

Brand Traffic in Social Media and Web Searching Before and After Real Life Events: The Relationship between Information Diffusion and Information Searching

Abstract

For this research, we evaluate the relative traffic pertaining to the comments people post to the social soundtrack on Twitter, Instagram and Tumblr and the terms people search for on Google during the same periods. Focusing on Super Bowl 2015 commercials for this research, we use statistical t-tests to compare the relative volume of social soundtrack postings on each of three social media platforms and searching on the major search engine between two temporal phases (Pre and Post) for Super Bowl 2015. Findings show there is no overall significant difference in the volume of traffic between the phases for social media and web search; however, at the individual brand level, there are specific brands that show increase or decrease in volumes between phases for social media and search. Our research results are important in identifying the temporal trends and interplay between types of social media platforms and searching concerning the sharing of brand mentions in information sharing and word-of-mouth advertising.

Keywords: Super Bowl 2015; Google Trends; social soundtrack; Social Networks; second screen

1 Introduction

The increase use of mobile devices and the emergence of online social networks greatly augment the opportunity for conversational interactions for in-real-life (IRL) events, especially ones that are broadcast. The merging of these technologies allows for social conversations concerning IRL events via online social media platforms (e.g., Facebook, Twitter, Weibo, vk, etc.). The online social media sites have embedded themselves alongside broadcast mediums, affording what we refer to as the social soundtrack for the IRL event, leading to an interesting convergence of technologies and social behaviors, including information sharing and word-of-mouth advertising.

This social soundtrack is a fascinating conversational interactivity that can be both real-time (i.e., during the live broadcast) and non-real time (i.e., before or after) based on the event's period. The social sound track regarding such events can also happen on various online social media platforms. The integration of these platforms as the conversational medium in combination with IRL events marks the emergence of a social phenomenon that greatly enhances prior aspects of such broadcast mediums. This new technology merging is referred to as the second screen phenomenon, although there may be multiple (i.e., more than two) screens involved in the conversation.

With the second screen phenomenon, the broadcast media event is shown on the base device (i.e., typically the largest screen) which is where the viewing occurs, while the secondary screen is another computer device (e.g., usually a smartphone but also desktop, laptop, tablet) that facilitates the conversation that occurs on the social network. The secondary screen is what facilitates the social soundtrack, the online conversation with others regarding an in IRL event, such as Super Bowl, Academy awards, Grammy awards, etc. Social soundtrack participants exchange conversational interactions related to the IRL event via second screen devices by sharing of social media posts (Mukherjee & Jansen, 2014) to a social media site. The media broadcasts of special IRL events are associated with substantial social soundtracks, as these events do not lend themselves to recordings for later viewing, unlike, for example, a seasonal TV show. Therefore, they lend themselves to the creation of online conversations unique to particular periods.

With these temporal boundaries, the second screen interactions about an IRL event leads to a social soundtrack that is fixed in duration, with the duration bounded by the event's *Pre* (i.e., period ending at the start of the event) and *Post* (i.e., period beginning after the event ends) phases. As an example, Super Bowl 2015 is one such IRL broadcast media event. The Super Bowl occurs once in a year and is a major happening, particularly in the US. As a major sporting game, the Super Bowl event involves multiple categories of interest. One category of interest is Super Bowl commercials that have become a cultural phenomenon in their own right, alongside the game and halftime show.

For our research, we compare the social soundtrack (i.e., social media postings) and web searching occurrences (i.e., search terms submitted to search engines, such as Google) concerning the Super Bowl 2015 commercials between *Pre* and *Post* phases. Generally, search data is typically

not considered social media, so this research is a phase-based comparison concerning two online channels of the interaction effect of Social Bowl commercials, which are expensive branding events. Search data is a critically important economy indicator (Kulkarni, Kannan, & Moe, 2012), as it is the driver for most of the online commerce, especially advertising (Jansen & Mullen, 2008).

In prior work, there has been little academic research concerning the increasingly important second screen phenomenon and little systemic practitioner investigation from the analysis of the relative traffic between social soundtrack and search data. In this study, our research investigates how second screen based social soundtrack conversations concerning Super Bowl 2015 commercials along with search data differ in the *Pre* and *Post* phases for this event. In our research, we use three popular social media platforms (i.e., Twitter, Instagram, and Tumblr) as our social soundtrack data collection sites and use Google Trends to collect the searching activity.

