

Determination of Meme Proliferation Factors

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Abstract:

The ubiquity of the Internet has become part of everyday life. The Internet allows for the searching of information on topics that are relevant at that particular time. The possession of valuable information by members of a network improves the worth of such members and subsequently increases their influence. Memes refer to pieces of information or message that replicate. Social networking sites on the Internet provide an ideal platform to propagate messages as groups of like-minded people connect with one another and communicate ideas. Messages pertaining to popular, trending or controversial topics become memes on social networking platforms.

The design of memes serving as narratives has the potential to create disinformation or create a revolution as in the case of the Arab Spring. Narratives are the use of stories to influence behaviour. Messages could be created for nefarious purposes and if these messages become memes, these malicious messages can replicate at a rapid rate and potentially influence behaviour and action in a negative manner. The converse is also true a positive change could be attained through the propagation of memes designed for that specific outcome.

It is essential to understand what factors are required to effectively disseminate memes within a narrative network with the goal to transform behaviour of the members in the social network. As the majority of Internet users indiscriminately trust the content encapsulated within the information highway, a threat exists in which entities with power could influence society.

This paper addresses factors that could increase the proliferation of memes within cyber space. A framework is proposed of high-level factors that can be used in the design of a meme so as to increase its proliferation. Thereafter, the paper presents an experiment whereby these proliferation factors were investigated. Overall, the goal of the paper is to demonstrate how messages can be designed to proliferate and potentially influence individuals.

Keywords: influence, narratives, meme, profile, propagation, social networks

1. Introduction

Narrative networks form through the use of stories that helps create identity and belonging in a community with shared interests. Already in 2001, Arquilla and Rondfeldt (2001) explained that some narratives can be used for manipulative purposes by trying to create connection in a network. Arquilla states that disinformation, misrepresentation and outright lying are downsides that can result from the narrative level. The creation of unscrupulous storylines can unfold in the media. The 9/11 terrorist attacks are a typical example of a potentially negative narrative. Some claim that it was not a terrorist attack but a cover-up from the US government (Woodworth 2014). Similarly, great speculation rages over the cause of the Malaysian passenger plane that disappeared from skies at the beginning of 2014 (Quinn, Branigan 2014). Some part of society could use narratives to frame this event as a conspiracy by the Malaysian government (Adams 2014).

In 2011, the Defense Advanced Research Projects Agency (DARPA) welcomed proposals for the creation of narratives (books, propaganda, stories, that cause people to think) in order to create concealed messages that would influence vulnerable people (Yirka 2011). DARPA is the Pentagon's division responsible for the development of cutting-edge technology for the USA Department of Defense (Heyes 2012). The proposal requested narratives that could have a powerful influence on human thoughts and behaviour by influencing memory, emotions, judgment bias and personal identity (DARPA 2011). Narratives could potentially influence political radicalisation, violence in social movements and the course of insurgencies. Post (2007) mentions that the Internet has helped to propagate the ideology of right-wing extremism, as well as Islam. Individuals can become enraged by extremist messages and thereafter even resort to computer based attacks. Essentially narratives stemming from the Internet and social networks have the potential to serve the role of

weaponisation. Narratives could serve as a weapon to hijack the mind and plant false but believable stories (Heyes 2012).

The evolution of the Internet has given viral messages an enormous boost (Chielens 2002-2003). Movie and television stars, sports, scandals, scientific discoveries and incredible animals are examples of popular topics that go viral over the Internet. However, messages could also be created for malicious purposes and if these messages become memes, these malicious messages can replicate at a rapid rate and potentially influence behaviour and action in a negative manner. A meme is defined as *“an idea, behavior, style, or usage that spreads from person to person within a culture”* (Merriam-Webster 2014). Melodies, catch-phrases, fashion, and the technology of building arches are seen as examples of memes (Dawkins 2006). In this research context, the term meme and message is used interchangeably, to convey ideas that could influence another person. In other words memes have now become a popular form of cultural transmission and its main premise is to be memorable, which helps promote its replication.

