Correlation of Brand Mentions in Social Media and Web Searching Before and After Real Life Events

Phase Analysis of Social Media and Search Data for Super Bowl 2015 Commercials

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Abstract— **The integration of social media technologies with second screen devices during the broadcasts of in-real-life events facilitates a mode of online conversation we refer to as the social soundtrack. In this research, we compute the correlations between the comments people post in the social soundtrack on various platforms (i.e., Twitter, Instagram and Tumblr) and the terms people search for on a major web search engine (i.e., Google). The broadcast media event for this research is Super Bowl 2015 commercials. Using statistical t-tests, we compare the correlations between the relative volume of searching, obtained via Google Trends, and the relative volume of social soundtrack postings on each of three social media platforms for two temporal phases (Pre and Post) for Super Bowl 2015. We exclude the game day from our research due to insufficiency of granularity for search data on the game day. Research results show that there is no overall significant difference in phase correlation between social media and search data. However, at the individual level, there are brands that do show significant correlation between phases. The number of significant positive correlations between the social soundtrack postings and web search concerning brands are considerably high compared to the number of significant negative correlations in both phases. The research results are important in identifying the temporal trends and interplay between type of social media platforms and searching concerning the sharing of brand mentions in word-of-mouth marketing. The result will eventually help retailers focusing on the brands with higher correlations to lever the opportunity of electronic word of mouth advertising.**

Keywords—Super Bowl 2015; social soundtrack; social networks; second screen; search channel

I. INTRODUCTION

The emergence of online social networks and increase use of mobile devices greatly augments the opportunity for conversational interactions for in-real-life (IRL) events, especially ones that are broadcast. This merging of technologies allows for social conversations concerning IRL events via online social media platforms (e.g., Facebook, Twitter, Weibo, vk, etc.). These online social media sites have embedded themselves alongside the broadcast medium, affording what we refer to as the social soundtrack for the IRL event.

The social soundtrack is an interesting 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 period. The social soundtrack concerning such events can also happen on various online social media platforms. The integration of these platforms as the conversational medium in conjunction with IRL events marks the emergence of a relatively new social phenomenon that greatly enhances prior aspects of such broadcast mediums. This new technology convergence is referred to as the second screen phenomenon, although there may be multiple (i.e., more than two) screens involved.

With the second screen phenomenon, the broadcast media event is shown on the base device (i.e., typically the largest screen) where the viewing occurs, while the secondary screen is the computer device (e.g., usually a smartphone but also desktop, laptop, tablet) that facilitates the conversation that occurs on the social network. It is the secondary screen that allows for the social soundtrack, the online conversation with others regarding an IRL event, such as Super Bowl, Academy awards, Grammy awards, etc. The social soundtrack participants exchange social media posts related to the IRL event via second screen devices by sharing of comments [1] to a social media site. TV 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.

Hence, 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. Super Bowl 2015 is one such IRL broadcast media event. It occurs once in a year and is a major happening, especially in the US. The Super Bowl event involves multiple categories of interest. Among them, Super Bowl commercials have become a cultural phenomenon in their own right, alongside the game itself.

In our research, we compare social soundtrack postings concerning the Super Bowl 2015 commercials with web searching occurrences (i.e., search terms submitted to search engines, such as Google). Search data is typically not considered social media, so this research is a comparison across online channels of the interaction effect of Social Bowl commercials as expensive branding events. As the driver for

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most of the online commerce, especially advertising, search data is a critically important economy indicator [2].

There has been little academic research concerning the increasingly important second screen phenomenon and little systemic practitioner investigation from the analysis of relationship between social soundtrack and search data. Our research investigates how second screen social soundtrack conversations concerning Super Bowl 2015 commercials correlate with search data in the *Pre* and Post phases of this event. We use three popular social media platforms (i.e., Twitter, Instagram, and Tumblr) as our social soundtrack data collection sites. We use Google Trends to collect the search data.

As online communications have the potential to become more powerful marketing tools, one key question that arises is how the interaction among broadcast advertising, social media conversations, and web search impact brands. Understanding the relationship between the social soundtrack occurring on different 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. The present research investigates the correlation between social soundtrack conversations and web search in the context of commercials broadcast during the Super Bowl 2015.

II. Related Work

Our research focuses on IRL broadcast media events which generates significant social soundtrack on various social media sites using second screens [3, 4].

