

# Analyzing Second Screen Based Social Soundtrack of TV Viewers from Diverse Cultural Settings

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**Abstract.** The presence of social networks and computing device in form of secondary screens used in conjunction with television plays a significant role in the shift from traditional television to social television (sTV). In this research, we explore the overall secondary screen usage in terms of four conversation patterns each over different cultural social soundtrack related to different TV shows. We process more than 469,000 tweets from second screens for four popular TV shows from four different countries. The ANOVA test results identify significant differences in overall usage of conversational patterns among viewers for TV broadcast across diverse cultures using second screens.

**Keywords:** Second screen · Social television · Social soundtrack · Cultural bias

## 1 Introduction

With the advent of Internet technology and the emergence of online social networking, the social possibility of TV has greatly expanded, as the merging of these technologies now allow a number of social activities and conversation concerning TV content via social networks (e.g., Facebook, Twitter, Weibo, etc.). This combination of TV and online social networks has forged a *social TV* that imparts feelings of togetherness and facilitates communication among people in dispersed locations. The social network has embedded itself within the modern TV culture and acts as a *social soundtrack* for TV content. The social soundtrack is the social commentary that results from integrating social networks as interactive tools with TV broadcasts.

The integration of Twitter (or other online social network) as the social soundtrack with televised broadcasts both in real time and non-real time marks the emergence of a new phenomenon augmenting the prior limited social aspect of TV. This new usage phenomenon is referred to as *second screen* (TV and computing device). The secondary screen allows the social soundtrack, the conversation with others, regarding the particular TV program.

In this research, we investigate the relative usage of four different patterns of social soundtrack conversations used by the audiences of TV shows from four different cultural biases, specifically examining if viewer's overall usage of each second screen interaction patterns differ for different cultural settings. This research is important as the variation in conversation patterns in distinct cultural social soundtracks can

facilitate the understanding of the intent of viewer's communication via second screen on entertainment and TV commercials belong to divergent societies.

## 2 Related Work

### 2.1 Social TV (sTV) and Second Screen Usage

There is existing literature concerning socializing aspect of TV. Abreu, Almeida and Branco [1] developed the 2BeOn sTV system with the goal of making users go online to ensure interpersonal communication. Mukherjee and Jansen [2] investigate the engagement of second screen in sTV for sharing information during real time and non-real time transmission of TV shows. The degree of sociability increased significantly via second screen based online social networks services for TV viewing. The conversation interactions in the social soundtrack can be considered as a form of end-user enrichment of the TV content [3]. Such end user enrichment enhances the sTV socialization via the user generated content and converts sTV into a community [4].

### 2.2 Conversation in Social Soundtrack

There are prior studies on social network interaction framework that focus on aspects of second screen based social conversation. Mukherjee, Wong, and Jansen [5] examined predominant conversation pattern in TV show related social soundtrack during live and after live broadcast of TV shows. Honeycutt and Herring [6] examined the tweets to find specific purposes of interlocution (i.e., '@' symbol) in directed communication and referencing. boyd, Golder, and Lotan [7] studied the conversational aspects of retweet and investigated the reasons of retweeting in Twitter, while Naaman, Boase and Lai [8] introduced an item list of broadcast statements including information sharing, personal opinion along with random thoughts and observations in an undirected manner as observed by Jansen, Zhang, Sobel and Choudhury [9].

Though the aforementioned research speaks for social soundtrack conversations none of the above studies examined the relative usage of conversation patterns of varied cultural social soundtrack.

