

**Frame of Reference Biases**  
**The Effect of Social Media on Behavioral Reinforcement**

Since its evolution, the use and utility of Social Media has been a matter of debate in many forums across the world. There have been many debates regarding the merits, demerits, implications, and long-term impact of Social Media. While on the one hand, it has democratized the media, making it much less unidirectional, on the other hand, the empowerment of a possibly less credible source of information to create conversations whose ability to influence an individual's Frame of Reference and outcome calls for greater research.

The source of information is usually validated based on a number of factors such as presence of implicit bias, consideration of Frame of Reference, and point of view of primary source creator. Personal feelings influence the way individuals and groups choose sides and view the facts. Social Media posts ability to influence the Frame of Reference of an individual are different from that of a Main-Stream Media (MSM) post. A person is likely to actively seek to link himself/herself to posts that exhibit an emotion that is to resonate with his/her own. Such behavior could potentially increase the virality of a post irrespective of its credibility. Social media posts from persons within ones network are likely to be taken with a greater degree of credibility, thereby reinforcing the impact on Frame of Reference of a post. This paper presents an analysis of the impact of Social Networking Sites (SNS) on an individual's Frame of Reference and its implications for his expression and behavior.

## INTRODUCTION

Ellison (2007) has referred Social Networking Site (SNS) as “Web-based services that allow individuals to (1) construct a public or semipublic profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system”.

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<sup>1</sup> This Paper is a summarized version of the Paper presented by Datawise at IIM Ahmedabad by K Vinay Kumar and Keerthi Paturi.

SNSs provide a flexibility to virtually connect to any individual or a group of individuals. As a result, the usage of SNSs has drastically increase over the past five years. Approximately, the active users of SNS have increased from approximately 1.2 billion users to 2.14 billion users in the years 2011 to 2015 respectively. Major SNS Facebook, Twitter and LinkedIn have 1.7 billion, 317million, and 465 million active users respectively. Some of the reasons for the improved usage of SNS includes- an individual's interest in socially connectivity, effective and simple mode to express his/her view point, and increasing availability of SNS through mobile applications.

These SNSs have gradually increased modes of communication and expression available to individuals as well as organizations. Many organizations such as Microsoft, Apple and Walmart have been using these SNSs to interact with a major segment of audiences across the world, for services such as product marketing, HR for identifying and engaging talent directly, operations to connect with experts who may share strategic ideas, and business development to establish connections with new potential clients.

It is estimated that around 73% of Fortune 500 companies have a Twitter account and 62% have YouTube account (Source: iSentia Whitepaper). The SNSs play a key role in organizational activities such as online brand awareness, sentiment analysis, relative organization online presence, and public engagements (Tripathi, 2009). SNS provide various solutions to organizations for their operations such as Facebook Ads for product marketing, Facebook Insights for simple analytics on activeness of organizations on SNS, Twitter to find and follow individuals, track trending topics, showcase a message or campaign of an organization and recruitment of key personals through LinkedIn job posts.

## Types of Social Networking Site

SNS can be categorized in to various types based on their activities. SNS can be broadly classified based on its structure- user profile based SNS and content based SNS.

### Profile based SNS

These SNSs are organized on the basis of user profiles. The best example is Facebook. Some of the activities of such SNS includes commenting, leaving a text, and sharing content. All the mentioned activities, involves usage of user profile space of members. Users of SNS also use content from other SNS to improve their profile.

### Content based SNS

In content based SNS, content being posted is more important than user profile. SNS such as Youtube is used to share content in the form of videos, where user profile is secondary. These are the SNSs where validity of message and credibility of the source of information are issues.

### Micro-blogging

Micro-blogging sites such as Twitter are used to post short messages. These messages are generally based on trending topics such as major organizational changes and current affairs. These micro-blogging sites are also used by individuals to express what's on their mind.

SNS helps individuals as well as organizations to express their view or interest to a huge number of audience without the involvement of MSM. This has fueled the creation of discussion forums and setting trending topics which can influence an individual's Frame of Reference. The sources of posts on SNS are not always credible, as it may not be subject to the journalism ethics and standards as apply to the MSM. These contents could therefore have messenger's implicit. As a reader, an individual's Frame of Reference could be influenced by this.