For 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 [5]. Advertisers are using ads to encourage potential consumers' online interactive behavior on different social soundtrack using second screens. Lee, Ham, Kim, and Kim [6] use Twitter as the social media platform to assess people's interest in car-related commercials during Super Bowl 2012. Shin, Byun and Lee [7] study second screen interaction on Twitter to address the creation of consumer interest in brands televised during Super Bowl 2014. There are studies that show that electronic word of mouth (eWOM) advertising stimulates web searches [8, 9]. Zigmond and Stipp [10] claim an increased internet search activity results when TV advertising is coordinated with Internet campaigns for special events, such as the Olympics. In another study, Neff [11] claims that social soundtrack interaction plays a positive role on brand engagement for Coca Cola but is skeptical of its influence on short-term sales.

Though the aforementioned studies identify social media use in discussing brands and establish the importance of web search, they neither investigate the synergies among the various social media platforms and web search activity during temporal phases of IRL event. Also, they have been mainly limited to one social media platform.

As such, there are several unanswered questions concerning the social soundtrack interactions and web search activity concerning IRL events. *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 questions that motivate our research.

III. Research Question

The social environment can influence and shape individual human behavior [12]. Making broadcast media events more social therefore influences the human communication in a socially-mediated way that can affect human thoughts and behaviors. 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. Therefore, the social soundtrack can influence and shape the social environment.

For clarity, we define our key constructs:

- **IRL broadcast media event** - Happening anchored temporally and 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** - A keyphrase that is submitted to a search engine

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

Within the spectrum of US broadcast media events, there are certain IRL events that draw considerable social media attention. Such events include the Oscars award ceremony, music video awards shows, Grammys award show, and sporting games. Our research focuses on the 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 [13]. Due 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 commercials are an event in their own right.

There are considerable conversations in the social soundtrack concerning Super Bowl commercials before and after the Super Bowl event. We term these temporal phases of Super Bowl as: 1) *Pre* Super Bowl phase, and 2) *Post* Super Bowl phase. We label the conversations on the game day (in this case, 1st Feb 2015) as the *During* Super Bowl phase. We exclude the entire game day from the study due to insufficiency of search data granularity [14]. 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, *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.

In our research, we selected three social media platforms for the social soundtrack data collection, which are Twitter, Instagram and Tumblr. Twitter is one of the most popular micro-blogging sites [15]. Instagram is a medium of communication where users perform online sharing of images and videos [16]. 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 [17]. We chose Google Trends as the data collection channel for the relative frequency of the search terms occurring in the Super Bowl phases.

For this research, if the Super Bowl commercial have a branding effect, our premise is that a relationship exists between social soundtrack conversations and search data concerning Super Bowl commercials from the perspective of the two Super Bowl phases. Based on this perception, we formulate our research question to evaluate the strength of relationship between social soundtrack conversations and search data over *Pre* and *Post* phases of Super Bowl.

RQ1. Is the relationship between social soundtrack conversations and search data significant between 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 its role an economic indicator.

We define the following hypotheses corresponding to *RQ1*.

Hypothesis 01: The relationship between social soundtrack conversations and search data volume is significant between Super Bowl phases for Twitter.

Hypothesis 02: The relationship between social soundtrack conversations and search data volume is significant between Super Bowl phases for Instagram.

Hypothesis 03: The relationship between social soundtrack conversations and search data volume is significant Super Bowl phases for Tumblr.

IV. Data Collection and Research Design

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 [13].

A. Data Collection in Super Bowl Phases

As shown in Table 1, we collected 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 utilized the respective APIs and tokens for Twitter, Instagram, and Tumblr in corresponding scripts with search queries.

The queries that we used 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.

The query list included the terms that occurred most frequently as social media tags (e.g., #superbowlcommercial, #superbowlxilx, 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.

TABLE I. Super Bowl 2015 data by social media platforms

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

TABLE II. Start and end dates and times for Super Bowl phases

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

* Data included for comparison but not included in data analysis.

The data collection period is divided into three temporal phases. Table 2 shows the date and time of each Super Bowl phase. 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 2/1/2015-18:39:50), 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, Google trends drops hourly updates and only counts daily updates [14].

B. Super Bowl Commercial Keyphrases for Social Soundtrack

Once we had collected the data from the three social media sites, we classified the data into Super Bowl commercials

category from second screen interactions on each social media platform. The keywords for commercials are extracted from the relevant websites [18, 19] and are in lower case.