Our present research investigates the relative traffic in temporal phases for social soundtrack conversations and web search in the context of commercials broadcast during the Super Bowl 2015. One key question that arises is how the interaction among broadcast advertising, social media conversations, and web search impact brands, as online communications have the potential to be powerful tools for information sharing and marketing. Concerning impact, understanding the difference in traffic in terms of relative volume between the social soundtrack occurring on various social media platforms and web search on major search engines in phases for IRL events can provide business insights to retailers in managing and evaluating branding and advertising campaigns.

2 Related work

While end user enrichment enhances the social possibilities of TV via user generated content, there has been inadequate research on second screen interactions. Leroy, Rocca, Mancus and Gosselin (2013) examined users' second screen behavior concerning where and when people look at their TV. Zhao, Zhong, Wickramasuriya and Vasudevan (2011) mined viewers' sentiments concerning US National Football League teams by analyzing social media tweets. Neither of these research studies measured the interaction effects of social networks and second screens concerning IRL events temporally.

Our research focuses on what we refer to as IRL broadcast media events, as the prevalence of seasonal TV (i.e., a broadcast show scheduled over several weeks with new episodes released at intervals) has decreased. These IRL event as somewhat unique, as the broadcasting of these media events are anchored temporally and do not lend themselves to delayed viewing (i.e., recording as they are airing and watching at a later time). In terms of online traffic, these IRL events can also generate substantial social media conversation that we label as the social soundtrack. The social soundtrack is generated on various social media sites using second screens (Lenhart, 2012; Lindsay, 2011) to facilitate the online conversation.

In this research, the specific IRL broadcast media event we examine is Super Bowl 2015, specifically the commercials. The rapid growth of social media leads to reinforcement of the impact of TV advertising in terms of its ability to develop brands (Stipp, 2011). Now, advertisers are using ads to encourage potential consumers' online interactive behavior in different social soundtracks using second screens. In prior work, Lee, Ham, Kim, and Kim (2014) used Twitter as the social media platform to assess people's interest in car-related commercials during Super Bowl 2012. Also, Shin, Byun and Lee (2015) studied second screen interaction on Twitter to address the creation of consumer interest in brands televised during Super Bowl 2014. Similarly, there have been studies that show that electronic word of mouth (eWOM) advertising stimulates web searches (Keller & Fay, 2012; Rockwood, 2012). For example, Zigmond and Stipp (2010) claimed an increased internet search activity results when TV advertising is coordinated with Internet campaigns for special events, such as the Olympics.

Although the aforementioned studies identified social media use in discussing brands and established the importance of web search, they neither investigated the synergies among the various social media platforms and web search activity during temporal phases of IRL event. Likewise, they were been mainly limited to one social media platform, which is a restraining factor.

Therefore, there are several unanswered questions concerning the social soundtrack interactions and web search activity concerning IRL events, including: *How do different social media platforms affect web search? How does the media broadcast of IRL events influence web search? How does the social commentary in the phases of an IRL event stimulate web searching activity concerning aspects of that IRL event?* These are some of the underlying questions that motivate our research presented here.

3 Research question

It is known that the social environment can influence and shape individual human behavior (Ashford & LeCroy, 2009). Therefore, making broadcast media events more social, influences human communication in a socially-mediated way that can affect human thoughts and behaviors. Increasingly, viewers of an IRL event use a social media site as a channel of communication by posting online messages centered on the broadcast event via second screens to build social relationships. Consequently, the social soundtrack can influence and shape the social environment around the IRL event that is being broadcast.

We define our key constructs, for clarity:

- **IRL broadcast media event** - Happening that is aired and anchored temporally by not lending itself for delayed viewing.
- **Second screen** – Computing device used for posting social media content to the social soundtrack while viewing an event on a primary screen.
- **Social soundtrack** – Collection of social media posts from second screens relating to a particular broadcast event.
- **Web search** – The submission of a keyphrase as a query to a search engine.

Online social media sites allow for broadcast media events to be accessed and shared by viewers in a variety of ways. Using these sites, the community members can join in discussions while getting ready for, while watching the, or after the show, having their comments viewed and responded to by other members communicating in the social soundtrack. So, these social soundtrack conversations may or may not be active during the live telecast of the event. The second screen technologies, such as smartphones, tablets, laptops, and even desktops, greatly facilitate these social soundtrack conversations by allowing them to occur anytime via the use of primarily mobile technology.

