategy with six sub-dimensions is the moderator. In addition, store age, store size, and past store performance are the controlled variables. Hypotheses are elaborated in detail in the following section.
**Signal Observability**

Signal observability refers to the extent to which outsiders are able to detect the signal. We propose that signal observability can enhance strategic signaling-seller performance by drawing consumer attention and enhancing seller and product perceptions (Lampel et al. 2000; Ramaswami et al. 2010; Warner et al. 2006). For instance, a luxury store interface (an indicator of website quality) more easily captures consumer attention with visual appeal than plain store interfaces. The observability of a luxury store interface is greater than that of a plain interface, and can easily attract consumers and convey information of product quality. Thus, we propose the following hypothesis:

H1a-H1c: Signal observability positively moderates the relationship between seller financial performance and e-marketplace sellers’ signals, including warranty (H1a), reputation (H1b), and website quality (H1c).

**Signal Cost**

Signal cost, which refers to the transaction costs associated with signal implementation, is highly important to signaling theory that some refer to it as the “theory of costly signalling” (Bird et al. 2005; Connelly et al. 2011). Although some scholars consider costliness as unnecessary in guaranteeing signal value (Bird et al. 2005), a broad conclusion of theoretical models in different contexts is that costly signals are more credible or valid for consumers (Srivastava 2001), investors (Busenitz et al. 2005), and competitors (McGrath et al. 2004). The basic rationale of the signaling process in the e-marketplace lies in consumer signal interpretation based on these costs (Spence 1973; Srivastava 2001). Signal effects may vary depending on cost. In particular, the higher the signal cost is, the greater the signal credibility is. Thus, we hypothesize:

H2a-H2c: Signal cost positively moderates the relationship between seller financial performance and e-marketplace sellers’ signals, including warranty (H1a), reputation (H1b), and website quality (H1c).

**Ease of Verification**

Ease of verification (Mavlanova et al. 2012), which refers to the extent to which a displayed fake signal is easily verified as false, has an important function when a seller decides whether or not a signal should be used. More specifically, a high-quality seller prefers an easily verified signal (i.e., high ease of verification) because such a signal can adequately convey the quality information to consumers. Low-quality sellers refrain from using such a signal. By contrast, rational high- and low-quality sellers more than likely reject a signal that is difficult to verify (i.e., low ease of verification). Overall, ease of verification provides consumers with another criterion for distinguishing high- and low-quality sellers. Thus, this dimension may positively moderate the relationship between signals and sale performance.

H3a-H3c: Ease of signal verification positively moderates the relationship between seller financial performance and e-marketplace sellers’ signals, including warranty (H1a), reputation (H1b), and website quality (H1c).

**Signal Fit**

Signal fit, which refers to the extent to which the signal is correlated with unobservable quality (Busenitz et al. 2005; Zhang et al. 2009), can resolve consumer doubts about sellers and product quality by conveying appropriate information. Thus, seller performance is positively affected. For instance, a cosmetic seller may use a warranty to resolve consumer doubt concerning product quality. The fit of this signal denotes the duration of the validity period and the compensation amount. When the validity period is long and the compensation amount is large, the signal fit is high. Consumers will perceive that the quality of this seller’s product is high, which can enhance seller performance. Thus, we argue that:

H4a-H4c: Signal fit positively moderates the relationship between seller financial performance and e-marketplace sellers’ signals, including warranty (H1a), reputation (H1b), and website quality (H1c).

**Signal Frequency**

Signal frequency represents the number of times signals are transmitted. In an online environment, consumers usually have a short attention span because of their limited resources of time and information processing and increased levels of control (Engel et al. 1990; Hoffman et al. 1997; Koufaris 2002; Miller
1956; Quelch et al. 1996; Sheth et al. 1997). Thus, capturing consumer attention is always at the center of seller competition in the same industry. When a seller sends out more signals, these signals will more likely catch consumer attention, thereby conveying product information to consumers. We argue that signal frequency will enhance signal effects on e-marketplace sellers’ performance.