Blackmore (2000) has explained that people spread memes indiscriminately irrespective of whether they are useful, neutral or harmful. She states that a marvellous scientific idea or technological invention may spread because it is useful but a song like Jingle Bells is not useful but spreads because of its melody. Other memes could also be harmful like chain letters, pyramid schemes or promotions for slimming diets and dangerous medical cures. Thus, by gaining knowledge of what makes a meme, one can also help create awareness against dangerous memes.

Cialdini (1998) discusses the premise of acceptable norms. He explains that preferences are established within the social network and any deviant behaviour will be discouraged by members (Cialdini, Trost 1998). Consequently, if negative norms are created within a social network, malicious behaviour can be promoted and condoned. As is the case with terrorist organisations, negative narratives on their websites and social networks can encourage violent behaviour and dissident acts of protestation and violence. Similarly, the media or other interest groups can create narratives on social networks in the form of memes in order to influence behaviour and opinion.

Social media makes it easier to tell stories that contribute to narrative psychology (Renando 2011). Through social media, individuals share their recollections and get feedback, which essentially contributes to narrative psychology. Through these interactions, social media helps develop meaning and identity. The events of the Arab Spring uprising depict the influence of narratives in the social media. Social networking sites were used by activists to publicise the protests in Egypt. Social media- its rise and new activist uses have played a critical role in mobilisation, empowerment, shaping opinions and influencing change (Huang 2011). Therefore, the creation of memes through narratives can help influence behaviour, opinion or viewpoints.

To understand the dynamics of meme propagation on social networks, it is important to study the dynamics of adoption. Kempe, Kleinber and Tardos (2003) state the premise of viral marketing is initially target a few influential members of the network. Similarly, in order to create a meme it will be important to find influential members in a network. Other dynamics can also create adoption and thus the focus of this study will be to determine other factors that influence meme proliferation.

In social networks, users build their social currency and influence by increasing their number of friends/followers together with frequent updates about activities, opinions and interests. If a message is sent out and a personalised response is returned, trust can be strengthened. Automated responses may be unhelpful or suspicious. Thus, the nature of responses and updates can create trust. When an active or popular user has many friends and frequently updates current or useful information, these messages can begin to proliferate at a rapid rate. Memes are considered as information that replicates (Aunger 2002). Popular or trending topics can replicate and then become memes as they are created from the most prevalent or entertaining issues.

Often for a meme or trend to begin, the message needs to be initially propagated to other members of the network. An inactive account or account with no real friends will hardly create enough trust. In addition, the nature of the message also needs to be considered. However, various factors can influence the proliferation of memes. Therefore it is imperative that in order for messages to become memes or trends, certain conditions are present.

This paper discusses the findings from an experiment conducted to determine what initial factors could be beneficial to the development of a narrative network which would utilize memes to effectively disseminate information to members of a network. Initially a framework is proposed that discusses factors that contribute to the proliferation of a meme. Thereafter, the design and results from the experiment are given.

2 Proposed High Level Framework for Meme Design

In this section, we address the high-level design of the memes for the proposed experiment. If a person mentions or retweets a message this shows awareness or interest in the issue. Therefore, a mention or retweet can be used to create a meme and stimulate interest and awareness in an issue. A retweet or mention can help attract more followers or proliferate the meme.

To design a meme to be attractive the following factors should also be considered:

- **Newness** – New content or breaking news has a higher probability to propagate between users in a network as users who possess new information have higher status within social groups.
- **Emotional** – Memes that evoke positive emotions, for example happiness and hope could be beneficial to other users. Conversely, the opposite is also true as negative emotions such as in the case of a natural disaster or breaking news could be used to propagate through the network and subsequently inform and influence other users.
- **Enticing** – The use of wording to draw the attention of the reader to the message. The words include “WOW”, “OMG” and “Shocking”.
- **Targeted** – Social networks are created around people who are like-minded and have the same interests. A user within a specific social network build around a specific interest is higher in value if information is disseminated which benefits the group.
- **Richness** – A message can be a combination of text, links to external resources on the Internet and images. The presence of all these would be more of value to the user as more senses of the user are used, which enhances the experience.

Veerasamy and Labuschagne (2013b) explain to determine trust in a social network account, one should consider the activity, friends, information, albums and profile picture of the account. Essentially by studying the profile and activity, one gains information about the behaviour and personality behind the account. This helps build trust in an account. Interaction with an account creates trust and a person is more likely to resend, like or favourite a message from a known account. When a person has many contacts, their social status increases and this may create influence. Influence and enticement can be created through emotive or positive words.