Along the spectrum of US broadcast media events, there are certain IRL events that draw considerable social media attention. These events include the Oscars award ceremony, music video awards shows, Grammys award show, and sporting games. This research utilizes Super Bowl 2015, as this program was the most-watched American television broadcast in history, at the time of this study, with an average audience of 114.4 million viewers (Wikipedia, 2015). Owing to the high level of viewership, companies (e.g., Budweiser, Nationwide, McDonalds, etc.) pay for expensive ads that are televised during the Super Bowl broadcast. Super Bowl commercials are an integral aspect of the Super Bowl broadcast, and the game's commercials are an event in their own right, with a substantial fan base.

Temporally, there are considerable conversations in the social soundtrack concerning Super Bowl commercials before and after the Super Bowl event. For this research, we term these temporal phases of Super Bowl as: 1) *Pre* phase, and 2) *Post* Super phase. Also, we label the conversations on the game day (in this case, 1st Feb 2015) as the *During* phase. However, we exclude the entire game day from this research due to insufficiency of search data granularity available (Heisler, 2008).

The *Pre* phase highlights the audience lead up conversation in social media and can start weeks ahead of the event. The *Post* phase highlights the audience conversation in reaction to the event and can continue for days after the event. In our study, the *Pre* phase spans from the moment the data collection for the social soundtrack starts and continues till the day of the game. The *Post* phase is the social soundtrack beginning when the event day is over until that point the social soundtrack data collection ends, which can vary event to event.

For our research, we select three social media platforms for the social soundtrack data collection, which are Twitter, Instagram and Tumblr. In terms of volume, Twitter is one of the most popular micro-blogging sites (Jansen, Zhang, Sobel, & Chowdury, 2009). Instagram is a medium of communication where users perform online sharing of images and videos (Hu, Manikonda, & Kambhampati, 2014). Tumblr is the second largest microblogging service after Twitter. It supports eight types of posts such as 1) images, 2) videos, 3) audios, 4) text, 5) answer, 6) links, 7) quotes, and 8) chat (Chang, Tang, Inagaki, & Liu, 2014). We choose Google Trends as the data collection channel for the relative frequency of the search terms occurring in the Super Bowl phases, as Google is the dominant search engine in the US market.

In this research, if the Super Bowl commercial have a branding effect, our premise is that there will be a difference in flow of both social soundtrack conversations and search traffic concerning Super Bowl commercials from the perspective of the two Super Bowl phases. Grounded on this perception, we formulate our research question to evaluate the difference in traffic for social soundtrack postings and web search data between *Pre* and *Post* phases of Super Bowl event.

- RQ1. Is there any difference in the volume of social soundtrack conversations and search data by brand between the Super Bowl phases?

This research question informs retailers and marketers about the dominance of the Super Bowl commercials related activity (conversations and/or web search) in a specific phase of Super Bowl. As a foundational research question, we would expect, if the buzz about specific ads (i.e., *Pre* phase) and the specific ads themselves (i.e., *Post* phase) had an effect on behavior outside of social media, we would expect some impact on search activity given search's role as an economic indicator and advertising driver.

To examine the research question, we define the following hypotheses.

- *Hypothesis 01: There is a significant difference in volume of social soundtrack postings between Super Bowl phases for Twitter.*
- *Hypothesis 02: There is a significant difference in volume of social soundtrack postings between Super Bowl phases for Instagram.*
- *Hypothesis 03: There is a significant difference in volume of social soundtrack postings between Super Bowl phases for Tumblr.*
- *Hypothesis 04: There is a significant difference in volume of searching activity between Super Bowl phases for Google.*

4 Data Collection and Research Design

For data collection, Super Bowl 2015 took place on the 1st of February (Sunday) at University of Phoenix Stadium, Arizona, USA. The kick-off time was 6:30 PM Eastern. The NBC channel broadcast the event, with an average of 114.5 million watchers (Wikipedia, 2015), making it the largest media event ever at the time of the study.

4.1 Data Collection in Super Bowl Phases

As presented in Table 1, we collect data related to Super Bowl 2015 from the 10th of January 2015 and continued till the 24th of February 2015 on each of the three social media platforms. To collect data from each platform, we utilize the respective APIs and tokens for Twitter, Instagram, and Tumblr in corresponding scripts with search queries, as shown below.

	Twitter	Instagram	Tumblr
Volume	3,112,789	811,262	51,569

TABLE 1. Volume of Super Bowl 2015 Data by Social Media Platforms

To collect the data, the queries that we use include: 'superbowl', 'superbowl xlix', 'superbowl 49', 'superbowl commercial', 'superbowl Ad', 'superbowl halftime', 'sb49' and 'football'. The aim of forming this list of queries was to collect data for this research using each term as a search query on all three social media platforms to ensure comparability.

