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The shape of Word-of-Mouth response function

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A R T I C L E I N F O

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A B S T R A C T

A consumer may not be affected by all positive recommenders due to limitations of cognitive capacity. This limitation (of cognitive capacity) results in two different response functions for the size of positive recommenders: One is an *S*-shaped function which assumes that the second and third sources (recommenders) have greater additional impact than the first source, and the other is a concave-shaped function which assumes that the first source (recommender) is more influential than the second and the third sources. In this paper we operationalize volume of Word-of-Mouth as the total number of positive Word-of-Mouth senders and using two conjoint studies empirically investigate whether the relationship between the volume of Word-of-Mouth and its impact follows a concave-shaped function or an *S*-shaped function. The two conjoint studies support the concave-shaped response for the volume of Word-of-Mouth.

1. Introduction

The importance of Word-of-Mouth (WOM) is well recognized in business (e.g., Bass, 1969; Mansfield, 1961). WOM is one of the most influential channels of communication as it is found to be more credible than other marketing communication channels, and the influence of WOM is expected to continue to grow due to a technology-driven explosion in communication channels (Allsop et al., 2007). Several studies have empirically demonstrated that WOM may be more persuasive than other marketing instruments such as advertising (e.g., Dichter, 1966, p.166; Godes and Mayzlin, 2004; Herr et al., 1991; Trusov et al., 2009). Consumers perceive social and psychological benefits and costs from WOM (Frenzen and Nakamoto, 1993; Gatignon and Robertson, 1986). For example, consumers may perceive benefits from WOM because they may justify their decisions based on WOM (general approval) and achieve social status, whereas they may perceive costs due to social obligations from WOM.

Many researchers have investigated the shapes of consumer response function for marketing inputs such as price and advertising. It is important to discern the shape of response function because knowledge of the response function is a critical input in making decisions regarding successive resource allocations for the marketing inputs [e.g., the price & advertising response functions in Lilien et al., 1992, chapters 4 and 6]. However, there is little empirical research on the shape of consumer response function for WOM, even though there are many studies which analyze the impact of WOM on sales or adoption of an innovation (e.g., Chevalier and Mayzlin, 2006; Trusov et al., 2009).

In this paper we operationalize volume of WOM as the total number of positive WOM senders and analyze consumer responses to this volume of WOM. One can expect that a consumer may not be affected by all positive recommenders due to limitations of cognitive capacity (Simon, 1955, 1957). This implies that there might be an effective size of positive recommenders which is sufficient for the full impact of WOM. Consequently, the effective size of positive recommenders allows us to consider two alternative response functions for the volume of WOM, an *S*-shaped function (e.g., Asch, 1951, 1955; Tanford and Penrod, 1984) and a concave-shaped function (e.g., Latané, 1981; Mullen, 1983, 1987) and empirically test which of these two more closely describes the response function for the volume of WOM. For this purpose, we review past studies on the relationship between group size and its social influence, formulate the value function representing a consumer's perceived value vis-à-vis the size of positive recommenders, design and conduct two conjoint studies to recover the value function, and then identify the shape of this function.

The empirical results support a concave-shaped WOM volume response function across various product categories. A concave-shaped WOM volume response function implies that the effect of WOM volume monotonically decreases as WOM volume increases. This concavity can be helpful in intuitively understanding some of the extant results from diffusion models, such as the decrease in coefficient of WOM with increased penetration (e.g., Balasubramanian and Ghosh, 1992; Easingwood et al., 1983; Park and Choi, 2016; Srinivasan and Mason, 1986; Sultan et al., 1990; Van den Bulte and Lilien, 1997). In addition, the concavity of WOM volume response function leads to some valuable

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practical implications in allocating a firm's marketing resources for eWOM. For example, it is possible to consider two dimensions of product-related conversation: WOM volume (which is an analog to 'frequency in adverting') and WOM dispersion (which is an analog to 'reach in adverting') where the volume indicates the amount of WOM whereas the dispersion indicates the extent to which product-related conversations are taking place across a broad range of communities (Godes and Mayzlin, 2004). The concavity of WOM volume response function leads to the conclusion that it may be more efficient to focus resources on the dispersion dimension of WOM than the volume dimension of WOM.

2. Background

Volume and valence among the most important WOM attributes have been largely examined (e.g., Liu, 2006; Mahajan et al., 1984; Mizerski, 1982; Neelamegham and Chintagunta, 1999). Volume measures the total amount of WOM interactions, whereas valence captures the nature of WOM messages (whether they are positive or negative). We focus on the volume of WOM among the two attributes of WOM, like the research focusing on the volume of WOM (e.g., Anderson, 1998; Bowman and Narayandas, 2001). The two previous studies investigate how the volume of WOM is affected by customer satisfaction in controlled laboratory settings. In contrast, we analyze how consumers' preferences are affected by the volume of WOM in two controlled laboratory settings. Hereafter, WOM indicates the volume of WOM in this paper.