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', etc.) and the first and last names of actors participated in videos related to Super Bowl 2015 brands (e.g., 'liam', 'neeson', 'braylon' etc.). There may be the situation where a single post contains more than one brands (e.g., comparing two commercials, likings of commercials etc.). Under such circumstances we put that post

In this research, we deal with 47 brands [18, 19]. 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. 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. There may be the situation where a single post contains more than one brands (e.g., comparing two commercials, likings of commercials etc.). Under such circumstances we put that post into multiple brand categories (i.e. the specific brand names the post mentions)

C. Super Bowl Commercial Key-phrases for Search Data

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 [18, 19] (e.g. 'mercedes', 'budweiser', 'pepsi' etc.). The brands either sponsor the championship or pay for advertisements during the media broadcast. The search 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).

D. Research Design

Once collected, we segregated 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 of search data. Relative counts of the postings in social soundtracks is computed for each social media platform by using equation 1 to maintain the same scale the search data exhibits (0 to 100). We then further segregated 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.

$$rel\_count^{i} = \frac{Count\_of\_Post^{i}}{\max_{i}\{Count\_of\_Post^{i}\}} \times 100 \quad (1)$$

In equation 1, *i* denotes the day of data collection. The *max* function selects the highest value from the set of relative counts for each social media platform. The relative count values lie in the range of 0 to 100. For search data, we also find 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 for each social media platform (i.e. if the value 100 does not lie within that range of dates). So, each social soundtrack has relative counts over days, which are used to find correlations with relative counts over days for search data. These magnitudes of correlations are the units of analysis in testing the research hypotheses. We believe that comparing volume of social soundtrack conversations to that of web search is important as higher correlations between social conversations and search data implies that brand-related conversations may lead to an increase in web search about that brand and, perhaps, vice versa.

V. METHODOLOGY

For evaluation, we computed the Pearson's correlation between search data and the relative count of conversation for each of the three social soundtrack mediums within each of the *Pre* and the *Post* Super Bowl phases. We evaluated correlations between web search data and the social soundtrack posts in both phases for each of the 47 brands as displayed in Table 3.

The correlation coefficients are either positive, negative, or nearly zero values. We took the absolute values of the correlation coefficients across brands for both the phases to test the significance of difference in average strength of social soundtrack–search data relationship in these two phases of Super Bowl 2015. The absolute values of correlation signify the strength of relationship, while the sign denotes the direction (.95 and -.95 are both strong but with different signs).

We performed statistical-t tests between the absolute correlation values in two phases of Super Bowl to evaluate our research hypotheses. T-test identifies the Super Bowl phase that has greater social-search correlation

VI. RESULTS

Once the absolute values of Pearson correlation between social soundtrack and search trend in *Pre* and *Post* Super Bowl phases are computed, the correlation data was imported into SPSS, where the statistical-t tests were performed to test the hypotheses. The critical value of t-statistic is 1.986 with df = 92 and $\alpha = 0.05$. The correlation data follows normal distribution and satisfies the homogeneity of variance assumption for each of the social soundtrack mediums (i.e. significance of Levene statistic > 0.05). The results are displayed in Table 4.

Hypothesis 01: The relationship between social soundtrack conversations and search data volume is significant between Super Bowl phases for Twitter.

Hypothesis 02: The relationship between social soundtrack conversations and search data volume is significant between Super Bowl phases for Instagram.

Hypothesis 03: The relationship between social soundtrack conversations and search data volume is significant between Super Bowl phases for Tumblr.

From Table 4, it is observed that, the difference in average strength of the correlation between social soundtrack and search data in *Pre* Super Bowl phase is not statistically

significant compared to that in *Post*-Super Bowl phase across brands, for all three social networking platforms. The hypotheses are not supported for all three platforms. There is no significant difference in correlations between social soundtrack data on any of the platforms and web search for the Super Bowl 2015 brands in *Pre* and *Post* phases.