Our query list includes the terms that occurred most frequently as social media tags (e.g., #superbowlcommercial, #superbowlxlix, etc.) in a collection of sample data for all social media platforms collected against the seed query named "superbowl". We collected the sample data for 48 hours (i.e. from 01/06/2015-16:00:00 to 01/08/2015-16:00:00) to identify the potential queries for this research, and the sample data was not included in the data set used in this research analysis.

For analysis, the data collection period is divided into three temporal phases. The date and time of each Super Bowl phase is shown in Table 2. As noted, we categorize game day as the *During* phase. The game started at 2/1/2015-18:30:00 and continued till 2/1/2015-22:30:00. We consider that *During* phase respectively includes these 4 hours; the first 18 and half hours of the game day (2/1/2015-00:00:00 to 2/1/2015-18:39:59), and the remaining one and half hours of the day (2/1/2015-22:30:01 to 2/1/2015-23:59:59). We do not include the game day (i.e., *During* phase) in our analysis, as unlike social soundtrack data, we cannot annotate sufficient Google Trends search data during this time frames for our research (Heisler, 2008). From research design perspective, search data collected on a single day becomes inconsistent for analysis with that collected over multiple days in other phases, as we could not collect hourly search data for the *During* phase.

	Start Date Time	End Date Time
<i>Pre</i> Super Bowl	1/10/2015- 00:00:00	1/31/2015-23:59:59
<i>During</i> Super Phase (*)	2/1/2015-00:00:00	2/1/2015-23:59:59
<i>Post</i> Super Bowl	2/2/2015-00:00:00	2/24/2015-00:00:00

TABLE 2. Start and End Dates and Times for Three Super Bowl phases. (* Data included for comparison but not included in data analysis.)

4.2 Super Bowl Commercial Keyphrases for Social Soundtrack

We classified the data into Super Bowl commercials category from second screen interactions on each social media platform, once we had collected the data from the three social media sites. The keywords for commercials are extracted from the relevant websites (Anonymous, 2015; Staff, 2015) and are in lower case for all queries.

For data collection, the query list of Super Bowl commercial keywords contains the ad titles of the brands (e.g., 'mercedes', 'coca cola', 'wix'etc.), titles of the themes / videos for the ads (e.g., 'real strength', 'like a girl' etc.), the popular name of the brands (e.g., coke, burrito etc.), hashtags associated with the brand spots (e.g., '#realstrength', '#likeagirl', '#itsthateasy', etc.) and the first and last names of actors who participated in videos related to Super Bowl 2015 brands (e.g., 'liam', 'neeson', 'braylon', 'o neil', 'o-neil' etc.).

For this research, we use 47 brands. We form the query lists for each of these 47 brands such as upcoming movie trailers (e.g., 50 Shades of Gray, Jurassic World 3D), products (e.g., Mercedes, Skittles), etc. With this query list, the posts are assigned to a specific brand for each social media platform depending on the presence of terms from the query list in Twitter texts, Tumblr blogs, and captions for Instagram posts for that brand for each commercial.

4.3 Super Bowl Commercial Key-phrases for Search Data

Similarly, we collect the search data regarding web queries from Google Trends, where the query list contains the brand names of the commercials extracted from the web sites (Anonymous, 2015; Staff, 2015) such as upcoming movie trailers (e.g., 50 Shades of Gray, Jurassic World 3D), products (e.g., Mercedes, Skittles), services (e.g., Esurance, TurboTax), technologies (e.g., Microsoft, Mophie), mobile games (e.g., Game of War, Heroes Charge) etc. For the Super Bowl, the brands either sponsor the championship or pay for advertisements during the media broadcast. The searching data shows the relative interest of users over days for those brands. The span of search data collection is same as that for social media data (see Table 2) and in both *Pre* and *Post* phases.