Advertising principles can also provide great insight into the marketing of a topic and the creation of a meme. In his book *Contagious: Why Things Catch On*, Berger (2013) describes a model entitled STEPPS which stands for Social Currency, Triggers, Emotion, Public, Practical Value and Stories. A brief explanation of these insightful principles follows.

The first part of the STEPPS model refers to Social Currency. Social Currency refers to increasing a person's social status by being knowledgeable about trendy and interesting topics. Social currency can be created through bringing out the novelty through stories and exaggeration. The use of games and loyalty schemes also creates interest. Social currency is created when consumers boast about scheme benefits and promote the game play.

The second principle of the STEPPS model is Triggers. Stimuli and triggers from the environment can help remind people of a certain concept. Frequent stimuli, word association, alliteration and idea linking are all techniques that can trigger a response. In some cases a negative response like a critical review can generate interest as it creates attention to the topic.

The third principle that can be applied from the STEPPS model is the use of Emotion. Emotive words can appeal to the gentle side of people. On the other hand negative words also arouse emotion like anger or outrage. Remarkable topics like scientific discoveries can also create the emotions like awe and amazement. Humour is also a very popular emotionally-enticing technique.

The next principle in the STEPS model is a very simple one: Public. If a concept is not in the public eye it cannot be seen. A rather obvious deduction, it is important to note that if a topic is not placed on a platform that can be seen by many, its message can be lost.

The second P in the STEPPS model stands for Practical value. Tips for saving time, improving health, or saving money will spread as it provides consumers with a beneficial service. Incredible offers, special deals, health, reviews and education articles are all useful and are thus popular topics to spread.

The last principle from the STEPPS model is Stories. Many people are epic story tellers. The interest that is created out of stories can be used as a marketing advantage. The principle of STORIES can incorporate the other principles of the STEPPS model as well. Stories can be told to create social currency (by trying to look impressive or create envy), for practical value, with emotional arousing tones, as recounts of awe-inspiring tales or to create lessons. Overall, to use this technique make the product/topic part of the story in order to create interest.

Now that the STEPPS model has been explained, the discussion moves on to other design principles that can be applied. Blackmore has explained that memes form from variations and combinations of old ones, either in a person's mind or when memes are passed between people (2000). Furthermore, Young (2012) has stated that coming up with a completely new idea to go viral may be difficult and in some cases just a matter of luck. Young encourages the use of borrowing an idea that is already popular.

Quodosi (2012) talks about different techniques of creating memes that generates interest. These include:

- **Communication-** The methodology of memes relies on a simple message that is easy to grasp. Memes are not very text heavy
- **Image-** Most memes are sent using an image. However, Bernstein (2012) has also shown that videos are very powerful and can also go viral. He explains that many companies succeed in creating memes by using YouTube in their social media advertising strategy.
- **Appeal-** memes provides some type of appeal which includes fascination to our ego, or amusement and distraction.

Garun (2012) explains that following the right people is a great filter for finding content as it helps see what is viral. By using the judgement of friends and trusted sources, the credibility of the content is increased and promotes viewing the content. Therefore, it is imperative to realise that people rely on the judgement of their trusted contacts.

Moreover, Brandon (2013) discusses various ideas that are helpful for the high-level design of memes that will be used during the experiment (See Section 2):

- **Post the same links multiple times-** Many users only carry out "drive-bys" on social networks streams and can thus miss viewing some content. It is better to post a link a few times at different zones to ensure that more potential followers can be reached.
- **Reciprocate followers and also follow them on social channels-** Some followers may not be aware of a person's handle on a certain channel so it helps to be visible in many channels. Try to users with similar interests or those that are "influencers" (have many followers). A good strategy is to follow influencers as it can help find another league of new followers as well.
- **High frequency of interaction with followers-** When regularly interacting with followers a relationship can be established. When big corporations provide responses to message, assurance in the brand is built. Similarly, recurring messages helps establish trust and create an open channel for communication.
- **Show personality-** Automated or random messages can seem impersonal or suspicious. It may seem like a bot has generated them. When creating contacts it is important to show that the user is legitimate and will be using the media frequently. Answer messages directly, follow-up responses or using humour can all establish users as an "influencer". Staying active and continuous engagement is critical.

