The current issue and full text archive of this journal is available at
www.emeraldinsight.com/0309-0566.htm

Received 16 February 2012
Revised 18 February 2013
Accepted 7 May 2013

Word-of-mouth marketing

Towards an improved understanding of multi-generational campaign reach

Lars Groeger and Francis Buttle
Macquarie Graduate School of Management, Macquarie University, Sydney, New South Wales, Australia

Abstract

Purpose – The paper aims to provide a theoretically informed critique of current measurement practices for word-of-mouth marketing (WOMM) campaigns.

Design/methodology/approach – An exploratory field study is conducted on a real-life WOMM campaign. Data are collected from two generations of campaign participants using a custom-built Facebook app and subjected to social network analysis (SNA). We compare our theoretically informed measure of campaign reach with industry standard practice.

Findings – Standard metrics for WOMM campaigns assume campaign reach equates to the number of campaign-related conversations. These metrics fail to allow for the possibility that some participants may be exposed multiple times to campaign-related messaging. In this exploratory field study, standard metrics overestimate campaign reach by 57.5 per cent. The campaign is also significantly less efficient in terms of cost-per-conversation. SNA shows that multiple exposures are associated with transitivity and tie strength. Multiple exposures mean that the total number of campaign-related conversations cannot be regarded as equivalent to the number of individuals reached.

Research limitations/implications – SNA provides a sound theoretical foundation for the critique of current WOMM measurement practices. Two social-structural network attributes – transitivity and tie strength – inform our critique. A single WOMM campaign provides the field study context.

Practical implications – The findings have significant implications for the development and deployment of WOMM effectiveness and efficiency metrics and are relevant to WOMM agencies, agency clients and the Word-of-Mouth Marketing Association.

Originality/value – This is the largest field study of its kind having collected data on >5,000 WOMM campaign-related conversations. Participants specified precisely whom they spoke to about the campaign and the strength of that social tie. This is the first SNA-informed critique of standard WOMM campaign measurement practices and first quantification of offline multiple exposures to a WOMM campaign. We demonstrate how standard campaign metrics are based on the false assumption that word-of-mouth flows exclusively along intransitive ties.

Keywords Facebook, Word-of-mouth, Social network analysis, Campaign reach, Transitivity, Word-of-mouth marketing (WOMM)

Paper type Research paper

Introduction

Word-of-mouth (WOM) has been acknowledged for many years as a major influence on what people know, feel and do (Buttle, 1998). Indeed, efforts to understand WOM have ancient origins (Aristotle, trans. Roberts, 1924). Twenty-three centuries later, there is now significant research literature on interpersonal influence. Much of this research has examined organic WOM, that is, WOM that occurs naturally and is not explicitly aroused and managed by marketers for strategic purposes. The four-decade long

European Journal of Marketing
Vol. 48 No. 7/8, 2014
pp. 1186-1208
© Emerald Group Publishing Limited
0309-0566
DOI 10.1108/EJM-02-2012-0086

history of research into the effect of interpersonal influence on innovation adoption is perhaps the best-known exemplar (Rogers, 1962, 2003).

More recently, however, marketers have begun to seek ways to explicitly arouse and manage WOM with a view to influencing consumer behaviour (Godes and Mayzlin, 2009). Known as amplified WOM, viral marketing or word-of-mouth marketing (WOMM) (Hinz *et al.*, 2011, Kozinets *et al.*, 2010, Libai *et al.*, 2010, Sernovitz, 2012, Trusov *et al.*, 2009) organisations are re-visiting "WOM as a powerful marketing tool" (Sweeney *et al.*, 2012, p. 237). WOM is now more widely understood to be a communication or promotion medium (Winer, 2009).

WOMM involves the seeding of products to targeted groups of consumers with the goal of encouraging them to spread positive WOM, which, in turn, increases brand awareness and sales (Trusov *et al.*, 2009). WOMM is sometimes referred to as a panacea:

> It seems like the ultimate free lunch: Pick some small number of people to seed your idea, product, or message; get it to go viral; and then watch while it spreads effortlessly to reach millions (Watts and Peretti, 2007, p. 22).

According to PQ Media (2009), WOMM is the fastest-growing marketing communications segment, and American investment in WOMM campaigns was projected to be $3.04 billion in 2013. Until recently, companies were experimenting with WOMM out of test budgets, but now many are integrating WOMM into their routine marketing communications plans (Carl, 2009), stimulating the need for improved measurement practices (Van den Bulte and Wuyts, 2007).

The hyper-reach of WOMM implies that WOMM messages spread rather like a chain-letter: if you send an email to 100 friends, and each of those forwards it to 50 people, who, in turn, send it to 50 friends, who yet again pass it on to another 20 friends, your message could reach 5 million people ($100 \times 50 \times 50 \times 20$), over the four generations (or degrees of separation). But is this really how WOMM works? Is it not possible that some, maybe even many, people receive the message more than once, such that reach is below, even well below, 5 million.

If we are to measure this "multi-generational" transmission of WOM and assess the true reach of WOMM campaigns, we need to know the specifics of who talks to whom across generations, including the people who initially spread the information, known as Generation 0 (Gen0), the people they talk to (Gen1) and the people Gen1 then talks to (Gen2). The Word-of-Mouth Marketing Association (WOMMA, www.womma.org), the peak organization for WOMM practitioners, has established a number of methods to estimate the number of conversations for each generation (WOMMA, 2009). However, these methods may fail to report the true reach of campaigns because they assume that each conversation is with a unique and previously uninformed person. Without any empirical evidence about who actually speaks to whom across multiple generations, the assertion that the total number of campaign-related conversations equates to reach is pure speculation.

In this exploratory research, we use social network analysis (SNA) (see recent review by Burt *et al.*, 2012) to improve our understanding of true WOMM campaign reach and to inform the development of improved WOMM metrics. Current WOMM measurement approaches are poorly informed by theory and appear to be based on a misunderstanding about how WOM spreads within social networks, particularly the assumption that messages flow along intransitive ties. We provide empirical evidence

for our critique of current measurement practices using a dataset from a real-world WOMM campaign. This data set is gathered using a novel methodology and includes multi-generational friendship network data for each WOMM campaign participant. SNA allows us to identify who specifically talks to whom about the campaign and, therefore, to measure the true reach of the campaign. We demonstrate that standard campaign metrics overestimate true campaign reach by 57.5 per cent. We now describe current WOMM measurement practices and introduce elements of network theory that inform our research questions. The answers to our theoretically driven research questions form the basis for the proposed enhancement of WOMM campaign metrics.

WOMM campaign measurement

Marketing communication managers and their agencies widely use reach and frequency as indicators of campaign outcomes, reach being the total number of unique people reached and frequency being the number of times a member of a target market is exposed to a media vehicle or within a given period (Farris *et al.*, 2010). The WOMMA models its metrics on these established practices, adopting reach, defined as the total number of persons reached "through an action of peer-to-peer connectedness" (Stradiotto, 2009, p. 33), as one of the most important key performance indicators (KPIs) for a WOMM campaign. Reach "allows for an understanding of how far a given marketing message may have spread" (Stradiotto, 2009, p. 32).

In its Metrics Guidebook, WOMMA (2009) does distinguish between reach and frequency, stating that "when counting reach, individuals are counted only once, irrespective of the number of times they may have been exposed (frequency) to a given marketing message" (Stradiotto, 2009, p. 33). However, the methods described in the Guidebook (e.g. post WOM episode reporting, WOM diary) do not allow for a differentiation between reach and frequency. WOMM campaign reach reported by Carl *et al.* (2008) and others at industry conferences (Fay and Carl, 2011) is deemed equivalent to the total number of campaign-related conversations. Furthermore, the most recent WOMMA (2012) publication on campaign Return on Investment (ROI) refers to "unique consumers reached" or "total program reach" as if every exposure to the campaign message is with a unique person, previously unexposed to the campaign. Our interviews with industry experts confirm that this approach to estimating total reach is common practice for WOMM agencies (Soup, 2011; TRND, 2011). Occasionally, a presenter at a WOMM industry conference mentions the possibility of "social network overlap" (Cuppari, *et al.* 2010, p. 12), but their calculations of overlap (multiple exposures) are proprietary and unpublished. We do not know whether the structure of campaign participants' friendship networks is considered or if there is some other basis for the estimated overlap. Academics have also noted the possibility of multiple exposures (Mazzarol *et al.*, 2007), but do not provide empirical evidence for it. This further stresses the importance of delivering a theoretically informed assessment of WOMM campaign measurement and publishing these findings.