4.4 Research Design

We segregate the count of social soundtrack posts collected for all three social media platforms on Super Bowl commercials into daily (24 hours) intervals to keep the same dimension as the search data. Relative counts of the postings for each social soundtrack was computed for all three social media platforms by using equation 1 to maintain the same scale the search data exhibits (0 to 100). We then further segregate the relative day-count data concerning social soundtracks and the web search data from Google Trends in *Pre*, and *Post* phases by annotating the time shown in Table 2, again skipping the *During* phase.

$$rel_count^i = \frac{Count_of_post^i}{\max_i \{Count_of_post^i\}} \times 100 \quad (1)$$

From equation 1, i denote the day of data collection. Max function selects the highest value from the set of relative counts for days on each social media platform. For normalization, the relative count values lie in the range of 0 to 100. In collecting the search data, we also found the relative counts based on the highest relative count value within the start and end date (i.e., start of *Pre* phase to end of *Post* phase) of data collection, as displayed in Table 2 (i.e. if the value 100 does not lie within that range of dates). Therefore, each social soundtrack has relative counts over days, which along with that for search data are used as the units of analysis in testing the research hypotheses. For this research, we believe that comparing volume of social soundtrack conversations to that of web search is important as brand-related conversations may lead to an increase in web search about that brand and, perhaps, web search may lead to an increase in social media postings.

5 Methodology

For assessment, we compute the daily relative count for search traffic on Google and postings for each of the three social soundtrack mediums within each of the *Pre* and the *Post* Super Bowl phases using equation 1. Then, the daily relative counts for each individual brand were aggregated over number of days in each phase. We have two sets of aggregated relative count data, one for each phase for the 47 brands with commercials in Super Bowl 2015.

Then, we perform statistical-t tests between the relative count values in two phases of Super Bowl to evaluate our research hypotheses. The critical value of t-statistic is 1.986 with $df = 92$ and $\alpha = 0.05$. These relative count attributes for our data follow power law distribution and hence are not

normal. Therefore, we transform the relative count data for both social soundtrack conversations and web search via the Box-Cox transformation (Box & Cox, 1964) using log transformation function $\log(\text{count} + 1.0)$. In using the log transformation, the data is successfully normalized, and the transformed data satisfies the homogeneity of variance assumption for each of the social soundtrack mediums (i.e. significance of Levene statistic > 0.05). We then perform a t-test to measure the significance of change in traffic between *Pre* and *Post* phase on all four online channels for each brand (i.e., three social media and one search platform). We also compute the brand specific phase-wide correlation for social soundtrack postings in all three social media platforms and web search in Google with time. For this brand specific t test over a span of 44 days (i.e. *Pre*: 22 days and *Post*: 22 days), $|T|_{\text{critical}} = 1.683$ with $df = 43$ and $\alpha = 0.05$.

5 Results

After the aggregated relative counts for brands for social soundtrack and search trend in *Pre* and *Post* Super Bowl phases were computed, the log transformed data was imported into SPSS, where the statistical-t tests were performed to test the hypotheses. The results are displayed in Table 3, and the volume data for each brand on the three social media platform and the search engine are presented in Table 4. In Table 4 notable increases in traffic are in bold and notable decreases in traffic are in bold italics between *Pre* and *Post* phases.

Hypothesis 01: There is a significant difference in volume of social soundtrack postings between Super Bowl phases for Twitter.

Hypothesis 02: There is a significant difference in volume of social soundtrack postings between Super Bowl phases for Instagram.

Hypothesis 03: There is a significant difference in volume of social soundtrack postings between Super Bowl phases for Tumblr.

Hypothesis 04: There is a significant difference in volume of searching activity between Super Bowl phases for Google.

Hypothesis	df	T-statistic	p-value
01	92	0.944	0.348 > 0.05
02	92	0.766	0.445 > 0.05
03	92	0.065	0.065 > 0.05
04	92	-0.719	0.474 > 0.05