Furthermore, Chielens (2002-2003) has stated that in an ideal situation, a replication will have exponentially increasing number of carriers which serve as hosts/vectors for this replication. Public awareness is essential for

creating a viral concept. Godin (2013) explains that a critical aspect of creating a virus is the source of the viral infection. For a virus to proliferate, it needs to come into contact with people. Similarly for a meme to go viral, it needs to have a large number of people to reach. In addition, Godin explains that if there is a specific idea to spread, find the matches that would also be interested in the idea. Targeted message may create a bigger impact as they reach the appropriate audience.

Based on the discussion in this section, Figure 1 shows a high-level summary of the design factors for the proliferation of a meme. Due to the time restrictions of the experiment only three of the STEPPS principles are utilised in the framework. (Social Currency, Practical Value and Story-telling). This framework refers to several terms used in the Twitter environment. However, a subset of the principles encompassed can be applied to other social networks. For example, a Retweet correlates to re-posting a message. Followers refer to the number of contacts. “Favourited” is term found on various social networking sites.

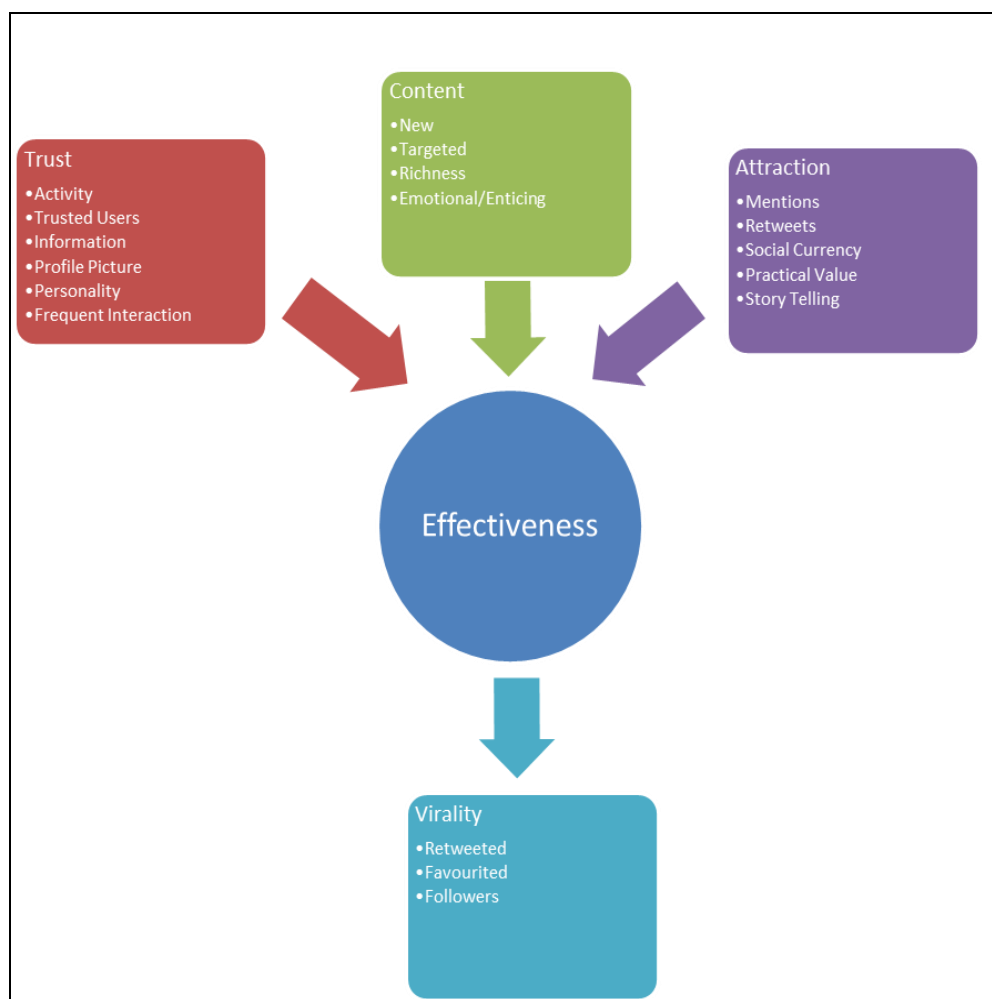


Figure 1: Meme Design Framework

This section discussed various factors that can be applied when designing a meme. The next section will therefore discuss the application of the framework in an experiment.