Carl *et al.*'s (2008) analysis of WOMM campaign reach illustrates the measurement problem. Carl *et al.* (2008) report on a WOMM campaign in which a new consumer good was seeded to 5,000 Gen0 campaign participants. A month later, they surveyed Gen0, Gen1 and Gen2 to reveal message pass-on behaviours. Figure 1 illustrates exponential growth in the number of campaign-related conversations, despite a significant decline in

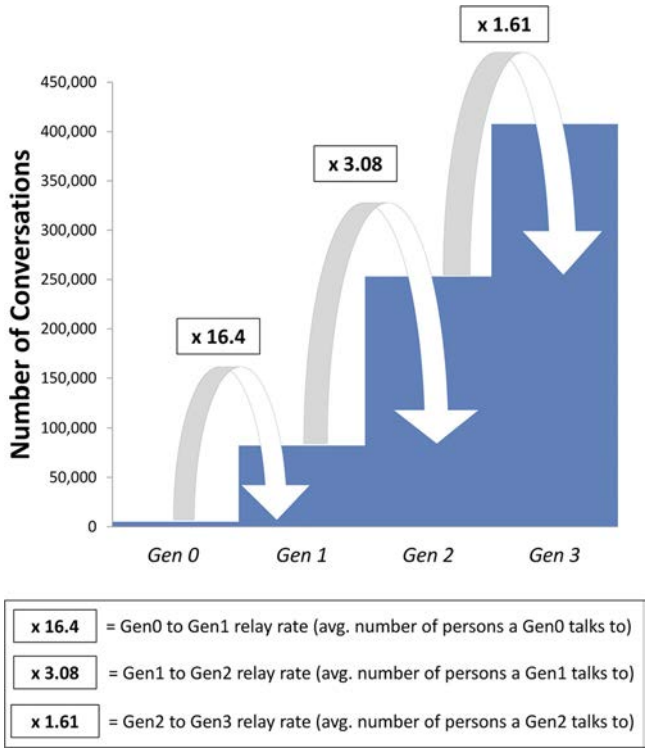

Figure 1.
Relay rate and reach per generation (adapted from Carl *et al.*, 2008, p. 8)

the number of conversations per generation. The total reach for this campaign is claimed to be in excess of 740,000 people (82,150 Gen1 + 253,022 Gen2 + 407,365 Gen3) excluding the 5,000 original Gen0 participants. Put another way, WOM from each Gen0 participant is claimed to have reached an average of 149 people over three generations. Carl *et al.*'s (2008) research assumes that each conversation is with a unique person; it fails to account for the influence of social-structural network attributes on message dissemination. Without details about precisely who talked to whom about the campaign, there is no way of knowing whether the claim that the campaign reached 740,000 unique people is correct or fallacious. If true campaign reach is a lower number, this will also have implications for efficiency-related campaign metrics, for example, cost-per-person reached.

Literature review and research questions

The theoretical foundation for our research is network theory (Burt *et al.*, 2012, Scott, 2005). Social networks have become a "hot" topic among social scientists with the number of articles in the Web of Science nearly tripling in the past decade (Borgatti *et al.*, 2009). However, the key ideas, concepts and methodologies to analyse social networks that have been around for decades and are found outside of the marketing discipline, which has long ignored a network perspective (Van den Bulte and Wuyts, 2007). The Marketing Science Institute recognised the potential contribution of network theory

when "the connected customer" was cited as an important contemporary research theme (Marketing Science Institute (MSI), 2006). Former MSI Executive Director Hanssens stated that "the framework *par excellence* to study the connected customer is the social network paradigm" (Hanssens, 2007, p. vii).

A social network is a social structure made up of a set of actors (such as individuals or organizations) and the dyadic ties between them. In a social network, the actors are known as nodes (or vertices) and the relationships between them as ties (or edges). SNA is as much an analytical tool for understanding, exploring and visualizing social structures as it is a theoretical perspective that stresses the importance of networks and their influence on individual actors (Kilduff and Brass, 2010). Instead of examining individual traits, SNA explores the interactions between social actors with these interactions becoming a social structure worthy of analysis in its own right (Wasserman and Faust, 2009).

WOM is an inherently social phenomenon because information is transmitted between actors along social ties (Huang *et al.*, 2011, Sweeney *et al.*, 2012); the structure of these ties determines who speaks to whom across multiple generations. This structure is made visible by SNA. Reingen and Kernan (1986) are highly critical of previous WOM research for "its failure to capture the social-structural context within which such communication is embedded" (p. 370). Twenty years later, Van den Bulte and Wuyts (2007) were still calling for the deployment of SNA to help marketers understand how WOM is disseminated. Our research responds to this call to action. We now explore two social network constructs that are particularly relevant to our research – transitivity and tie strength – and introduce our research questions.

Transitivity

The concept of transitivity originates from sociology (Simmel and Wolff, 1950 (1917)) and is indicated in the expression "any friends of my friends are also my friends" (Snijders, 2011). Transitive ties are commonplace in social relationships (Davis, 1970; Holland and Leinhardt, 1971; Rapoport, 1953; Weimann, 1983). The more ties there are between members of a social network, the more transitive it is. Figure 2 illustrates the difference between transitive and intransitive social networks. In the intransitive network, A is friends with B and C, but B and C do not know each other (dotted lines). In the transitive network, friends F, G and H are all connected (solid lines).

Transitivity may constrain the dissemination of WOMM messaging (Van den Bulte and Wuyts, 2007). In the transitive network shown in Figure 2, an original Gen0 campaign participant (F) speaks to two Gen1 friends G and H (solid arrows). G and H are connected to each other and have a common friend, J, to whom they communicate the message. However, in the intransitive network this has not happened because B and C have no friends in common; B and C each talk to friends D and E who are, respectively, unique to them. Four conversations occur in each of the two networks. However, the transitivity of the ties between G, H and J allows multiple exposures to occur which subsequently leads to a 25 per cent decrease in the number of individuals reached (3 as opposed to 4).

In an intransitive network, WOM passes along chain-like ties. Cumulative reach is estimated by $1 + X^1 + X^2 + X^3 \ldots + X^n$, where X represents the number of recipients of the message in generations 1 to n (Duff and Liu, 1975). Our earlier criticism of WOMM industry practice, as exemplified by Carl *et al.*'s (2008) research described above, is that

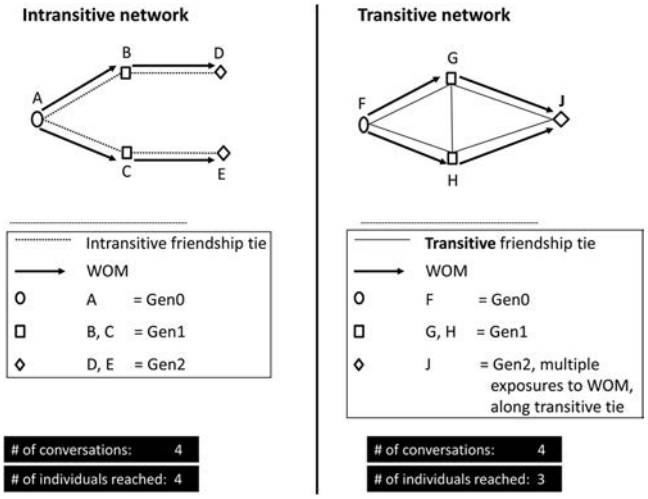

Figure 2.
WOM diffusion along transitive ties across two generations

it assumes messaging is communicated entirely within intransitive networks and, thus, every conversation is with a new uninformed person. However, in a transitive network, reach is constrained when transitive ties are activated and some persons are exposed to the message more than once (e.g. person J in Figure 2).

Multiple exposures based on transitivity may happen both within referral chains and between referral chains. A referral chain comprises an original Gen0 WOMM campaign participant and all the Gen1, Gen2 […] GenN people who are subsequently reached by that Gen0's WOM.

Figure 3 conceptualises how multiple exposures may occur. Multiple exposures *within* referral chains occur if a Gen1 talks to another Gen1 who is also spoken to by Gen0 (Figure 3, arrow 1) or two Gen1 talk independently to the same Gen2 (Figure 3, arrow 2). Multiple exposures *between* referral chains happen when one Gen0 (A) talks to another Gen0 (Z) about the campaign (Figure 3, arrow 3), a Gen0 talks to a Gen1 who has already been spoken to by another Gen0 (Figure 3, arrow 4), or a Gen2 talks to another Gen2 each of them being located in referral chains originating from a different Gen0 (Figure 3, arrow 5). This results in reduced campaign reach, as some persons receive multiple exposures to the WOMM message; not every campaign-related conversation is with a unique person. Extant research provides no insights into this phenomenon.