## Main Stream Media

Two decade ago, Main Stream Media (MSM) was the only source for broadcasting news to a large set to audience. This included Newspaper and Television. The news was communicated periodically such as daily once and was one way communication. The scope of learning the view point of the audience was limited, at best to Circulation Audits, which could provide aggregated and generic feedback. The MSM though has its own advantages such as the news broadcasted needs to adhere to well established journalism of ethics and standards. MSM has undergone major changes in the recent years such as 24 hours news bulletins on television, time slots for common citizens to express their views through television, and reader's columns in the newspaper.

## Frame of Reference

SNSs have changed the way a news is being communicated and the way a common citizen expresses his view. SNS are used to communicate the news instantly in a customized mode, where the news is communicated to the people of interest. Most of the news may not be extracted from a well-researched source.

Research work of Dan M. Kahan (2008) presents that the source of information plays a significant role for an individual to form an opinion on any issue. His study on Biased Assimilation, Polarization, and Cultural credibility presents an evidence that a public member with information from an unidentified advocate are likely to form polarized opinions on risks and benefits related to influencing issues. His findings show that individuals with less information or information extracted from unidentified source are likely to be more polarized in their opinions. His key findings also include that once a known advocate starts presenting his argument, the response will gradually become neutral in his opinion.

The source of information is usually validated based on a number of factors (District, 2007) such as:

- **Presence of implicit bias:** The extent to which a primary source creator overwrites the facts based on his or her experience.

- **Consideration of Frame of Reference:** Context, set of criteria or references that influences people or a group's perception and thinking. (Beegle, 2009)
- **Point of view of primary source creator:** Personal feelings influence the way individuals and groups choose sides and view the facts.

Social Media posts ability to influence the Frame of Reference of an individual are different from that of a Main-Stream Media (MSM) post. Whereas credibility of MSM is based on a painstaking and scientific process of researching and collecting information, verifying it, and then posting it for public consumption, SNS has no such rules built into the posts. The virality of an SNS post depends on the credibility, fan following of the person who initiates posts, and the ability to hold interest of the audience. Further, there is a decreasing interest in a 24-hour news cycle and increasing interest for ambient news. MSM has, of late, been losing out to the SNS on account of multiple issues – there have been accusations of MSM biases, as well as cases of poor research, and MSM content being recycled and repackaged to be inserted in SNS – all of which have impacted the credibility of MSM, even while SNS continues to gain popularity (Macnamara, 2014).

Knowingly or unknowingly, SNSs are playing a key role on an individual's Frame of Reference of, and are further influencing his or her behavioral patterns. A person is likely to actively seek to link himself/herself to posts that exhibit an emotion that is likely to resonate with his/her own. These links could be in the form of likes, shares, comments, or friend tagging. Such behavior increases the virality of a post irrespective of whether of its credibility. Social media posts from persons within ones network are likely to be taken with a greater degree of credibility, thereby reinforcing the impact of Frame of Reference of a post (Paquette, 2013).

**Table 1: Key Difference between MSM and SNS**

	<b>MSM</b>	<b>SNS</b>
Validity of source	High	Low
Credibility of source	High	Low
Possibility of two-way communication	Low	High
Time lapse between message and reception	High	Low
Potential for corroboration from multiple sources	High	Low
Possibility of Messenger bias	Low	High

### Implications for consumers MSM and SNS

A study (2014) was conducted, considering 2008 elections in the United States of America as case study, which was stated as "Facebook Elections" by many blog writers. The objective of the study was to measure the credibility of SNS for political information. The study presented that the majority of individuals view newspapers and television as a more credible source for political information when compared to SNS.