2. Experiment

An experiment was designed to investigate the proposed design factors for meme proliferation. The next few sections describe the design, data collection and analysis of the experiment.

2.1 Design

An “A/B” test was used during the experiment. The main objective of using the “A/B” test is to determine if certain factors were affecting the outcome of each test. The experiment required to be conducted within an established environment with maximum exposure to the Internet society and provide a mechanism to collect

data generated during the experiment. The social media site Twitter was selected to conduct the experiment as it provides an effective platform to disseminate memes to all the users. Twitter is used as a broadcasting platform where all Twitter users can view public tweets. A tweet in the context of Twitter is a message that contains 140 characters to convey information in the format of text and in some instances images. In addition Twitter also provides researchers with access to its tweets via an Application Program Interface (API).

Two Twitter accounts “supr3m3travel” and “jillhilljackson” were created for the experiment. These accounts would be individually used to tweet memes that were designed to convey different ideas. Also, the accounts were personalized as this increases the credibility of the account (Veerasamy, Labuschagne 2013a). For example “supr3m3travel” was themed around the topic of travelling and “jillhilljackson” was generalized. In other words, the building of trust within social networks is imperative to the success of gaining a following on social networking sites, which in turn would improve the chances of a meme becoming viral. A newly created profile on Twitter does not have a profile description or a profile image. People are less likely to trust this profile and not follow the account until actions are performed on the profile to improve the trust levels.

Next a developer account was created for each newly created Twitter account to access the Twitter API (Twitter 2014). This resulted in the capability to extract data about each account as a single account does not allow access to data created by other Twitter accounts. Hence, “supr3m3travel” cannot access data about a tweet created by “jillhilljackson”. For example, one of the methods, “GET statuses/retweeters/ids”, lists the users who retweeted (RT) a tweet created by a specified user (Twitter 2013). However, if “jillhilljackson” created the tweet then “supr3m3travel” cannot list the users who retweeted the tweet created by “jillhilljackson”.

A data collection system was programmatically developed, which would be executed weekly to connect and extract tweet data from the Twitter data sources via the API. In the context of this research, only the creation date, the identification number (ID) of the tweet, the number of retweets, the number of favourites, as well as the number of followers per tweet were collected. The unique ID of the tweet is used as an input to determine the users who have retweeted the tweet. Hence, this would only be determined if the number of retweets for the tweet was higher than zero. A user who retweets a tweet finds the information useful to spread to their network. The number of favourites is an indication of users who found this tweet valuable for future reference and the number of followers indicates the size of the users following. These three metrics provides insight into the influence of the user and subsequently how effective the meme was disseminated. The collection of data was executed weekly as this would allow time for the meme to spread through the social network as Twitter users are dispersed around the globe and operate in different time zones.

A schedule together with the strategy was created for the experiment to conduct an A/B test (See Table 1). This provided a high level description of which actions would be taken during the specified time intervals.

Table 1: Experiment A/B Testing

Account	A		B	
	Strategy	Dates	Strategy	Dates
supr3m3travel	<ul style="list-style-type: none"> No interaction with other profiles Message specific to travel 	2013/10/29 to 2013/11/20	<ul style="list-style-type: none"> Interaction (Reply reciprocation and Follow) Message specific to travel 	2013/10/29 to 2013/11/20
jillhilljackson	<ul style="list-style-type: none"> Interactions (Reply) Message covering all fields 	2013/11/21 to 2014/01/07	<ul style="list-style-type: none"> No interaction with other profiles Message covering all fields 	2013/11/21 to 2014/01/07

Memes which focused on travel were created for the Twitter account “supr3m3travel” during the first phase of the experiment. Finally, the memes to be tweeted by each Twitter account were created using some of the factors according to the specified strategy in Table 1. It is challenging to encompass the various design

principles when facing word restrictions in Twitter. Applying story-telling, practical value and social currency principles, together with mentions, requests for tweets, emotive words, in conjunction with target specific requirements can be rather difficult using a limited number of characters. In a traditional advertising campaign, word limits may not be so stringent and thus the various principles of the STEPPS model and the design framework can be applied more advantageously. Thus, during this experiment the design factors were applied as far as possible in the context of the environmental restrictions.