To summarise, and as indicated in Figure 2, transitivity of social ties is a necessary though not sufficient precondition for multiple exposures. Transitivity enables multiple exposures to occur but only when the transitive ties are activated for WOM. If transitivity is present and leads to multiple exposures it would be false to claim that campaign reach equates to the total number of campaign-related conversations. Our first research question, therefore, explores the influence of transitivity on multiple exposures:

RQ1. What is the influence of transitivity on multiple exposures?

The second social network construct we investigate is tie strength.

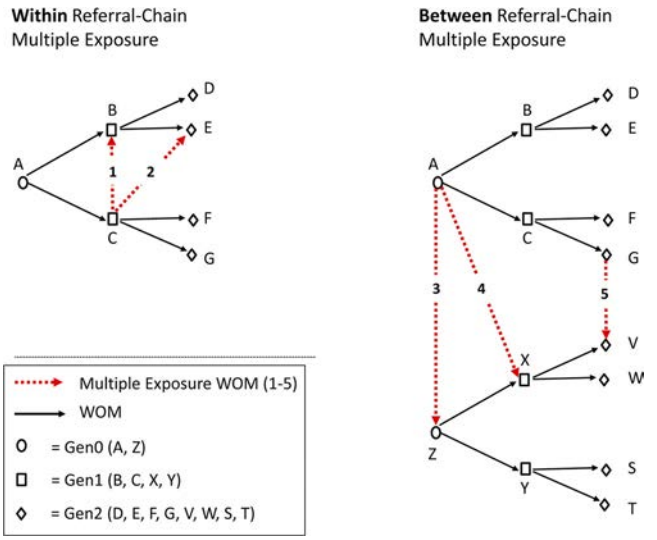

Figure 3.
Multiple exposures within and between referral chains

Tie strength

A social tie is an information-carrying connection between actors. The strength of a tie, according to Granovetter (1973), varies between strong and weak and is determined by the amount of time, the emotional intensity, the intimacy and the reciprocal services that connect the actors. Reingen and Kernan (1986) have found that the stronger the tie, the more likely it is to be activated for WOM referral. Brown and Reingen (1987) draw on Granovetter's (1973, 1982) observation that while strong ties are more likely to be associated with within-group influence, weak ties allow communication to flow between otherwise disconnected groups of people. This has generated the apparently paradoxical notion of "the strength of weak ties" (Granovetter, 1973). Brown and Reingen's (1987) work on customer referral behaviours show that weak ties act as bridges enabling WOM to spread into parts of social networks that would be unreachable by strong ties. Their work supports the weak tie hypothesis.

Social relationships that are well-established and long-lasting, such as close friendships or working relationships, tend to settle into transitive patterns and feature strong ties (Hallinan and Hutchins, 1980). This leads us to suspect that tie strength may play a significant role in both enabling and constraining WOMM campaign reach. Where ties are strong between members of a social network, we suspect there is a higher probability that any single actor will be connected to other potential recipients along transitive ties and thus experience multiple exposures to the WOMM message. Conversely, as ties weaken, the opportunities for multiple exposures are reduced as the information spreads beyond the transitive network. Hence our second research question:

RQ2. What is the influence of tie strength on multiple exposures?

Much of the research into WOMM simply explores message pass-on behaviours and ignores the influence of social-structural attributes such as transitivity and tie-strength on those behaviours (Berger and Schwartz, 2011; Carl, 2007, Carl *et al.*, 2008). Our

research extends Reingen and Kernan's (1986) pioneering work on the influence of social-structural attributes on referral behaviours but within the context of a real-world product seeding campaign. The answers to these two questions provide a theoretically sound foundation for improvements to WOMM campaign measurement.

Context and methodology

The specific context for our research is WOMM campaigning. The WOMM agency Soup (www.soup.com.au) partnered with us in this research. Soup maintains a panel of 100,000 people who opt-in to receive new products that they try, share and talk about with others. Panel members commit to talk to their social networks – family and friends – about the product and their experiences.

We used an innovative methodology that we piloted before full-scale deployment. Collecting data on offline friendship networks is difficult due to the inconvenience and high costs of capturing the names of an individual's ("ego", in SNA terminology) friends (alters), and subsequently mapping their relationships (alter-alter) through interview, survey or observation (Hogan *et al.*, 2007). Hence, many SNA studies are limited to well-defined populations, such as organisations (Krackhardt and Hanson, 1993) or small communities (Weimann, 1983). Diffusion studies that investigate both strong and weak ties use a "roster technique" that presents respondents with a list of all of the members of the social network under examination (Rogers, 2003, p. 310). Our approach involved presenting participants with a list of their Facebook (FB) friends. We thus used participants' existing FB friendship data as a proxy for their offline conversation partners.

The key advantages of using FB friendship networks as a proxy are the low costs and high convenience for both the participant and researcher. Previous research shows that FB users tend to interact online with people with whom they already have an offline relationship (Ellison *et al.*, 2007, Lewis *et al.*, 2008). Wang and Wellman (2010) found that "just more than one fifth of all internet users report having one or more friends who are online only" (Wang and Wellman, 2010, p. 1,157). Jones *et al.* (2013) predict the strength of real-world relationships by analysing online interactions on FB, and Katona *et al.* (2011) also test and confirm that an online network can be a good proxy for people's real-life networks. Thus, we were confident that most of our participant's offline conversation partners were represented on FB. However, we further tested this assumption in our research by asking:

> How many of your real friends and family (i.e. those you regularly catch up with, go out for dinner/drinks, play sport with, etc.) are also friends with you on Facebook?

FB allows members to download their own "ego" friendship network and to learn which of these people are friends with each other (alter-alter ties). However, FB does not allow members to discover their friends' friends beyond the member's own network. The FB Application Programming Interface respects personally defined privacy settings. For our research, all participants' ego friendship networks were de-personalised to conform to FB's terms of service and satisfy university ethics requirements. Instead, each person was given a unique identification number that we used to map friendship networks.

We developed our data collection instrument as an FB application or app. The app invited respondents to identify the members of their FB friendship network to whom

they had talked about the particular campaign by checking a box on a drop-down list of their FB friends, and to report the strength of the ties that bind those friendships. Although there are several multi-dimensional measures of tie-strength (Petróczi *et al.*, 2006) we used a single-item measure: closeness. Marsden and Campbell (1984) report that closeness measures have been most often used as single indicators of tie-strength in previous research. Our single-item measure also minimized respondent burden. Our scale item asked participants to rate the closeness of each friendship on a 9-point Likert-type scale ranging from 1 (= barely know the person) to 9 (= we are very close friends). Thus, we are able to model the participant's friendship network and the embedded communication ties that connect network members. Although the FB friendship network is a digital construct, we were interested to know who had talked to whom in real analogue life about the WOMM campaign.

Being an innovative methodology, we ran a pilot study on real-life WOMM campaign for a brand of wine and invited 412 Gen0 to complete our app survey; only 30 participated (8 per cent response rate). We contacted a sample of pilot campaign participants and non-participants to investigate their experiences of the pilot survey or their reasons for non-participation. Having learned from the pilot, we modified the methodology and ran the main survey.

FB app survey

Our main study was conducted as part of the launch of a new bottled, Belgian-style beer. The launch was supported by a product-seeding campaign aimed to stimulate WOM among members of the social networks of Soup panel members.

Two-thousand members of Soup's panel were invited to an on-premise tasting. On the basis of their relative enjoyment of the beer and their fit with the brand's target market profile, 800 of the 2,000 attendees were invited to become Summer Ambassadors for the brand. These Gen0 participants were aged 25-35 years, male and female, city dwellers, drank beer at least fortnightly and were regular organisers of social events for the friendship networks.

The Gen0 participants were sent two cases of the product for two key dates, Christmas Day (25 December) and Australia Day (26 January). They were encouraged to incorporate the beer into social get-togethers, parties and barbeques. An agency survey one month after delivery found that, on average, 16 people attended each event, with 12 tasting the beer. Prior to our FB survey being launched, the agency asked the 800 Summer Ambassadors if they would like to opt-in to our FB app survey (see sample screenshots in Figure 4).

Three months after the WOMM campaign finished, the agency sent an email message to the 590 who had opted-in inviting them to participate in our research. Participants, having completed the app survey, could forward the app to Gen1 either through FB or as an email attachment for them to complete in the same way. Gen1 could do the same for Gen2 and so on. NodeXL, a free, open-source SNA template for Microsoft Excel, was used to analyse and visualise the data (NodeXL, 2012).