TABLE III. PEARSON CORRELATION BETWEEN SOCIAL SOUNDTRACK PLATFORMS AND GOOGLE TRENDS IN PHASES ACROSS SUPER BOWL COMMERCIALS ('*' INDICATES SIGNIFICANCE AT 0.05 LEVEL)

Brands	Twitter		Instagram		Tumblr	
	Pre	Post	Pre	Post	Pre	Post
50 Shades of Grey	0.11	-0.36	**0.43***	0.21	0.23	-0.16
Avocado	-0.29	-0.28	0.33	0.02	**0.44***	0.33
BMW	-0.32	-0.35	-0.07	-0.20	**-0.44***	-0.25
Budlight	**0.59***	**0.75***	**0.83***	**0.50***	**0.63***	**-0.02**
Budweiser	**0.76***	**0.96***	**0.91***	**0.95***	**0.82***	**0.96***
Clash of Clans	0.27	-0.21	0.27	-0.19	0.05	-0.19
Chevrolet	0..30	**-0.68***	**0.48***	-0.24	0.31	-0.36
Coca Cola	0.10	0.26	-0.27	0.10	0.01	0.16
Dodge	-0.17	-0.16	0.14	0.03	0.08	-0.23
Doritos	-0.13	**0.70***	**0.52***	**0.70***	**0.57***	**0.92***
Dove	0.39	-0.04	-0.02	-0.30	0.28	-0.07
Eat24	**0.56***	-0.30	**0.64***	-0.14	0.08	-0.21
Esurance	0.02	**0.74***	**0.64***	**0.73***	0.35	**0.73***
Fiat	0.17	0.17	-0.16	0.19	-0.16	0.04
Fast and Furious	0.06	0.32	0.05	0.25	0.11	0.12
Game of War	0.19	0.13	-0.28	0.11	0.11	0.01
Geico	-0.11	0.04	0.06	0.30	0.02	0.13
GoDaddy	**0.87***	0.21	0.21	0.19	**0.79***	0.33
GrubHub	0.08	0.17	**0.52***	0.21	0.41	-0.08
Heros Charge	**0.59***	-0.05	**0.43***	0.07	0.08	-0.16
Jeep	0.04	-0.19	0.15	0.05	0.15	-0.19
Jurassic World 3D	-0.11	0.39	0.41	**0.90***	0.34	**0.89***
Kia	0.08	-0.03	**0.56***	0.02	**0.43***	-0.11
Lexus	0.38	-0.01	0.34	-0.15	0.12	-0.30
McDonalds	**0.45***	0.19	-0.27	0.20	-0.11	0.07
Mercedes	-0.02	-0.35	0.37	-0.05	0.14	**-0.49***
Microsoft	-0.18	0.31	-0.21	-0.16	0.16	0.27
Mophie	**0.76***	**0.81***	0.17	**0.49***	**0.69***	**0.53***
Mountain Dew	0.32	**0.60***	**0.52***	-0.21	**0.51***	-0.29
Nationwide	0.17	**0.85***	0.16	**0.85***	0.07	**0.87***
Nissan	0.12	-0.07	-0.02	-0.09	0.10	0.07
Pepsi	**0.45***	0.25	**0.46***	0.09	0.32	0.20
Pitch Perfect 2	**0.76***	-0.17	**0.68***	0.07	**0.72***	-0.17
Pizza Hut	-0.30	-0.36	-0.20	-0.22	-0.01	**-0.47***
Skechers	-0.26	0.22	-0.06	-0.27	-0.13	-0.31
Skittles	**0.65***	0.14	**0.76***	**0.80***	**0.84***	**0.83***
Snickers	**0.80***	**0.57***	0.36	**0.89***	**0.76***	**0.83***
Sprint	-0.21	-0.26	-0.23	-0.25	-0.36	-0.03
Squarespace	0.21	**-0.60***	**0.45***	**0.48***	0.04	-0.16
Terminator	0.25	**0.85***	**0.66***	**0.74***	**0.87***	**0.72***
T Mobile	-0.22	-0.02	-0.29	0.13	-0.20	0.16
Tomorrowland	0.24	0.08	-0.02	0.02	**0.43***	0.05
Toyota	-0.14	-0.25	0.01	0.14	-0.06	-0.24
Turbo Tax	0.22	**0.43***	0.02	0.01	0.32	0.38
Verizon	**-0.46***	0.05	0.12	0.24	-0.17	-0.25
Victoria's Secret	-0.18	**0.44***	-0.11	0.03	0.06	0.15
Wix.com	-0.03	**0.44***	0.10	-0.03	0.27	0.19
Brands with Positive Correlations	11	12	16	11	13	9
Brands with Negative Correlations	1	2	0	0	1	2

Fig. 1 displays the snapshot of the relative counts averaged over the brands in all three social media platforms and Google Trends. The *During* Phase is shown for comparison though is not included in analysis. Fig. 1 shows the daily pattern of aggregated relative posts in social soundtrack and aggregated relative searches concerning the brands.