The seminal papers on the WOM effect (e.g., Bass, 1969; Mansfield, 1961), assume that the WOM effect increases linearly with increase in the number of previous adopters (who are expected to be positive recommenders). Later research in diffusion models relaxes the linearity assumption of the WOM effect (e.g., Easingwood et al., 1983; Sharif and Kabir, 1976). Easingwood et al. (1983) estimate the impact of WOM across five product categories and show that the impact of WOM decreases with penetration [across four of the five product categories]. They also estimate the WOM impact using Sharif and Kabir's (1976) formulation and demonstrate that the impact of WOM decreases with penetration [for all five product categories]. In addition, previous research has demonstrated that the estimate corresponding to impact of WOM in a diffusion model tends to decrease when the adoption data, which corresponds to a larger proportion of potential adopters, is used to estimate the diffusion model (e.g., Balasubramanian and Ghosh, 1992; Srinivasan and Mason, 1986; Sultan et al., 1990; Van den Bulte and Lilien, 1997). This has been interpreted as a systematic bias in the estimate corresponding to impact of WOM. However, it is also possible that the impact of WOM actually decreases with penetration, which leads to the "systematic bias" in the recovered impact of WOM. In addition, Park and Choi (2016) provide the same implication on the impact of WOM based on an additively decomposed Bass hazard function.

In sum, one can infer from the findings presented in previous research (e.g., Balasubramanian and Ghosh, 1992; Easingwood et al., 1983; Park and Choi, 2016, 2017; Srinivasan and Mason, 1986; Sultan et al., 1990; Van den Bulte and Lilien, 1997) that consumer response for WOM is a concave-shaped function since the impact of WOM decreases with penetration. However, the findings do not guarantee that the shape of WOM response function is concave, because the effect of WOM may disappear when marketing actions are included in the diffusion models (Trusov et al., 2009; Van den Bulte and Lilien, 2001).

Past research on group size and its social influence has identified two functional forms of the response function: the *S*-shaped response function and concave-shaped response function. Asch (1951) finds that the second and third sources (recommenders) have greater additional impact than the first source. Asch (1955) concludes that a majority size of three is sufficient for the full impact of a group to be felt, beyond that there is no additional impact. Tanford and Penrod (1984) also propose an *S*-shaped function for the relationship between group size and social influence. An *S*-shaped function allows for an asymptotic value so that the group size is important only up to a certain limit beyond which increasing group size has no additional impact. In sum, Asch (1951, 1955) and Tanford and Penrod (1984) are of the view that the relationship between group size and its impact follows an *S*-shaped function.

In contrast, Latané (1981) and Mullen (1983, 1987) argue that larger the group the greater its impact, not just because the group provides information about reality but also because of the group's power to reward and punish. They insist that the additional impact is smaller for each additional group member and the function relating group size to its impact is a concave-shaped function. This view is consistent with Weber's law which represents a logarithmic relationship between stimulus and perception.

Deutsch and Gerard (1955) reason that the impact of group size can be explained by two distinct processes: One is normative influence which reflects the group's power to reward and punish, and the other is informational influence which reflects the group's capacity to provide information about reality. Stasser and Davis (1981) suggest that the impact of group size will differ depending on whether the response to conformity pressure is public or private. Campbell and Fairey (1989) also propose different functions depending on the process which predominates. When the process is informational influence, they argue that the impact function of group size will be concave-shape which is consistent with the view of Latané (1981) and Mullen (1983, 1987), thus the first source provides the most information and each additional source is less valuable because the additional sources provide essentially redundant information. When the process is the normative influence, they argue that the impact function will be *S*-shape which is consistent with the view of Asch (1951, 1955) and Tanford and Penrod (1984), thus the second and third sources should have greater impact than the first.

In either case whether the response function is *S*-shaped or concave-shaped, there is this notion that there exists an effective size of the group. However, this size would vary depending on the response function being *S*-shaped or concave-shaped. So, then it becomes an empirical question to figure out shape of the response function. This is what we do in the next section where we conduct conjoint studies to recover the function of a consumer's perceived value vis-à-vis the size of positive recommenders and then identify the shape of this function.

3. Methodology

Consumers' response to WOM volume can be identified using three main methodologies: *inference*, *surveys*, and *experiments*. One can infer consumers' response to WOM volume with the estimates corresponding to the impact parameter for WOM volume in an assumed 'consumer response function' to WOM volume. For example, some researchers infer consumers' response to WOM volume based on a quantitative diffusion model (e.g., Bass, 1969; Easingwood et al., 1983; Mansfield, 1961; Srinivasan and Mason, 1986; Sultan et al., 1990). Note that these diffusion models assume a specific form of 'consumer response function' for WOM volume and the coefficient of imitation is estimated using aggregate-level sales data. It is also possible to investigate consumers' response for WOM volume based on surveys (e.g., Bowman and Narayandas, 2001; Reingen and Kernan, 1986; Richins, 1983). The attraction of survey methodology is that researchers can directly ask questions such as "How many people did you tell about a product?" and "How many people told you about a product?" However, the survey-based methodology has a disadvantage that it depends on respondents' memory. Yet another methodology to recover 'consumer response function' for WOM is based on experiments designed to measure consumers' response to various levels of WOM volume. The experiment-based methodology has an advantage that one can identify consumers' response function for WOM volume without assuming a specific form of the function, unlike the Bass model and its extended versions. In this