H5a-H5c: Signal frequency positively moderates the relationship between seller financial performance and e-marketplace sellers’ signals, including warranty (H1a), reputation (H1b), and website quality (H1c).

**Signal Consistency**

Signal consistency refers to the agreement between signals from one source. The consistency with which a seller deploys signals may also affect the strategic signaling-seller performance relationship. Consistent signal deployment indicates seller involvement in signal distribution in a systematic and regular manner. Contrary to the belief that conflicting signals confuse consumers and make communication less effective, a consistent pace of signal deployment can mitigate this problem and increase signal credibility to help the seller in convincing consumers of product quality (Connelly et al. 2011). Thus, we hypothesize:

H6a-H6c: Signal consistency positively moderates the relationship between seller financial performance and e-marketplace sellers’ signals, including warranty (H1a), reputation (H1b), and website quality (H1c).

**Methodology**

Four alternatives approaches are available to identify and measure strategy variables. These approaches are (1) investigator inference (i.e., the researcher assesses the strategy of an organization to use all the available information); (2) self-typing (i.e., managers assess the strategies of their own firms using descriptions of the strategies); (3) external assessment (i.e., ratings are obtained from individuals external to the focal organization, such as competitors, consultants, industry analysts, and expert panels); and (4) objective indicators, which control potential perceptual biases and measure the more objective aspects of strategies (Snow et al. 1980). We use a combination of objective indicators and external assessment in this study because the usage of multiple sources of information can enhance the validity of strategy measures.

**Data Collection**

To test the research model, we used the aforementioned two approaches to collect data. One portion shows the secondary data that consist of longitudinal data observations of 1336 sellers in the apparel industry for over 10 months. Another portion shows the ranking of signal attributes as provided by experts.

**Secondary Data**

Taobao, which is the largest online B2C e-marketplace in China and retail platform giant in Asia, connects more than 170 million registered users and has some 800 million product lines from food to clothes to technology (Mackie 2011). The rich background of Taobao has made it a popular subject for e-commerce studies. We chose sellers in the apparel industry because clothing is a typical experience product, which is difficult to evaluate prior to purchase and is readily apparent after use (Wells et al. 2011). With regard to sample selection, we only targeted sellers who operated business continually in the allotted period. We deduced 10 signal types in the Taobao transaction platform, as shown in Table 2. These signal types can be further divided into three categories, namely, warranties, reputation, and website quality. We used $\text{Signaling}_i$ to denote the value of each signal and $i$ to represent the signals, as shown in the following function, $\text{Signaling}_i = [S_1, S_2, \ldots, S_{10}]$, $i \in \{1, 2, \ldots, 10\}$.

<table>
<thead>
<tr>
<th>NO.</th>
<th>Signals</th>
<th>Descriptions</th>
<th>Variable Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overall rating</td>
<td>The sum of positives minus negatives received by a seller from unique buyers throughout his/her entire history.</td>
<td>Reputation</td>
</tr>
<tr>
<td>2</td>
<td>Percent of positives</td>
<td>The percentage of positive feedback over total feedback throughout his/her entire history.</td>
<td>Reputation</td>
</tr>
</tbody>
</table>
**E-Business and Competitive Strategy**