TABLE IV. RESULTS OF THE HYPOTHESES TESTING

Hypothesis	df	T-statistic	p-value
01	92	-0.378	0.692 > 0.05
02	92	0.794	0.429 > 0.05
03	92	0.159	0.874 > 0.05

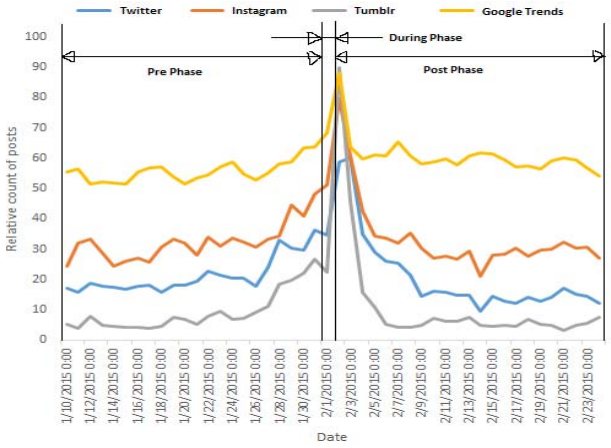

Fig. 1. Patterns of social soundtrack conversations in three social media platforms and search aggregated over the brands.

VII. DISCUSSION AND IMPLICATION

A. *Discussion of Results*

For this research, we examine the research question pertaining to the correlations in relative volumes between second screen interactions highlighting the use of three social networks and searching activities concerning the IRL broadcast media event, Super Bowl 2015 commercials, in 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.

Our research question addresses the dependence between social soundtrack commentary on each of the social media platforms and search data on Google concerning Super Bowl brands by computing the correlation between number of posts and number of searches for each brand in each phase. The absolute values of the phase-wide correlations are considered in the study, as they represent the magnitude of the relationship. From Table 4, our test results show that social soundtrack conversation does not exhibit significant difference in relationship with web search between two phases overall, but the number of significant positive correlations are greater than that of significant negative correlations in both the phases across all social networks for individual brands.

From Fig. 1, the social soundtrack conversations in all three social media platforms and the web search activity around the commercials start much before the Super Bowl 2015 kickoff due to the curiosity about the upcoming commercials. As might be expected (see Fig. 1), the patterns of social soundtrack conversations and web search drastically increase their slopes on the game day (i.e., *During* phase), which is excluded from the analysis. However, what is interesting is that, despite the expense of the Super Bowl commercials and social media chatter, there is no significant correlation overall with web searching data, which one would expect if the commercial were having an effect on consumer behavior.

B. Implications

Though no strength of relationship between phases were in found, we observe from Table 3, that there are several brands that show stronger positive phase-wise correlation for three social soundtrack platforms. Regarding practical implications of research findings, we believe that there is increased rate of potential diffusion of information concerning those brands during *Pre* and *Post* phases. 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. The excitement and the curiosity of the Super Bowl commercials weeks before and after broadcast of an IRL event may drive an increase in web search concerning the brand names, in certain cases. In Fig. 1, from the *During* phase, though not included for analysis, it is understood the advertisement during the media broadcast is most likely having an effect on consumer behavior in terms of brand interest. However, the branding effect seems to dissipate quickly.

If increased web search is generated by second screen interactions in the social soundtrack about brands associated with an IRL media broadcast, then this may lead to increase sales of the product indirectly and generate profit in long the term. So, specific brands might have much to gain by the *Pre* and *Post* social soundtrack conversations if coordinated with other online channels, such as search. Thus, the social soundtrack could enhance sale possibilities via word-of-mouth advertising using perhaps advanced temporal analysis [20], which can be reflected in consumers' searches and "clicks" concerning the brands. However, the results appear to be brand specific.

VIII. CONCLUSION

In this research, we analyze relationship between second screen interactions concerning Super Bowl 2015 commercials as represented in the social soundtrack and the search data concerning the brands in this IRL event. We examine 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. In sum, we believe that our research contributes to understanding user behavior in web search and viewer interaction via social soundtrack mediums while viewing media broadcast of an IRL event. In future work, we will study 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.

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