Results

We collected data from Gen0 and Gen1, and we also obtained further data about, but not from, Gen2. Of the 590 Gen0 who opted-in to our FB survey, 309 (52 per cent) completed the app survey. Gen0 passed on the FB survey to 665 Gen1 friends, of whom 50 (7.5 per

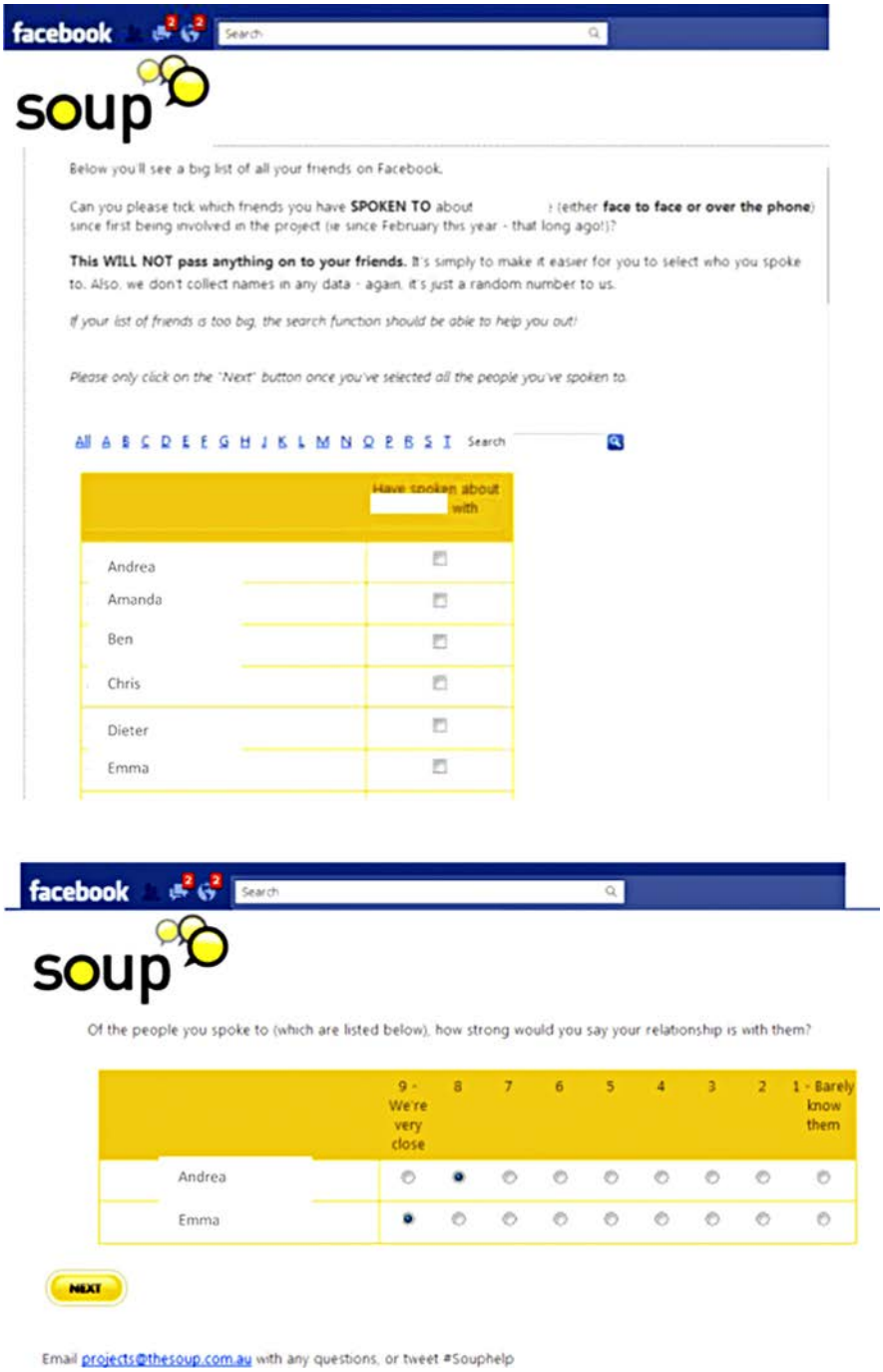

Figure 4.
Screenshots of FB application

cent) completed the survey. Gen1 passed on the survey to 59 Gen2 conversational partners, none of whom participated.

A prerequisite for using FB data for our research is that participants' offline conversation partners are effectively represented within their FB networks. Absent this, we would be unable to draw conclusions about the reach of WOMM messages into offline social networks. The results justify our decision to use FB friendship data as a proxy for offline conversation partners: 83 per cent of all Gen0 and Gen1 participants ($n = 354$) reported that at least half of their regular offline social interaction partners are also friends with them on FB; 51 per cent stated that "most" or "pretty much all" of their offline friends are FB friends too. We have excluded from our analysis data from 5 Gen0 participants who reported that "very few" or "none" of their offline friends were also FB friends. Consequently, for our research, participants' FB friendship networks are a reasonable proxy of their offline social networks, though not a precise mirror.

Before we present our answers to the research questions, we provide an overview of the results of the app survey (Table I). The 304 Gen0 (Table I, cell A2) whose data were retained for analysis reported talking to an average of 55.4 persons (cell A3) about the beer over the course of 3 months. This relatively high number is most likely a reflection of their role as Summer Ambassadors and the social events to which many Gen1 were invited. Therefore, Gen0 who participated in our FB survey talked to 16,841 Gen1 conversational partners about the brand (cell A2 × cell A3). Projecting from the 304 respondents to the 800 original Gen0 program participants, this implies 44,320 (cell A3 × cell A1) Gen1 conversational partners for the entire population of Gen0 program participants.

The 50 Gen1 participants reported talking to an average of 7.3 friends (cell B3) about the beer, implying a total number of 323,536 (cell B3 × cell A5) Gen1–Gen2 conversations. In the absence of data from Gen2, we rely on our research partner's estimation model derived from >100 WOMM campaigns. Their proprietary modelling data reports an average 50 per cent drop off in conversations from Gen1 to Gen2, a proportion endorsed by Carl (2007) and reported in Carl *et al.*'s (2008) research. Thus, as Gen1 speaks on average to 7.3 friends, we estimate that Gen2 speaks on average to 3.65 (= 7.3/2) friends. This implies a total number of 1,180,906 (cell C3 × cell B5) Gen2>Gen3 conversations. Therefore, there were 1,548,762 (cell A5 + cell B5 + cell C5) conversations generated as a result of this campaign, giving a Gen0/conversation ratio

	A Gen0	B Gen1	C Gen2
Participants	800		
Number completing our FB survey	304	50	
Average number of friends spoken to about the beer (relay rate) . . .	55.4	7.3	3.65 (e)
. . . producing this total number of actual conversations	16,841	365	
. . . which implies this total number of generational conversations . . .	44,320	323,536	1,180,906 (e)
. . . which leads to this total number of multi-generational conversations		1,548,762	

Table I. Participants and conversations

of 1:1936. In other words, for every original Gen0 program participant, there was an average of 1,936 conversations over three generations.

The WOMMA measurement practices described earlier assume campaign reach equates to this number of campaign-related conversations. For this campaign, therefore, WOMMA protocols would estimate campaign reach at 1,548,762. To establish whether transitivity has any impact on this estimate, we now answer *RQ1*.

RQ1. What is the influence of transitivity on multiple exposures?

Our research challenge is to find out whether these 1,548,762 persons are unique identities or whether some of them are exposed to the campaign message more than once as a result of the activation of transitive friendship ties. NodeXL (2012) allows us to graph and compute multiple exposures. In total, we identified 149 cases of multiple exposures to the WOMM message; 92 of these occurred within referral chains and 57 between referral chains (Figure 3).