The next section describes how the data was collected during the experiment.

2.2 Data Collection

The first test (Test A) for both Twitter accounts was initiated on 29 October 2013 and completed on 20 November 2013. The strategy for the Twitter account “supr3m3travel” was to create meme around the theme of travel. This was aligned with the description of the account and subsequently would have increased the account’s credibility as experienced by other Twitter users. Also “supr3m3travel” did not interact with other Twitter account. In other words “supr3m3travel” did not retweet tweets created by other Twitter users or replied on other tweets. The other Twitter account “jillhilljackson” in turn interacted with other tweets created by other Twitter users and created general messages that were not specific to a topic.

Test B started on 21 November 2013 and concluded on 7 January 2014. The strategy was changed for both Twitter accounts during this phase. During this test the account “supr3m3travel” not only replied to other users but also followed them. The account “jillhilljackson” posted memes that were general in nature. Also no interactions were pursued by the account “jillhilljackson”.

The data collection system described earlier was used weekly to connect to Twitter through the API and extract the requested data. This in turn was sanitized as only a subset of the data was required for this experiment and finally stored within a storage platform. The next section discusses the analysis of the results.

2.3 Analysis

The data sets for both Twitter accounts used during the experiment were graphically illustrated in Figure 2. The data depicted in the figure shows the temporal data collected from 29 October 2013 to 7 January 2014. This shows the number of followers for each Twitter account at daily intervals. Figure 2 shows the growth in the number of followers on the “supr3m3travel” account during the B test. During the B testing, the strategy for the “supr3m3travel” account was to interact more frequently and follow new contacts.