In recent times, the election campaign of President-elect Mr Donald Trump of the USA was largely driven on SNS which many a times posted unverified posts. Even while the MSM took a more equitable approach, clearly the impact of SNS on the voters' Frame of Reference and therefore their influence on behavior cannot be denied. And this was reflected in the election results. The impact of such potential influence was so high as to cause Mark Zuckerberg to assure readers that fake news on Facebook did not play a role in the US elections, even while there has been an increasing popularity of social media news authentication apps. An online recommender system established in a study conducted by Hewlett Packard labs has shown that the opinions of SNS's peers have a significant influence over an individual's behavior (Zeitel-Bank, 2014).

A study (Ruohan Li, 2015) was conducted to identify the factors influencing credibility of information on social media platforms. The results show that interactivity, medium dependency from medium credibility dimension and argument strength from the message credibility dimension are the factors influencing the credibility of SNS information.

Metzger (2014) stated "The users with higher social media self-efficacy find information shared via social media to be more trustworthy than do those lower in social media self-efficacy" through his study.

This paper presents an analysis of the impact of SNS's on an individual's Frame of Reference and its implications for his expression and behavior.

## METHODOLOGY

On 8 November 2016, the Prime Minister of India, Narendra Modi had declared that INR 500 and INR 1,000 notes will no longer be valid as legal tender. This step (Demonetization) was taken with an intent to curb black money transactions. Demonetization has been a matter of active debate both on MSM as well as on many SNS for the past one month and continues to be one of the major topics for discussion among common citizens.

For the purpose of this paper, we have considered the current issue of demonetization as a case study to establish the effect of social media on consumer behavior reinforcement of an individual's Frame of Reference. We collected quantitative survey data from a total of 130 respondents constituting a mix of persons who were active on Social Media and those who had no Social Media accounts. The respondents were broadly divided into the following four segments:

*Social Media posts ability to influence the Frame of Reference of an individual are different from that of a Main-Stream Media (MSM) post. Whereas credibility of MSM is based on a painstaking and scientific process of researching and collecting information, verifying it, and then posting it for public consumption, SNS has no such rules built into the posts.*

Figure 1: Segments of sample



- Segment 1: This segment includes respondents who do not have Social Media account and have a positive response.
- Segment 2: This segment includes respondents who have Social Media account and have a negative response.
- Segment 3: This segment includes respondents who have no Social Media account and have a negative response.
- Segment 4: This segment includes respondents who have Social Media account and have a positive response.

The survey collected information on key aspects of the respondent:

- Social Media account status.
- Social Media account operational details such as frequency of visit, and details of the sites being visited, and frequency of various activities.
- Favorableness of response towards currency demonetization.

## ANALYSIS

Objective of the analysis is to identify the influencing factors on an individual's behavior with respect to his / her SNS presence. As mentioned earlier, a survey was conducted across 130 respondents in Hyderabad. The data collected through survey consists of following parameters

**Table 2: Description of variables**

Variable	Description
SM Score	Score associated with usage of Social Media
Active.score.1	Score associated with activeness on Social Media.
Acitve.score.2	Score associated with network size on Social Media.
SM Reliance.1	Score associated with the reliance on Social Media of information for general information.
SM Reliance.2	Score associated with the respondent reliance on Social Media of information for the demonetization news.
Strength of Response	Strong Response or Weak Response