Within referral chain multiple exposures

Gen1 identified 298 ties for campaign-related conversations. Of these, 92 (30.9 per cent) took place between a Gen1 and a Gen2 who was also spoken to by another person within the same referral chain. Where within referral-chain multiple exposures were documented, Gen0 and Gen1 had spoken to 3.2 out of an average of 49 common friends. That is, these Gen0 and Gen1 had, on average, 49 transitive ties with common friends, each transitive tie being a necessary precondition for multiple exposures to occur. Clearly, not every transitive friendship tie leads to multiple exposures because not every tie is activated for WOM. Figure 5 is an illustration of NodeXL output that shows within referral-chain multiple exposures along transitive ties. It shows the referral chain of one Gen0 participant, Gen0 L. This participant talked to 14 friends about the campaign; one of these Gen1 also participated in our research. She is connected to all of the other 13

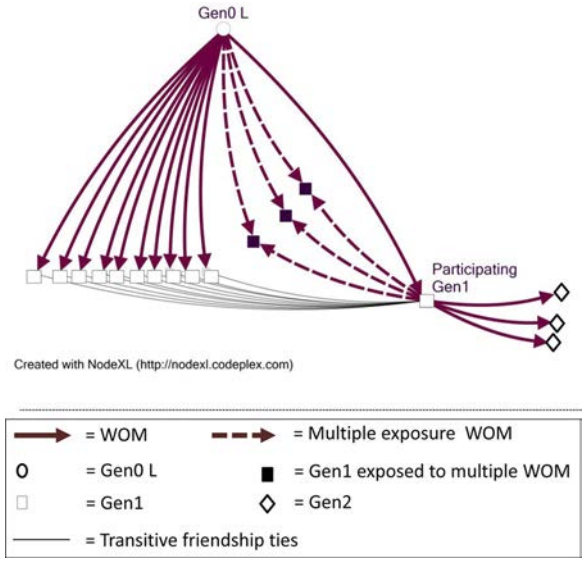

Figure 5.
Example of within-referral chain multiple exposures along transitive ties

Gen1 (solid lines in Figure 5) and talked to three of these common friends who had already been spoken to by Gen0 L (dashed arrows in Figure 5). In addition, she spoke to another three friends who are not connected to Gen0 L. Thus, 50 per cent of this Gen1's conversations were along transitive ties to common friends with Gen0 L and 50 per cent of the conversations reached Gen2 along intransitive ties.

Between referral chains multiple exposures

We identified 57 multiple exposures involving participants in more than one referral chain. Out of 304 Gen0 participants, 28 identified (9.2 per cent) another Gen0 as a conversation partner (i.e. another Summer Ambassador). Further, 29 conversations occurred between a Gen0 and a Gen1 who had already been informed by another Gen0. Figure 6(a) is an illustration of NodeXL output showing transitive friendship ties (solid lines) between Gen0 A and Gen0 Z: they have 34 common friends that could potentially be exposed to WOM from both campaign participants.

Figure 6(b) omits these friendship ties and only shows Gen0 A's and Gen0 Z's campaign related conversations (Figure 6(b), solid and dashed arrows). Gen0 A talked to nine conversation partners; Gen0 Z talked to eight conversation partners. They each identified the other Gen0 as a conversation partner (Figure 6, arrow 1) and each talked to two common Gen1 friends, activating two transitive friendship ties that lead to multiple exposures (Figure 6, solid triangle). This demonstrates again how transitive ties are a precondition for multiple exposures to occur and further demonstrates the extent of transitive ties between conversational partners.

Overall, SNA has demonstrated not only the existence of transitive ties between conversational partners but also their activation for message pass-on. Before we computed the impact of multiple exposures on campaign reach, we now turn to our second research question:

RQ2. What is the influence of tie strength on multiple exposures?

Our FB survey asked participants to rate the strength of the friendship tie with each person they spoke to about the beer Table II. We found that 69.1 per cent of brand-related conversations were along strong ties (points 7-9 on the scale) and 30.9 per cent were along weaker ties (points 1-6). The chi-square test allows us to reject, at the 5 per cent level, the null hypothesis that there is no association between tie strength and campaign-related conversations (χ^2 = 13.62, df = 1). We conclude that there is a stronger probability of campaign-related conversations travelling along strong ties than weaker ties.

Based on the principle of transitivity, we also suspect that where ties are strong and transitive there is a high probability of multiple exposures to the WOMM message. Conversely, as ties weaken, the opportunities for multiple exposures are reduced. To find out if this is correct, we identify all cases in which there are multiple exposures to the WOMM message (n = 149) and categorise them by tie strength: 134 (89.9 per cent) of all identified multiple exposures occurred along strong ties and only 15 (10.1 per cent) along weaker ties. Considering the higher ratio of strong tie conversations to weaker tie conversations, we compare the sender-defined strength of the ties that describe those relationships with the tie profile of participants as a whole: 3.63 per cent (134/3,687) of all identified conversations along strong ties accounted for multiple exposure as opposed to 0.93 per cent (15/1,607) for weaker tie conversations. Thus, strong ties are associated

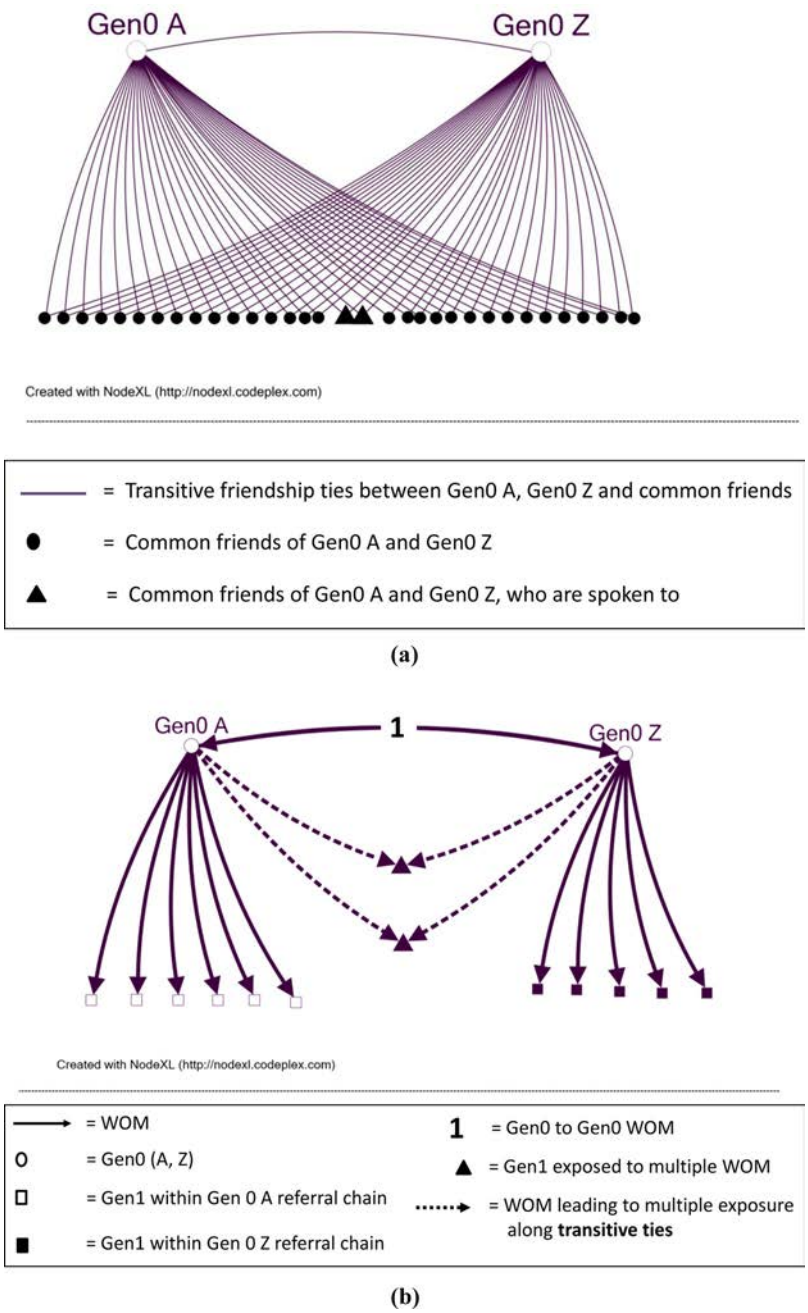

Figure 6.
(a) Example of transitivity between two Gen0; (b) Example of between referral chains multiple exposure

with four times the number of multiple exposures than weaker ties. The chi-square test shows this association between multiple exposure and tie-strength to be highly significant ($p = 0.0001$, $\chi^2 = 28.51$, df = 1).

These results demonstrate that some weaker friendship ties are also transitive. Those Gen1 whose tie strength was defined as weaker ($n = 6$) still had, on average, eight common friends (transitive ties) with Gen0, with each common friend providing an opportunity for multiple exposures. The number of common friends provides an upper bound to multiple exposures within any friendship dyad. In the case of strong friendship ties between Gen0 and Gen1, this upper bound was 41, demonstrating the significant extent of transitivity among campaign participants across generations. This supports our earlier observation that it is false to assume that WOM flows exclusively along intransitive ties.