TABLE 3. Results of the Hypotheses Testing

Brands	Google		Twitter		Instagram		Tumblr	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
50 Shades of Grey*	7.0	42.3	1.6	35.1	3.4	19.8	14.2	18.0
Avocado*	48.8	44.5	43.8	53.4	47.8	55.9	7.5	13.8
BMW*	90.1	90.4	19.6	6.9	29.2	25.0	13.6	2.7
Budlight*	35.6	32.0	49.2	36.3	43.4	40.1	17.0	13.0
Budweiser*	13.2	9.9	14.3	3.1	12.3	7.4	7.6	3.4
Clash of Clans*	67.0	73.4	22.1	25.2	34.0	33.8	4.4	4.7
Chevrolet*	47.2	53.2	13.0	35.4	35.8	32.8	2.4	2.9
Coca Cola*	87.5	89.6	18.7	14.1	53.3	50.0	4.7	5.1
Dodge*	85.1	89.0	14.4	41.0	44.1	52.4	4.8	4.9
Doritos*	18.9	15.9	23.3	11.2	18.1	10.9	8.9	8.0
Dove*	38.2	55.8	24.2	12.0	38.7	40.2	7.5	7.8
Eat24*	53.2	63.7	24.8	25.7	35.5	34.7	13.3	10.7
Esurance	27.8	30.2	12.0	8.9	16.0	13.6	11.2	10.6
Fiat	55.7	59.7	3.7	9.8	13.4	19.2	6.0	7.0
Fast and Furious*	50.8	63.8	24.7	24.5	53.2	51.6	11.4	12.3
Game of War	53.4	53.4	23.6	15.6	49.0	53.5	4.0	4.6
Geico*	77.8	84.6	37.5	19.4	32.3	25.0	7.1	5.7
GoDaddy*	50.4	46.9	11.8	9.8	39.8	27.9	16.0	5.6
GrubHub*	53.3	59.5	35.7	17.5	28.0	20.6	27.0	22.7
Heros Charge*	69.2	83.0	21.5	25.0	51.6	56.6	6.4	6.8
Jeep*	81.9	86.6	1.4	8.1	46.5	52.6	2.8	8.1
Jurassic World 3D*	17.1	25.1	7.9	11.4	17.6	22.5	5.7	9.3
Kia*	80.8	81.8	31.6	21.2	69.8	70.2	14.8	10.4
Lexus*	79.8	80.0	23.1	17.2	20.7	14.5	12.7	9.8

Brands	Google		Twitter		Instagram		Tumblr	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
McDonalds*	83.6	78.2	7.2	17.0	20.9	25.5	12.6	7.5
Mercedes*	89.3	89.7	30.4	23.1	56.8	58.8	19.4	15.5
Microsoft	77.1	75.9	7.0	8.0	36.0	35.3	14.1	14.8
Mophie	19.2	19.9	10.1	6.0	3.3	3.4	6.1	1.8
Mountain Dew*	24.3	38.6	34.0	31.2	20.5	34.8	4.6	2.2
Nationwide	23.3	24.9	32.4	26.1	16.6	8.8	6.9	6.1
Nissan*	85.2	88.1	9.6	5.3	37.3	50.6	4.3	3.4
Pepsi*	72.3	70.2	24.8	10.6	35.7	11.7	9.8	4.9
Pitch Perfect 2*	23.9	38.7	19.4	9.2	28.4	16.5	12.4	7.6
Pizza Hut*	56.2	55.1	45.4	28.1	41.4	26.6	18.7	19.1
Skechers*	78.9	77.7	29.0	45.1	36.0	31.9	6.9	8.9
Skittles*	35.5	25.4	25.8	23.6	23.8	12.4	7.4	2.5
Snickers*	33.1	39.6	27.9	22.4	23.3	18.4	4.8	3.6
Sprint*	79.5	86.4	9.8	9.7	48.2	60.0	2.5	3.4
Squarespace*	39.3	51.6	11.4	13.9	43.9	43.1	7.4	9.1
Terminator*	24.0	21.0	35.2	26.4	32.5	31.5	17.1	14.1
T Mobile	94.9	95.0	30.4	28.3	34.8	37.4	9.0	7.6
Tomorrow-land*	37.5	31.6	6.8	8.8	36.8	19.0	14.3	10.0
Toyota*	92.9	93.1	33.9	22.2	48.6	41.4	12.5	11.7
Turbo Tax*	49.0	64.6	17.8	17.3	38.5	44.7	9.8	4.6
Verizon*	89.6	90.4	32.9	6.6	15.0	4.0	13.5	1.0
Victoria's Secret*	79.0	75.8	24.0	7.1	25.1	15.6	8.2	6.1
Wix.com*	61.0	51.8	24.7	27.3	32.2	24.4	8.7	7.3
Traffic Increase from <i>Pre</i> to <i>Post</i> (+)	18 (38%)		6 (13%)		8 (17%)		1 (2%)	
Traffic Decrease from <i>Pre</i> to <i>Post</i> (-)	3 (6%)		20 (43%)		15 (32%)		12 (26%)	
No change in Traffic <i>Pre</i> to <i>Post</i>	26 (55%)		21 (45%)		24 (51%)		34 (72%)	

Table 4. Average relative traffic on social soundtrack platforms and google trends in phases across super bowl commercials (Figures in the cells are in %)¹

To illustrate the relative searching volume, Figure 1 displays the snapshot of the daily patterns of relative posts in all three social media platforms and relative searches concerning the brands in Google Trends. The *During* Phase is shown for comparison, though is not included in analysis. The relative posts for both social soundtrack and search data are averaged over the brand for each day during both *Pre* and *Post* phase.