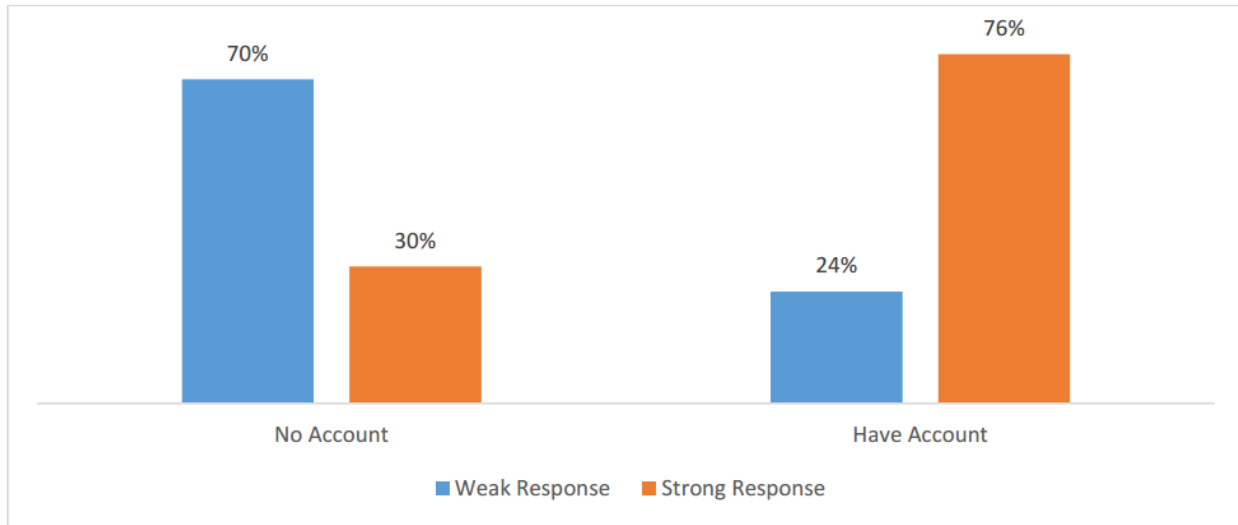
Strength of Response is the dependent and categorical variable with two levels of responses, that is 1- strong response which includes strongly disagree and strongly agree and 0- weak response.

Except the variables – Strength of Response, all the above mentioned variables are independent variables and continuous in nature. For the purpose of analysis, we have considered Discriminant Analysis as the best method to identify the influencing factors of an individual’s Frame of Reference and further influencing his behavior.

The following figure shows the proportion of responses with respect to the Social Media presence. The figure shows that, most of the respondents who have a Social Media account had a strong response on the currency demonetization, compared to the respondents who do not have a Social Media presence.