Analysis of true reach

We now present our analysis of the true reach of this WOMM campaign. Table III adds two further layers of information to the data we presented in Table I. First, we specify the number of campaign-related conversations per generation classified by tie strength (rows 4). Second, we add our findings from *RQ1* and *RQ2* about the number of multiple exposures and their association with tie strength (rows 6). This enables us to differentiate between frequency of conversations along strong and weaker ties per generation (rows 5) and the actual reach of unique individuals per tie and generation (rows 7).

Our analysis, which is sensitized by tie-strength and levels of multiple exposures, suggests that there were only 1,240,751 campaign-related conversations, not 1,548,762. Further, we find that the true reach of the campaign, that is the number of unique persons reached, is 983,978 across three generations, not 1,548,762, and, thus, approximately 21 per cent of all conversations are multiple exposures (Table III, rows 10, 11 and 12).

General discussion

Implications for theory

SNA has provided significant insights into the dissemination of WOM, and, particularly, the roles played by transitivity and tie strength. WOMMA's conventional modelling of WOM dissemination is based on the assumption that WOM travels along intransitive ties. Our SNA shows this to be untrue. Such is the transitivity of ties connecting the people participating in campaign-related conversations that 21 per cent of these conversations are multiple exposures. To the best of our knowledge, this is the first publication of evidence quantifying the extent of offline WOM multiple exposures. SNA also shows that the tie-strength plays an important role in both enabling and

Table II. Activated tie strength – Gen0 and Gen1

	Total number of activated ties	Activated strong ties (scale points 7-9)		Activated weaker ties (scale points 1-6)	
	n	*n*	(%)	*n*	(%)
Gen0	4,996	3,451	69.1	1,545	30.9
Gen1	298	236	79.2	62	20.8
Total	5,294	3,687	69.6	1,607	30.4

Gen0 participants	800	
Gen0 average number of friends spoken to about the beer (relay rate) . . .	55.4	
. . . generating this total number of conversations . . .	44,320	
. . . along these ties . . .	Strong	Weaker
. . . with these proportions . . . (%)	69.08	30.92
. . . implying this number of conversations per tie strength . . .	30,614	13,706
. . . of which this per cent are multiple exposures . . . (%)	1.54	0.26
. . . leading to this total number of individuals reached per tie . . .	30,144	13,670
. . . and this total number of unique Gen1	43,814	
Gen1 average number of friends spoken to about the beer (relay rate) . . .	7.3	
. . . generating this total number of conversations . . .	319,845	
. . . along these ties . . .	Strong	Weaker
. . . with these proportions . . . (%)	78.46	21.54
. . . implying this number of conversations per tie strength . . .	250,944	68,901
. . . of which this per cent are multiple exposures . . . (%)	29.33	12.50
. . . leading to this total number of individuals reached per tie . . .	177,339	60,287
. . . and this total number of unique Gen2	237,625	
Gen2 average number of friends spoken to about the beer (relay rate) . . .	3.65 (e)	
. . . generating this total number of conversations . . .	876,622	
. . . along these ties . . .	Strong	Weaker
. . . with these proportions . . . (%)	78.46 (e)	21.54 (e)
. . . implying this number of conversations per tie strength . . .	688,315	188,307
. . . of which this per cent are multiple exposure . . . (%)	23.93 (e)	4.98 (e)
. . . leading to this total number of individuals reached per tie . . .	523,603	178,936
. . . and this total number of unique Gen3	702,539	
Total number of conversations across all generations	1,240,751	
Total number of unique individuals reached across all generations	983,978	
Per cent of all conversations that are multiple exposures (%)	20.69	

Table III. Revised reach modelling with consideration of tie strength

constraining message dissemination. Not only is WOM shown to travel principally (69.6 per cent) along strong ties, as predicted by Granovetter (1973, 1982) and Brown and Reingen (1987), but tie-strength is associated with the frequency of multiple exposures. Strong ties are associated with four times the number of multiple exposures than weaker ties. In addition, we have been able to confirm that transitive ties occur to a greater degree among close friends, and have visualised (Figure 6(a)) and quantified this friendship overlap: in those instances that multiple exposures occurred, conversation partners had an average of 48 (median 24) common friends. Across all 50 Gen0-Gen1 dyads, conversation partners had on average 38 common friends (median 21, mode 19). The tendency of weak ties towards intransitivity (Weimann, 1983) seems to hold, yet we also found some evidence of transitivity among weaker-tied friendships.

We suspect that homophily may account for the influence of transitivity and tie strength on WOMM message dissemination. Homophily is the "principle that a contact between similar people occurs at a higher rate than among dissimilar people" (McPherson *et al.*, 2001, p. 416). People, thus, tend to develop close social ties with others of similar background, education, occupation, status, interests and so on. As McPherson *et al.* (2001, p. 415) have said: "similarity breeds connection".

Interpersonal communication occurs most frequently between individuals who are alike, or homophilous (Rogers, 2003). Thus, homophily may predispose the spread of

WOM among relatively homogenous social network members. Diffusion studies have shown that homophily limits the extent to which an innovation diffuses widely within social networks (Duff and Liu, 1975; Rogers and Bhowmik, 1971). Homophily is "an invisible barrier to the flow of innovations within a system as it limits the spread of information to those individuals connected in a close-knit [i.e. transitive] network" (Rogers, 2003, p. 331). Homophily not only explains the strong ties between like persons, but also may serve as a foundation for network transitivity. Louch (2000, p. 51), for example, finds that there are "empirical grounds for associating increased homophily with transitivity". Our work lends further support to these sociological studies and shows WOM's diffusion to be constrained by transitive ties. While the possibility of multiple exposures is raised in the marketing literature (Mazzarol *et al.*, 2007, p. 1,477), its occurrence has not previously been empirically demonstrated. This study, thus, makes a significant contribution to the WOM literature and calls for further research into this phenomenon. In particular, the marginal impact of each additional exposure to a WOM message should be explored from a theoretical and managerial perspective.

Our FB app methodology could be valuable to researchers beyond WOMM, including researchers of innovation diffusion and public opinion.

Implications for WOMM measurement practice

Our research aims to deliver a theoretically sound critique of standard WOMM campaign measurement practices. SNA provides the foundation for our critique. Our analysis shows that standard WOMM metrics over-report both the number of conversations and reach of this WOMM campaign, because those measures fail to account for multiple exposures that vary according to transitivity and tie strength. Table IV summarises our findings and compares our results to those of the standard WOMMA practices in rows 1-4. Rows 5 and 6 report two important campaign efficiency metrics – cost-per-conversation and cost-per-person reached. Column A presents the results of WOMMA modelling. Column B presents our results based on our SNA investigation. Columns C and D show the differences.

Clearly, multiple exposures have a consequence for both efficiency and effectiveness outcomes. Application of WOMMA-endorsed modelling shows reach to be 1.55 million people over three generations. Our analysis, which takes account of multiple exposures,

Table IV. Comparison of WOMMA and revised reach modelling

	A WOMMA model	B Revised SNA-based model	C Difference (*n*)	D Difference (%)
Total number of conversations	1,548,762	1,240,751	329,623	24.82
Total number of unique individuals reached	1,548,762	983,978	564,784	57.50
Total number of multiple exposures	0	256,773	256,773	
Ratio of Gen0 to persons reached	1:1,936	1:1,230	706	57.50
Cost per conversation	9.69 cents	12.09 cents	2.40 cents	24.82
Cost per person	9.69 cents	15.24 cents	5.56 cents	57.50

indicates a much more modest reach of just >984,000 unique persons. Thus, our results show that the WOMMA estimate is 57.5 per cent higher than true reach. Similarly, we find that the total number of conversations is over-estimated by the WOMMA-endorsed model – by nearly 25 per cent. Evidently, this indicates a much less effective campaign than suggested by the WOMMA approach.

A key efficiency metric proposed by WOMMA, cost-per-conversation, is the cost of the campaign divided by the total number of persons reached. Recall that WOMMA, absent data to the contrary, assumes that the number of conversations is the same as the number of persons reached, with the consequence that cost-per-conversation is the same as cost-per-person reached. Given a hypothetical campaign cost of $150,000, the WOMMA calculations produce a cost-per-conversation of 9.69 cents per person reached. The true cost-per-person reached is 15.24 cents ($150,000/983,978).

We, therefore, urge WOMMA and campaign managers to reconsider the metrics they employ to assess campaign effectiveness and efficiency. While it is inappropriate to generalise from this one campaign, it may be possible over a number of similar studies to develop a correction factor to apply to convert WOMM estimates into true reach. If evidence from this one study were replicated elsewhere, then that correction factor would be 0.64. In other words, true reach is only 64 per cent of the WOMMA-based model (1.55 million $\times$ 0.64).