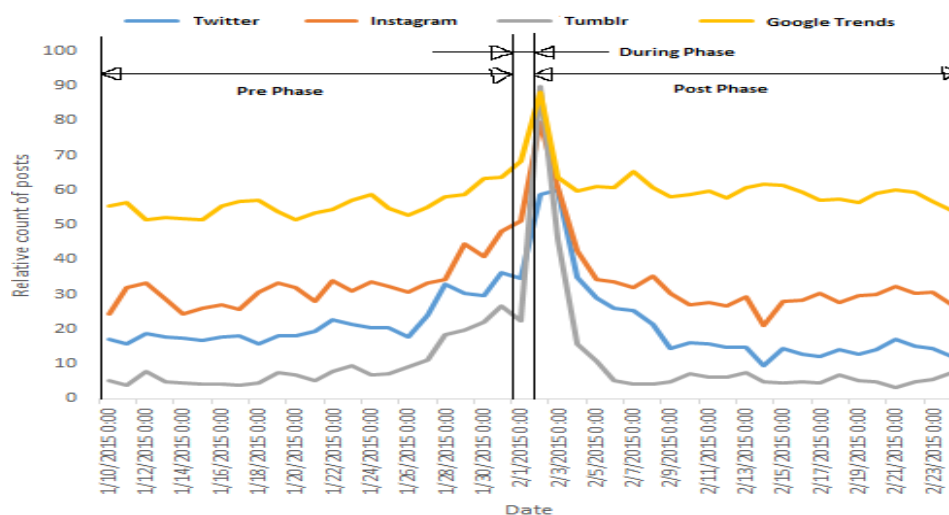


Fig. 1. Volume of social soundtrack conversations in three social media platforms and search averaged over the brands.

¹ The brands that exhibit significant change from Pre to Post in at least one online channel are denoted in bold with '*'.

We also computed the phase-based correlations between relative volume and time for each online channel across all brands. In Table 5, we listed the number of brands that shows significant positive or negative correlation between relative volumes and time in phases for all platforms. From Table 5, it is observed that in *Pre* phase the number of brands that show increase of relative volumes with time is significantly higher than that in *Post* phase for all three social media and Google. The reverse scenario is observed for *Post* phase (with negative correlation), where the numbers of brands that display decrease in relative volumes with time are considerably higher compared to that in *Pre* phase for all social soundtrack mediums and Google Trends.

		Google		Twitter		Instagram		Tumblr	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post
Number of Brands with significant positive correlation with time		15	4	26	0	28	1	33	0
Number of Brands with significant negative correlation with time		0	18	1	32	0	20	1	21
Number of Brands with no correlation with time		32	25	20	15	19	26	13	26

Table 5. Number of Brands that Show Significant Correlation between Relative Volumes in Super Bowl Phases and Time in All Four Platforms²

5 Discussion and implication

5.1 Discussion of Results

In this research, we examine the research question pertaining to the difference in relative volumes of second screen interactions highlighting the use of three social networks and of searching activities on a major search engine concerning the IRL broadcast media event, Super Bowl 2015 commercials, between two phases, *Pre* and *Post*. The relative counts of posts on all three social media platforms are normalized to maintain the same scale units (0 to 100) as that of the search data for comparison among the platforms.

The research question addresses the change in volume of social soundtrack commentary on each of the social media platforms compared to that of search data on the search engine concerning Super Bowl brands by computing the relative count of number of posts and number of searches for each brand between two phases, *Pre* and *Post*.

Our research results show that social soundtrack conversation does not exhibit significant difference in average volume of social media postings and brand search between the *Pre* and *Post* phases for the entire set of brands. However, it is observed that from *Pre* to *Post* phase web search activity increases significantly for a considerable number of brands (increase : decrease : no change = 18 : 3 : 26) as opposed to social soundtrack conversations that decrease convincingly for brands for all three social media platforms (i.e. Twitter – increase : decrease : no change = 6 : 20 : 21, Instagram- increase : decrease : no change = 8 : 15 : 24 and Tumblr – increase : decrease : no change = 1 : 12 : 34).