Figure 2: Strength of response with respect to Social Media presence

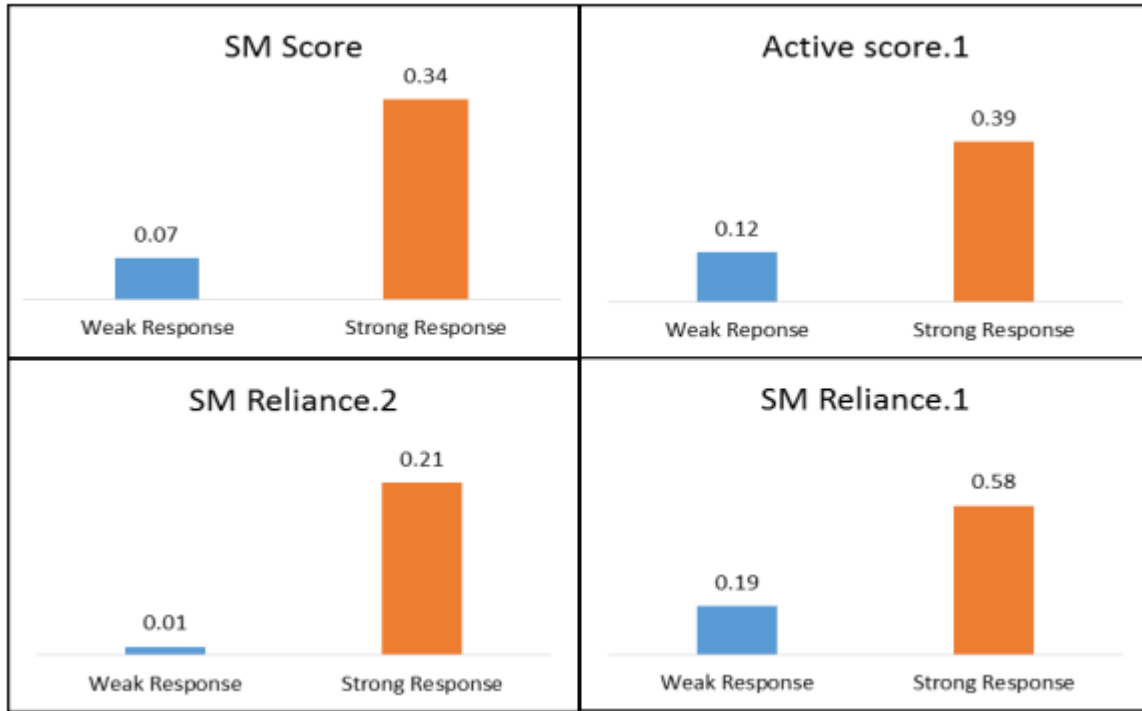


Following are the group following of the levels of Strength of Response variable with respect to each independent variable. The Figure 3 shows that, the group means of strong response level of Strength of Response variable are significantly high with respect to various independent variables such as SM Score, Active score.1, SM Reliance.1, and SM Reliance.2

Table 3: Group Means of Independent Variables

Class \ Variable	SM Score	Active. score.1	Active.score. 2	SM Reliance.1	SM Presence.2
Weak Response	0.07	0.12	0.00	0.19	0.01
Strong Response	0.34	0.39	0.06	0.58	0.21

Figure 3: Group means of Strength of Response variable with respect to each independent variable



Discriminant Analysis

Before conducting Discriminant Analysis, we determined “Wilks’ test” to check whether the means of all groups are equal and to identify the importance of each independent variable for further analysis.

The resultant lambda value of Wilks’ test for the dependent and all independent variables is 0.68 and the p value is 0.0001 which is far less than the significance level 0.05. This states that the means of both the levels of Strength of Response variable are not equal. Further we have conducted the same test to extract lambda value for each independent variable separately.

Table 4: Wilks’ Lambda for independent variables

Variable	Weak Response Mean	Strong Response Mean	Lambda	F	p-value
SM Score	0.07	0.34	0.72	49.28	< 0.0001
Active score 1	0.12	0.39	0.81	30.25	< 0.0001
Active score 2	0.00	0.06	0.96	5.85	0.017
SM Reliance.1	0.19	0.58	0.78	34.42	< 0.0001
SM Reliance.2	0.01	0.21	0.75	42.92	< 0.0001

The result shows that Active.Score.2 is not significant. The p-value shows that the contributions of variables SM Score, Active score.1, SM Reliance.1, and SM Reliance.2 are high in the discriminating the

variables. Discriminant Analysis is used to identify the variables, playing a key role in discriminating the levels of a dependent variable. The number of discriminant functions generated are number of classes in the dependent variable minus one. The individual coefficients of discriminant function are as mentioned below.

**Table 5: Discriminant coefficients**

	<b>F1</b>
SM Score	0.48
Active score 1	0.05
Active score 2	-0.04
SM Reliance.1	0.15
SM Reliance.2	0.48

Each coefficient represents the contribution of respective variable to the dependent variable. The following equation shows linear combination of independent variables.

$$\text{Strength of Response} = 0.48(\text{SM.Score}) + 0.05 (\text{Active score.1}) - 0.04(\text{Active.score.2}) + 0.15(\text{SM Reliance.1}) + 0.48(\text{SM Reliance.2}).$$

The independent variables with high contribution to the discrimination of classes in the dependent variable are SM Score, SM Reliance.1, and SM Reliance.2. Based on the comparison of the group mean values of the mentioned independent variables, we can statistically state that the SNSs have an influence on an individual’s behavior. The two variables which have the highest influence on the Strength of Response are SM Sore and SM Reliance.2, which further reinforce the fact that use of Social Media as a source of information does play a significant role in influencing the response.

The more the distance between the centroid values of the levels, the better the discrimination. In this case the discrimination is high as distance between both the centroid values is high.