## 3 Research Question

Social networks allow for TV programs to be accessed and shared by viewers asynchronously using second screen. We evaluate the relative usage of second screen based interaction patterns in overall social soundtrack conversations over different cultural biases carried out by the viewers via second screen. The overall social soundtrack conversation is accounted for including the patterns of second screen interactions during real time (i.e. live TV broadcast) and non-real time transmission (after live broadcast) of TV shows. The notion that divergent societies may have different prevalent conversation patterns leads to frame our research question:

*RQ. Is there any change in relative usage of conversation pattern in viewers' overall social soundtrack conversations in diverse cultural settings related to TV shows?*

To investigate our research question, we have segregated viewers' tweets from three TV shows into four categories such as: 1) Response (RS), 2) Referral (RF), 3) Retweet (RT) and 4) Broadcast (BC). We categorized the queries based on results from prior literature [5; 6; 8]. Table 1 describes the communication patterns for the categories. We inquire the existence of such patterns as described in Table 1 in the tweets posted by viewers to classify the collected tweets into four categories. The categories are mutually exclusive by introducing a priority order: RT > RF > RS > BC. This means that any tweet that includes characteristics of retweets will inevitably categorize to RT even if it contains the characteristics of other three categories and so on.

**Table 1.** Categories of social soundtrack conversation patterns

Categories	Description
Retweet (RT)	Any retweet as recognized by “‘RT: @’, ‘retweeting @’, ‘retweet @’, ‘(via @)’, ‘RT (via @)’, ‘thx @’, ‘HT @’ or ‘r @’ ”. It is immaterial whether the tweet contains the characteristics of other categories.
Referral (RF)	Any full length or shortened URL directed at another user. It does not contain any pattern contained in RT category.
Response (RS)	Tweets intentionally engaging another user by means of ‘@’ symbol which does not meet the other requirements of containing retweets or referrals
Broadcast (BC)	Undirected statements (i.e., does not contain any addressing) which allow for opinion, statements and random thoughts to be sent to the author’s followers.

Based on the notion of the research question, the research hypothesis is formulated as:

*Hypothesis: There is a significant difference in usage of each conversation pattern in viewers' overall social soundtrack conversations in diverse cultural settings.*

## 4 Data Collection and Analysis

We selected four popular TV shows, each from a different country and collected users' interactions in form of tweets from Twitter. The TV shows selected for this research are: 1) *True Blood* from US, 2) *Bienvenidos al Lolita* from Spain, and 3) *Mahabharat* from India, and 4) *Doce de Mae* from Brazil. The tweets for all non-US TV shows were collected starting from 6<sup>th</sup> Feb 2014 to 5<sup>th</sup> March 2014, while for *True Blood* we collected tweets from 9<sup>th</sup> June to 29<sup>th</sup> June 2013. The number of tweets for *True Blood*, *Bienvenidos al Lolita*, *Mahabharat* and *Doce de Mae* are 220390, 98230, 76443 and 74328 respectively. The queries used are the TV show names.

Once the tweets are collected, we extract number of unique users from geo-enabled tweets (i.e., < 10% of the collected tweets) participated in TV show related social soundtrack conversation. The number of unique users for *True Blood*, *Bienvenidos al Lolita*, *Mahabharat* and *Doce de Mae* are 4256, 1876, 1356 and 1296 respectively. We analyze our research hypothesis based on the overall second screen interaction that includes both real time (rtSS) and non-real time (nrtSS) second screen interaction of the users related to four TV shows. The coordinates extracted from the location features via Twitter geo REST api are mapped into time zones using timezoneDB api.

**Table 2.** Show times with time zones for *True Blood* on Sunday

Eastern	Central	Mountain	Pacific	Alaska	Hawaii
9 PM	8PM	10 PM	9 PM	8 PM	3 PM

The show timings of *True Blood* are displayed in Table 2, while Table 3 displays show timings of the non-US TV programs. The running time for *True Blood* is 60 minutes and was broadcasted by HBO in US, while *Bienvenidos al Lolita*, *Mahabharat* and *Doce de Mae* are televised by Antena3, Star Plus and Rede Globo TV networks in Spain, India and Brazil, respectively.