While WOMMA-endorsed metrics overstate reach and ignore frequency, advertising research suggests that multiple exposures may be desirable. Herbert Krugman's (1972) classic work suggested that a single exposure to a message might evoke curiosity but the three exposures would be much more likely to lead to a decision. Naples's (1979) review of various empirical advertising studies concluded that "an exposure frequency of two within a purchase cycle is an effective level" (p. 64) and "by and large, optimal exposure frequency appears to be at least three exposures within a purchase cycle" (p. 67).

In our heavily communicated world two or more exposures may be necessary to raise awareness (Vakratsas and Ambler, 1999; Nyilasy and Reid, 2009). Gen0 and subsequent generations in WOMM campaigns might not only be exposed to the same WOM message from several conversational partners in their social networks but also to varied executions of the same product campaign in other media such as television, radio, print and the Internet. Thus, multiple exposures may conceivably produce synergistic effects as campaign-related messages are received from more than one campaign participant or medium. From the perspective of a different effectiveness metric – that of behaviour – multiple exposures may be beneficial, though with the potential for diminishing returns as lifts in message exposure become increasingly ineffective (Deighton *et al.*, 1994).

Limitations and directions for future research

Although our research uses an innovative methodology and reports findings from a genuine new product launch, five particular limitations should be noted. First, our analysis and conclusions are derived from data collected during a single WOMM campaign for a Belgian-style beer. This product context and the consumer demographic (25-35 years old) may have had an impact on our findings. Certainly, our participants were all users of social media such as FB, organisers of social events and consumers of bottled alcoholic beverages. It would be useful to see whether our discovery of multiple

exposures is evident in other demographics and in less tech-savvy segments. Similarly, different product contexts might produce different results. For example, would a "father-son" product such as shaving equipment be subject to communication patterns driven by similar social-structural attributes? It would be imprudent to generalise from this one study. The second limitation is associated with using FB as a proxy for offline social networks. For this research, participants' offline social networks needed to be effectively represented in their FB social networks. While over half of the participants stated that "most" or "pretty much all" of their offline friends were also FB friends we acknowledge that FB is an imperfect replica of offline friendships.

The third limitation is that we only explore two metrics – reach and cost-per-person reached. We do not explore other effectiveness outcomes such as purchase intentions or purchase behaviour. Researchers, ourselves included, will want to further explore whether multiple exposures are a common feature of WOMM campaigns, and if so, whether that is problematic or not in terms of influence upon intentions or behaviour. Fourth, many Gen0 participants were themselves recruited by WOM, which may account for the observed transitivity of ties between Gen0 participants. This may be associated with a strong tendency towards homophily, making our Gen0 sample more likely to share WOM, thereby influencing the propensity for multiple exposures. Finally, in the absence of data from our participants, we relied on agency experience of message pass-on between Gen2 and Gen3. Soup's experience is that Gen2>Gen3 message pass-on is 50 per cent lower than Gen1>Gen2. Gen2's failure to participate in this research may be because they are removed from the initial WOMM stimulus and have no rational or emotional reason to participate.

In future research we plan to explore the association between propensity to purchase, purchasing behaviour and the social-structural characteristics of WOMM campaign participants. We also hope to generate more insights about Gen2 and beyond, relying less on agency assumptions.

Conclusion

Our analysis shows that the WOMMA-endorsed metrics for WOMM campaigns exaggerate both effectiveness and efficiency outcomes when those campaigns have significant numbers of multiple exposures to the WOMM message. Multiple exposures, which occur particularly along strong, transitive ties, mean that the total number of campaign-related conversations cannot be regarded as equivalent to the campaign's reach. Our data, obtained during a campaign for the launch of a new Belgian-style beer, found that the WOMMA estimate is 57.5 per cent higher than true reach, that is, 1.55 million compared to 0.985 million persons. Our data reveals a cost-per-person reached of 15.24 cents, which is significantly different from the WOMMA estimate of 9.69 cents.

References

Berger, J. and Schwartz, E.M. (2011), "What Drives immediate and ongoing word of mouth?" *Journal of Marketing Research*, Vol. 48 No. 5, pp. 869-880.

Borgatti, S.P., Mehra, A., Brass, D.J. and Labianca, G. (2009), "Network analysis in the social sciences", *Science*, Vol. 323 No. 5916, pp. 892-916.

Brown, J.J. and Reingen, P.H. (1987), "Social ties and word-of-mouth referral behavior", *Journal of Consumer Research*, Vol. 14 No. 3, pp. 350-362.

Burt, R.S., Kilduff, M. and Tasselli, S. (2012), "Social Network Analysis: Foundations and Frontiers on advantage", *Annual Review of Psychology*, Vol. 64 No. 1, pp. 527-547.

Buttle, F.A. (1998), "Word of mouth: understanding and managing referral marketing", *Journal of Strategic Marketing*, Vol. 6 No. 3, pp. 241-254.

Carl, W.J. (2007), "Measuring the ripple: creating the G2X relay multiple and industry standard methodology to measure the spread of word of mouth conversations and marketing-relevant outcomes", *Measuring Word of Mouth, WOMMA*, Vol. 3 No. 1, pp. 37-45.

Carl, W.J. (2009), "Is talking getting you anywhere? Measurnig WOM marketing", *Admap Magazine*, Vol. 45 No. 4, pp. 16-19.

Carl, W.J., Libai, B. and Ding, A. (2008), "Measuring the value of word of mouth", *Measuring Word of Mouth, WOMMA*, Vol. 4 No. 1, pp. 1-15.

Cuppari, S., Carl, W., Sheldon, S. and Hunter, D. (2010), *ROI Demystified*, Paper presented at the WOMMA Summit 2010, Las Vegas.

Davis, J.A. (1970), "Clustering and hierarchy in interpersonal relations: testing two graph theoretical models on 742 sociomatrices", *American Sociological Review*, Vol. 35 No. 5, pp. 843-851.

Deighton, J., Henderson, C.M. and Neslin, S.A. (1994), "The effects of advertising on brand switching and repeat purchasing", *Journal of Marketing Research*, Vol. 31 No. 1, pp. 28-43.

Duff, R.W. and Liu, W.T. (1975), "The significance of heterophilous structure in communication flows", *Philippine Quarterly of Culture and Society*, Vol. 3 No. 2/3, pp. 159-175.

Ellison, N.B., Steinfield, C. and Lampe, C. (2007), "The benefits of Facebook "friends:" social capital and college students' use of online social network sites", *Journal of Computer Mediated Communication*, Vol. 12 No. 4, pp. 1143-1168.

Farris, P., Bendle, N.T., Pfeifer, P.E. and Reibstein, D.J. (2010), *Marketing Metrics: The Definitive Guide to Measuring Marketing Performance*, Wharton School Publishing, Upper Saddle River, NJ.

Fay, B. and Carl, W. (2011), *WOM Measurement Webinar* [online], Word of Mouth Marekting Association, available at: www.slideshare.net/WOMMAssociation/wom-measurement-part-2-of-wommamra-webinar-series#btnNext (accessed 5 December 2012).

Godes, D. and Mayzlin, D. (2009), "Firm-created word-of-mouth communication: evidence from a field test", *Marketing Science*, Vol. 28 No. 4, pp. 721-739.

Granovetter, M. (1973), "The strength of weak ties", *American Journal of Sociology*, Vol. 78 No. 6, pp. 1360-1380.

Granovetter, M. (1982), "The Strength of Weak Ties. Teoksessa: social structure and network analysis", in Marsden, P.V. and Lin, N. (Eds), *Social Structure and Network Analysis*, Sage, Beverly Hills, CA, pp. 105-130.

Hallinan, M.T. and Hutchins, E.E. (1980), "Structural effects on dyadic change", *Social Forces*, Vol. 59 No. 1, pp. 225-245.

Hanssens, D.M. (2007), "Foreword", in Van den Bulte, C. and Wuyts, S. (Eds), *Social Networks in Marketing*, Marketing Science Institute, Cambridge, MA, p. VII.

Hinz, O., Skiera, B., Barrot, C. and Becker, J.U. (2011), "Seeding strategies for viral marketing: an empirical comparison", *Journal of Marketing*, Vol. 75 No. 6, pp. 55-71.

Hogan, B., Carrasco, J.A. and Wellman, B. (2007), "Visualizing personal networks: working with participant-aided sociograms", *Field Methods*, Vol. 19 No. 2, pp. 116-144.