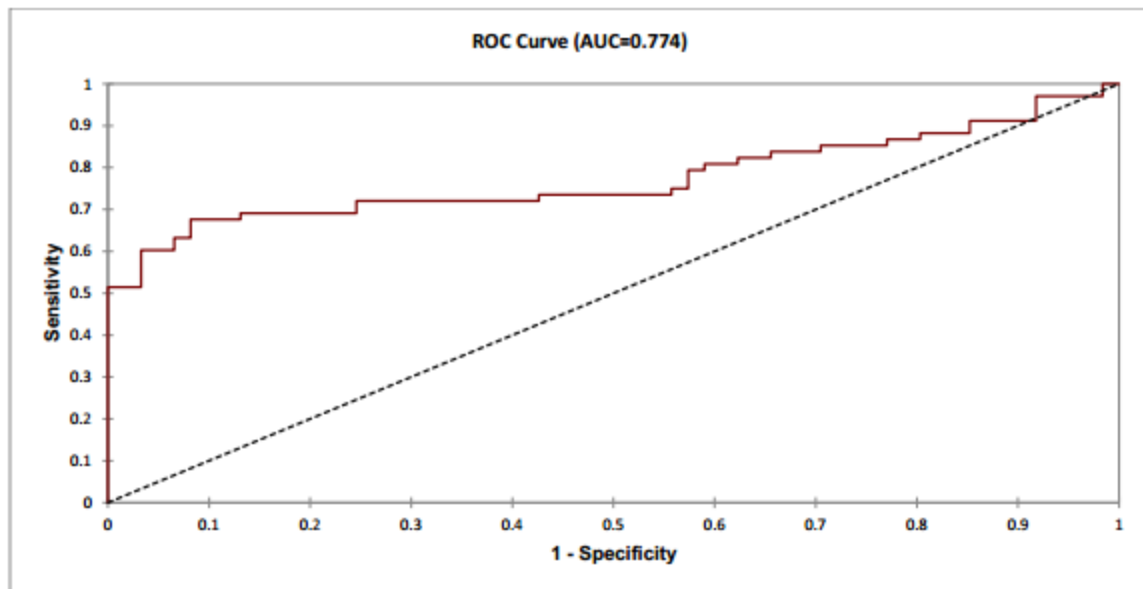
Considering the linear discriminant function, we have predicted the dependent variable of each observation using the respective predictors. A confusion matrix was constructed using the predicted and the actual values of each observation in the data. The confusion matrix of the sample data is as following. It shows that the accuracy of model is 76.15%. We can observe from the table that the True Positive and True Negative are more when compared to False Positive and False Negative respectively.

**Table 6: Accuracy of Model**

<b>Actual \ Predicted</b>	<b>Weak Response</b>	<b>Strong Response</b>	<b>Total</b>	<b>% correct</b>
Weak Response	50	11	61	83.61%
Strong Response	20	49	69	72.06%
Total	70	60	130	76.15%

The Receiver Operating Characteristic (ROC) curve of the model is as follows

Figure 4: ROC Curve



The ROC curve is used to measure the accuracy of a model. The curve is plotted with True Positive rate on the y-axis and False Positive rate on the x-axis. The more the Area Under Curve (AUC), the good the model is for prediction. In our case, the area under curve is 0.77, which shows that the Model is good for prediction.

## MAJOR RESULTS

The analysis highlights that the contribution of variables SM Score, Active Score.1, SM Reliance.1 and SM Reliance.2 is high for discriminating the observations with respect to levels of Strength of Response variable. The accuracy of the model is 76.15% and the area under curve is 0.77, which shows that the model is good for prediction. Based on the variables mentioned above, we can conclude that a significant difference exists in the degree of impact on an individual's Frame of Reference for persons on Social Media and those who are not, which in turn effects the behavioral reinforcement of an individual.