Though, it is interesting that, despite the high occurrences of social media chatter for majority of Super Bowl commercials in *Pre* phase compared to *Post*, there is higher traffic on web searching data in the *Post* phase for brands that are convincingly higher in numbers compared to that associated with lower traffic. It is worth mentioning that lion's share of the brands (40 out of 47 commercials) undergo a change in traffic between the phases for at least one online channel (i.e. either in Google and/or Twitter and/or Instagram and/or Tumblr), which one would expect if the commercial were having an effect on consumer behavior as exhibited in web searching.

² The brand specific correlation values in phases across all four channels are excluded due to space constraint.

We also compute the correlation of relative volume for web search and social media posts w.r.t. time. A positive trend of web search traffic (positive : negative : no correlation = 15 : 0 : 32) and social soundtrack posts on all three social networking platforms with time (i.e., Twitter- positive : negative : no correlation = 26 : 1 : 20, Instagram- positive : negative : no correlation = 28 : 0 : 19, Tumblr- positive : negative : no correlation = 33 : 1 : 13) are observed in the *Pre* phase till the Game day but in *Post* phase, the negative trend in relative traffic is perceived for all four platforms (i.e., Twitter- positive : negative : no correlation = 0 : 32 : 15, Instagram- positive : negative : no correlation = 1 : 20 : 26, Tumblr- positive : negative : no correlation = 0 : 21 : 26 and Google- positive : negative : no correlation = 4 : 18 : 25).

5.2 Implications

In terms of implications, though no significant change of overall traffic between phases were found, we observe that there are brands (i.e. 20 brands for Twitter, 15 for Instagram and 12 for Tumblr) that show, interestingly, higher volume of postings for all three social soundtrack platforms in *Pre* Super Bowl phase relative to *Post*, while the opposite scenario is enacted for brand-related web search, where the number of brands (i.e. 18 brands for Google) that show increases in searching in the *Post* phase is considerably higher than that displaying decreases in searching in *Post* phase.

Regarding practical implications of research findings, we believe that there is increased rate of potential diffusion of information concerning those brands during *Pre* Super Bowl phase via social platforms. This information diffusion is accomplished by sharing, publishing, and commenting via various types of posts (e.g. audio, image, video, etc.) among participants on the various social media platforms.

We believe that curiosity and excitement about an unseen item (i.e., brand themes, videos, etc.) till its launch generates more traffic in form of social media postings about that item compared to once it is viewed, at which posting the information diffusion focus shifts. After the telecast, there may be analysis of different aspects of the display of the brand ad but the excitement or inquisitiveness as a topic of conversation on social media dissipates. However, the excitement and the curiosity of the Super Bowl commercials weeks before broadcast of an IRL event combined with the impact of the actual commercial may drive an increase in web search concerning the brand names once the IRL broadcast is over.

We believe once the displays of the commercials are over, people are engaged more on seeking and searching information about those brands, which may be converted to clicks and eventually online purchase of those brands may result. This type of seeking and searching of information is of a type more suited to search engines than social media sites.

At the individual level, there are specific brands that exhibit a significant rise in relative web search activity in *Post* phase compared to *Pre* game day counterpart (e.g. 50 Shades of Grey, Chevrolet, Mountain Dew, Dove etc.). Findings exhibit positive trend for specific brands in the *Pre* phase for all three social media channel and web search while in the *Post* phase the negative trend is observed for the brands at individual level on all online channels.

It is also interesting to observe that average magnitude of relative volume of web search is considerably more than that of social soundtrack conversations on all three platforms. So, in *Post* phase, the rate of diffusion for searching activity is far less compared to social soundtrack conversations. Thus, the social soundtrack could enhance sale possibilities after the IRL event via word-of-mouth advertising that happens before the commencement of the event, which could be investigated using perhaps advanced temporal analysis (Zhang, Jansen, & Spink, 2009), that can be reflected in consumers' searches concerning the brands in *Post* phase. However, the results appear to be brand specific, so the actual commercial itself does appear to have an impact.

6 Conclusion

In this research, we analyzed the change in traffic in terms of second screen interactions and searching submissions concerning Super Bowl 2015 commercials between two phases. We examined our research question from the perspective of human information processing and eWOM advertising in conjunction with traditional broadcast advertising, both in terms of the relative volume of comments posted and relative trends in web search. We believe that our research contributes to understanding user behavior in web search (Jansen & Rieh, 2010) and viewer interaction via social soundtrack mediums while viewing media broadcast of an IRL event.

In future work, we will examine how different elements in the social soundtrack conversation concerning categories (e.g., commercials, half time show, game etc.) change in different phases for the IRL event in terms of volume and content aspects, such as sentiment and formality.

7 References

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