<table>
<thead>
<tr>
<th></th>
<th>Product Quality DSR</th>
<th>Product quality detailed seller rating within 28 days.</th>
<th>Reputation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Distribution DSR</td>
<td>Distribution detailed seller rating within 28 days.</td>
<td>Reputation</td>
</tr>
<tr>
<td>5</td>
<td>Service DSR</td>
<td>Service detailed seller rating within 28 days.</td>
<td>Reputation</td>
</tr>
<tr>
<td>6</td>
<td>Logistics DSR</td>
<td>Logistics detailed seller rating within 28 days.</td>
<td>Reputation</td>
</tr>
<tr>
<td>7</td>
<td>Consumer Rights</td>
<td>Buyer insurance program where buyers can seek recourse for unfulfilled or fraudulent transactions: Binary: 1 for &quot;yes,&quot; 0 for &quot;no.&quot;</td>
<td>Warranty</td>
</tr>
<tr>
<td>8</td>
<td>Money-Back Guarantee within 7 Days</td>
<td>Enrollment status of Money-Back Guarantee within 7 Days: Binary: 1 for &quot;yes,&quot; 0 for &quot;no.&quot;</td>
<td>Warranty</td>
</tr>
<tr>
<td>9</td>
<td>Luxurious Store Website</td>
<td>Enrollment status of Luxurious Store Website: Binary: 1 for &quot;yes,&quot; 0 for &quot;no.&quot;</td>
<td>Website Quality</td>
</tr>
<tr>
<td>10</td>
<td>Detailed Picture</td>
<td>Usage of Detailed Picture within 28 days: Binary: 1 for &quot;yes,&quot; 0 for &quot;no.&quot;</td>
<td>Website Quality</td>
</tr>
</tbody>
</table>

**Expert Evaluation**

More data were collected from several experts. These experts were from the fields of information systems, information management, and digital forensics. PhD and master students in information systems and information technology were also approached. We asked these experts to evaluate and compare the six attributes of each signal type. Then, they were asked to rank the signals according to the six attributes. The following matrix is an example, where \( i \) refers to the signals and \( i \in \{1, 2, \ldots, 10\} \) and \( j \) denotes the signaling attribute and \( j \in \{1, 2, 3, 4, 5, 6\} \),

\[
\text{Ranking}_{ij} = \begin{bmatrix}
R_{11} & R_{12} & \cdots & R_{16} \\
R_{21} & R_{22} & \cdots & R_{26} \\
\vdots & \vdots & \ddots & \vdots \\
R_{11} & R_{12} & \cdots & R_{16}
\end{bmatrix}
\]

**Data Analysis**

The Bayesian Decision-Theoretic Approach is particularly appropriate for strategy problems because of its dynamic nature (Eliashberg 1981; Rossi et al. 2003). More specifically, this approach allows the assignment of subjective probabilities of competitors’ actions by the decision maker and the subsequent revision of actions according to new information. When applied in the relative open e-marketplace research context wherein a seller can see most of the actions of its competitors, this method can provide sellers with the optimal selection of signaling strategy and permit the consideration of competitors’ choices. This method can also highlight the strength of the longitudinal dataset used in this study.

We identified the types of signaling strategies used by online sellers (i.e., the state space of signaling strategy structures) to examine the moderator effects of different signaling strategies. The k-means clustering method was used to cluster all 13,690 seller-month observations. These observations were gathered into K clusters based on similarity of the product value of \( \text{Signaling}_i \) and \( \text{Ranking}_{ij} \) using a Euclidean distance (Bockstedt et al. 2011). We selected k-means clustering because it is commonly used for its highly simple algorithm and good work performance in practice (Duda et al. 2000). Second, according to the Bayesian Decision-Theoretic Approach, we analyzed sellers’ preference of signaling strategy structures and determined the effect of these structures on posterior performance.

**Conclusion**

We drew from signaling theory and literature on strategic management to answer our research questions in this study. As previously mentioned, the questions are as follows: (1) What signaling strategies do e-marketplace sellers deploy? (2) How do signaling strategies moderate the strategic signaling-seller performance relationship in the e-marketplace? We first conceptualized the signaling strategies of e-marketplace sellers. Then, we analyzed signaling decision-making situations in terms of the preferred signaling strategy structures and posterior performance. We expect that the findings can (1) help sellers obtain better signaling outcomes through the active use of varied signaling strategies, and (2) remind transaction platform providers to improve their seller information disclosure policies.
References