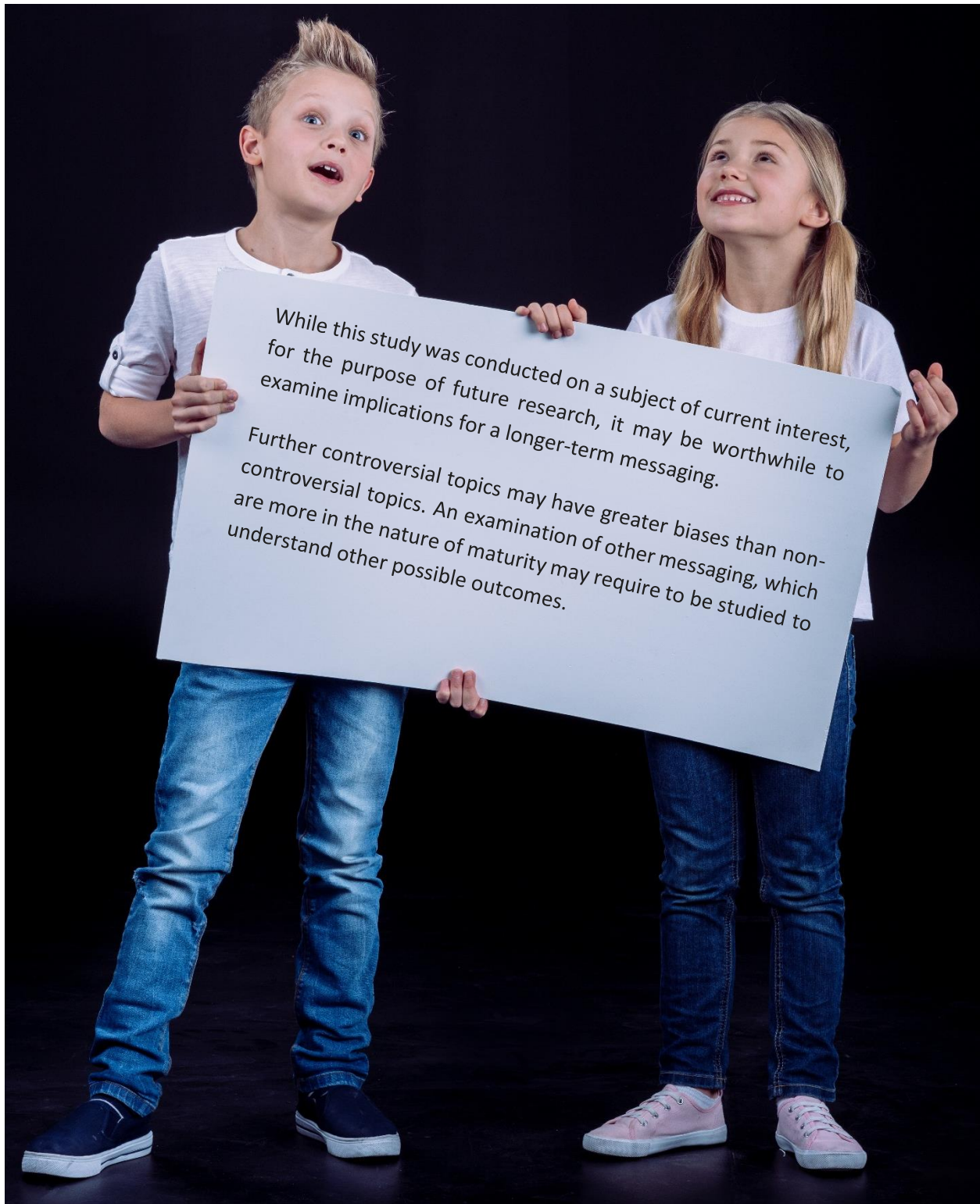
## IMPLICATIONS

This paper demonstrates the ability of SNSs to influence an individual's Frame of Reference and thereby, behavior, and presents potential marketing insights to organizations that may want to consider methods to positively influence a behavioral intent among its consumers. This presents three possible implications.

- Identification of potential customers: Organizations can leverage SNS to identify potential customers based on an individual's behavior and associations evolving from their Frame of

reference. By observing the online responses of an individual, it would be possible for organizations to suggest a preferred action that directly or indirectly develops an individual's new area of interest.

- Customer moderation: There is further potential to moderate an individual's behavior patterns once his Frame of Reference, and its influencers are identified. For organizations, negative behavior outcomes could be tempered while positive behavior outcomes could be enhanced.
- Customer retention: Through reinforcement of desired behavior, organizations could improve customer retention through suitable messaging.



While this study was conducted on a subject of current interest, for the purpose of future research, it may be worthwhile to examine implications for a longer-term messaging.

Further controversial topics may have greater biases than non-controversial topics. An examination of other messaging, which are more in the nature of maturity may require to be studied to understand other possible outcomes.

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