Holland, P.W. and Leinhardt, S. (1971), "Transitivity in structural models of small groups", *Comparative Group Studies; Comparative Group Studies*, Vol. 2 No. 2, pp. 107-124.

Huang, M., Cai, F., Tsang, A.S.L. and Zhou, N. (2011), "Making your online voice loud: the critical role of WOM information", *European Journal of Marketing*, Vol. 45 No. 7/8, pp. 1277-1297.

Jones, J.J., Settle, J.E., Bond, R.M., Fariss, C.J., Marlow, C. and Fowler, J.H. (2013), "Inferring tie strength from online directed behavior", *PloS One*, Vol. 8 No. 1, e52168.

Katona, Z., Zubcsek, P.P. and Sarvary, M. (2011), "Network effects and personal influences: diffusion of an online social network", *Journal of Marketing Research*, Vol. 48 No. 3, pp. 425-443.

Kilduff, M. and Brass, D.J. (2010), "Organizational social network research: core ideas and key debates", *The Academy of Management Annals*, Vol. 4 No. 1, pp. 317-357.

Kozinets, R.V., De Valck, K., Wojnicki, A.C. and Wilner, S.J.S. (2010), "Networked narratives: understanding word-of-mouth marketing in online communities", *Journal of Marketing*, Vol. 74 No. 2, pp. 71-89.

Krackhardt, D. and Hanson, J.R. (1993), "Informal networks", *Harvard Business Review*, Vol. 71 No. 4, pp. 104-111.

Krugman, H.E. (1972), "Why three exposures may be enough", *Journal of Advertising Research*, Vol. 12, No. 6, pp. 11-14.

Lewis, K., Kaufman, J., Gonzalez, M., Wimmer, A. and Christakis, N. (2008), "Tastes, ties, and time: a new social network dataset using Facebook.com", *Social Networks*, Vol. 30 No. 4, pp. 330-342.

Libai, B., Bolton, R., Bügel, M.S., De Ruyter, K., Götz, O., Risselada, H. and Stephen, A.T. (2010), "Customer-to-customer interactions: broadening the scope of word of mouth research", *Journal of Service Research*, Vol. 13, No. 3, pp. 267-282.

Louch, H. (2000), "Personal network integration: transitivity and homophily in strong-tie relations", *Social Networks*, Vol. 22, No. 1, pp. 45-64.

McPherson, M., Smith-Lovin, L. and Cook, J.M. (2001), "Birds of a feather: homophily in social networks", *Annual Review of Sociology*, Vol. 27, pp. 415-444.

Marsden, P.V. and Campbell, K.E. (1984), "Measuring tie strength", *Social Forces*, Vol. 63 No. 2, pp. 482-501.

Mazzarol, T., Sweeney, J.C. and Soutar, G.N. (2007), "Conceptualizing word-of-mouth activity, triggers and conditions: an exploratory study", *European Journal of Marketing*, Vol. 41 No. 11/12, pp. 1475-1494.

Marketing Science Institute (MSI) (2006), "MSI research priorities 2006-2008", available at: www.msi.org/pdf/MSI_RP06-08.pdf (accessed 10 January 2012).

Naples, M.J. (1979), *Effective Frequency: the Relationship Between Frequency and Advertising Effectiveness*, Association of National Advertisers New York, New York, NY.

NodeXL (2012), available at: http://nodexl.codeplex.com (accessed 7 February 2012).

Nyilasy, G. and Reid, L.N. (2009), "Agency practitioner theories of how advertising works", *Journal of Advertising*, Vol. 38 No. 3, pp. 81-96.

Petróczi, A., Nepusz, T. and Bazsó, F. (2006), "Measuring tie-strength in virtual social networks", *Connections*, Vol. 27 No. 2, pp. 39-52.

Rapoport, A. (1953), "Spread of information through a population with socio-structural bias: II. Various models with partial transitivity", *Bulletin of Mathematical Biology*, Vol. 15 No. 4, pp. 535-546.

Reingen, P.H. and Kernan, J.B. (1986), "Analysis of referral networks in marketing: methods and illustration", *Journal of Marketing Research*, Vol. 23 No. 4, pp. 370-378.

Roberts, W.R. (1924), "Notes on aristotle's rhetoric", *American Journal of Philology*, Vol. 45 No. 4, pp. 351-361.

Rogers, E.M. (1962), *Diffusion of Innovations*, Free Press, New York, NY.

Rogers, E.M. (2003), *Diffusion of Innovations*, Free Press, New York, NY.

Rogers, E.M. and Bhowmik, D.K. (1971), "Homophily-heterophily: relational concepts for communication research", *Public Opinion Quarterly*, Vol. 34 No. 4, pp. 523-538.

Scott, J. (2005), *Social Network Analysis: A Handbook*, Sage, London.

Sernovitz, A. (2012), *Word of Mouth Marketing*, Greenleaf Book Group Press, Austin, TX.

Simmel, G. and Wolff, K.H. (1950(1917)), *The Sociology of Georg Simmel*, Simon and Schuster, New York, NY.

Snijders, T.A.B. (2011), "Statistical models for social networks", *Annual Review of Sociology*, Vol. 37, pp. 131-153.

Soup (2011), *Personal Interview with Research Director Soup*, Sydney, Australia, 28 April 2011.

Stradiotto, M. (2009), "Reach", in WOMMA Measurement and Research Council (Ed.), *Measurement and Metrics Guidebook*, Word of Mouth Marketing Association, Chicago, IL, pp. 33-35.

Subrahmanyam, K., Reich, S.M., Waechter, N. and Espinoza, G. (2008), "Online and offline social networks: use of social networking sites by emerging adults", *Journal of Applied Developmental Psychology*, Vol. 29 No. 6, pp. 420-433.

Sweeney, J.C., Soutar, G.N. and Mazzarol, T. (2012), "Word of mouth: measuring the power of individual messages", *European Journal of Marketing*, Vol. 46 No. 1/2, pp. 237-257.

TRND (2011), *Personal Interview with Research Director TRND*, Berlin, Germany, 15 July 2011.

Trusov, M., Bucklin, R.E. and Pauwels, K. (2009), "Effects of word-of-mouth versus traditional marketing: findings from an internet social networking site", *Journal of Marketing*, Vol. 73 No. 5, pp. 90-102.

Vakratsas, D. and Ambler, T. (1999), "How advertising works: what do we really know?", *Journal of Marketing*, Vol. 63 No. 1, pp. 26-43.

Van Den Bulte, C. and Wuyts, S. (2007), *Social Networks and Marketing*, Marketing Science Institute, Cambridge, MA.

Wang, H. and Wellman, B. (2010), "Social connectivity in America: changes in adult friendship network size from 2002 to 2007", *American Behavioral Scientist*, Vol. 53 No. 8, pp. 1148-1169.

Wasserman, S. and Faust, K. (2009), *Social Network Analysis: Methods and Applications*, Cambridge University Press, Cambridge.

Watts, D. and Peretti, J. (2007), "Viral marketing for the real world", *Harvard Business Review*, Vol. 85 No. 5, pp. 22-23.

Weimann, G. (1983), "The strength of weak conversational ties in the flow of information and influence", *Social Networks*, Vol. 5 No. 3, pp. 245-267.

Winer, R.S. (2009), "New communications approaches in marketing: issues and research directions", *Journal of Interactive Marketing*, Vol. 23 No. 2, pp. 108-117.

WOMMA (2009), *Measurement and Metrics Guidebook*, Word of Mouth Marketing Association, Chicago, IL.

WOMMA (2012), *Solving the ROI Riddle: Perspectives from Marketers on Measuring Word of Mouth Marketing*, Word of Mouth Marketing Association, Chicago, IL.

Further reading

Jones, J.P. (2002), *The Ultimate Secrets of Advertising*, Sage, London.

About the authors

Lars Groeger is a Lecturer in Marketing at Macquarie Graduate School of Management where he teaches MBA students and Executives. His research focuses on WOM and SNA. Prior to joining academia, Lars gained extensive management consulting experience in the private and public sectors. Lars Groeger is the corresponding author and can be contacted at: lars.groeger@mgsm.edu.au

Francis Buttle is a Visiting Professor of Marketing and Customer Relationship Management at Macquarie Graduate School of Management. He has held senior positions at several leading international business schools and is author of eight books and over one-hundred refereed publications.

To purchase reprints of this article please e-mail: **reprints@emeraldinsight.com**
Or visit our web site for further details: **www.emeraldinsight.com/reprints**