**Table 3.** Show times with time zones for non-US TV shows

TV show name	Day	Show Time (PM)	Running time	Time zone
<i>Bienvenidos al Lolita</i>	Tuesdays	10:40	75 minutes	Central European
<i>Mahabharat</i>	Monday to Saturday	8:30	30 minutes	Indian Standard
<i>Doce de mae</i>	Thursday	11:15	30 minutes	Brasilia

Regarding investigation on relative overall usage of social soundtrack conversation patterns in diverse cultural settings, we classify taking both rtss and nrtSS tweets as a whole posted by every interactant for each show into four mutually exclusive categories (i.e.,RT, RF, RS and BC), as described in Table1. The overall tweet counts formed by identification of four conversation patterns against the interactants from different countries are used as units of analysis for evaluation of our first and second research questions respectively.

## 5 Results

The data is imported into SPSS platform for investigation. We approximately normalized the data using log transformation function  $\log(variable + 1.0)$ , as the data is not normal. In SPSS, we ran one way ANOVA tests for examining both the research questions where  $F_{critical(3, > 120)} = 2.60$  at 95% confidence level. We use the Games

Howell test as the post-hoc test since it is not sensitive to unequal variances and unequal group sizes. To perform the post hoc test, we lower the level of significance ( $\alpha$ ) from 0.05 to 0.008 with the help of Bonferroni correction to reduce the chance of false positive error.

While investigating our research question, we perform ANOVA on TV show related social soundtrack by users of four different countries for each of the four different conversation patterns presented in Table 1. The F-statistics over four different cultural biases for each conversation pattern is given by:  $F_{(3,8781)} = 58.49$  for RT,  $F_{(3,8781)} = 16.48$  for RF,  $F_{(3,8781)} = 42.63$  for RS and  $F_{(3,8781)} = 42.22$  for BC. The F values are significant and thus support the hypothesis.

**Table 4.** T-values (\* denotes significance) for four different TV shows for each conversation pattern

	<b>True Blood</b>	<b>Bienvenidos al Lolita</b>	<b>Mahabharat</b>	<b>Doce de Mae</b>
RT	12.66*		9.53*	19.47*
RF		6.32*	5.53*	5.44*
RS	9.76*	8.88*		11.34*
BC	2.81	16.21*	15.22*	

To identify the specific cultural biases that have the significant differences among the remaining cultural settings, the Games-Howell test is performed. From Table 4, Spanish TV show related social soundtrack becomes relatively predominant in using retweets (RT); US TV viewers use relatively more referral or URL based recommendation (RF) than the viewers from other societies; Indian TV show related social soundtrack involves more mention or reply based conversation, while undirected broadcast (BC) is relatively prevalent in overall discussions related to Brazilian TV show. It is also understood from Table 4, that though undirected broadcast in Brazilian TV show is significantly different over that in other non-US TV show related social soundtracks; it does not infer significance over US TV show related conversations.

## 6 Discussion

In this research, the analysis of each of interaction patterns in distinct cultural social soundtrack conversations shows (from Table 4) that US TV viewers rely comparatively more on URL based recommendation (RF) while Spanish, Indian and Brazilian audiences use relatively more pass along tweets (i.e. retweets (RT)), replies (RS) and undirected messages (BC)) respectively in social soundtrack conversations via second screen. The findings are important as they indicate the variations over each communication pattern and secondary screen usage in multiple cultures by its viewers in terms of information sharing behavior and social interactivity.

Regarding practical implication analyzing the reactions from undirected and directed recommendation will help cable providers and advertisers to identify the positive and negative effects of the televised shows and ads respectively for better personalization of TV shows and ads.

## 7 Conclusion

Though our data set spans for three/four weeks for each TV show, the results indicate a variation in social soundtrack conversation patterns for viewers from diverse cultural settings. We believe that our research provides valuable contribution concerning user's behavior and interaction while viewing of mass media from diverse cultural biases in a relatively new but emerging avenue of user behavior research in social soundtrack using second screen.

For future work, we will evaluate relative usage of second screen technology across diverse biases and also conduct content analysis of the social soundtrack data collected over a lengthier period from diverse cultures to determine the sentiment of the conversation occurring via user interactions with the second screen.

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