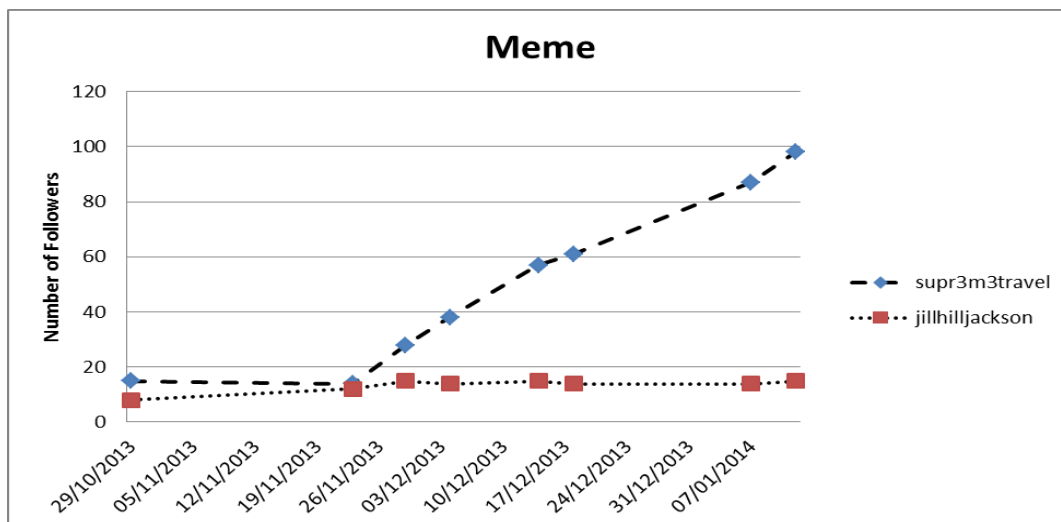


Figure 2: Growth of Number of Followers

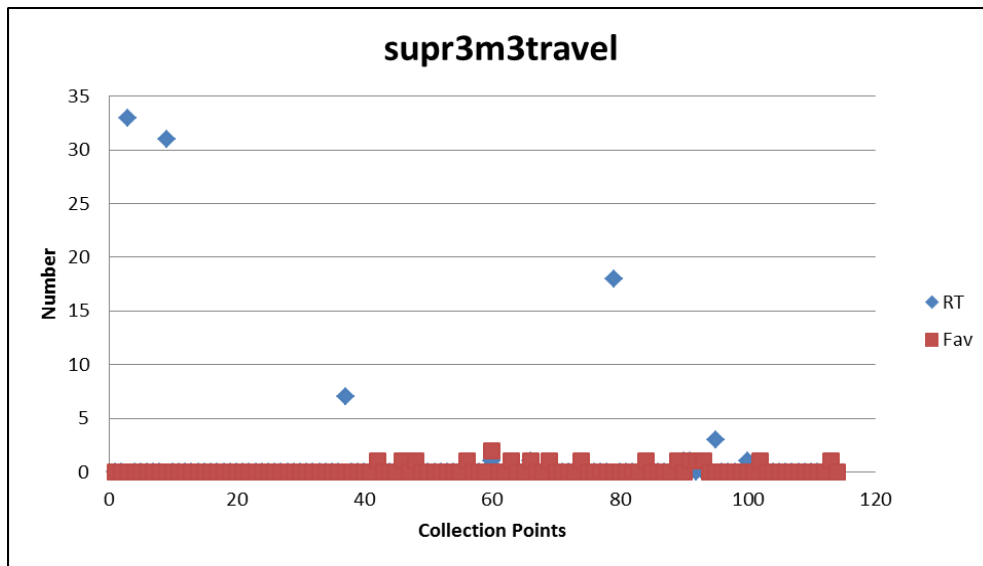


Figure 3: Number of Retweets and Favourites on “supr3m3travel Account”

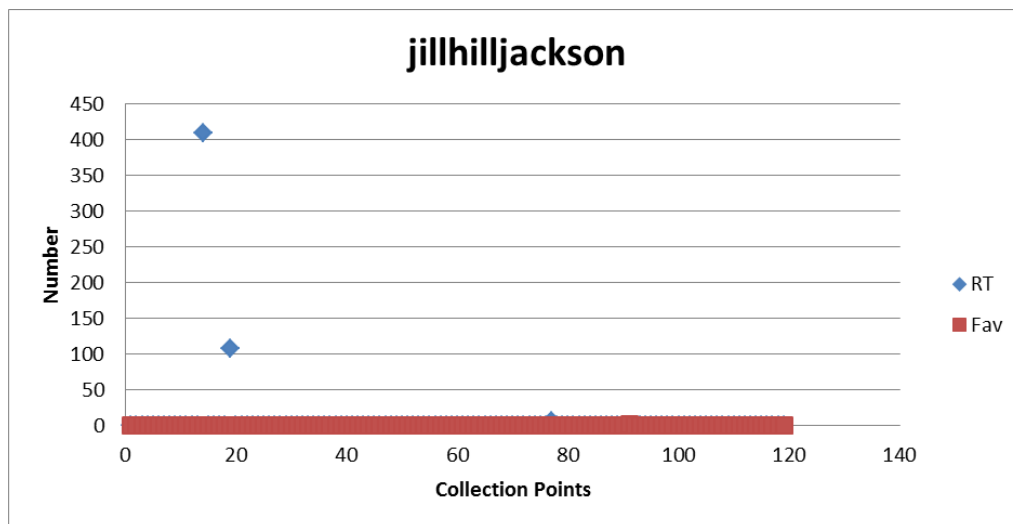


Figure 4: Number of Retweets and Favourites on “jillhilljackson” Account

A low number of retweets and favourites for each tweet created by the two Twitter accounts, were observed from the analysis of the results. However, the number of followers increased substantially for the account “supr3m3travel”. This occurred during the second phase of the experiment. The strategy followed by the Twitter account “supr3m3travel” was to follow other Twitter users, together with the interaction on tweets posted by other users. This strategy showed a significant impact. The strategy resulted in a substantial increase in the number of followers during the second phase (Test B) of the experiment.

Travel related messages were posted on the “supr3metravel” account throughout the experiment. Similarly, generalised messages were posted on the “jillhilljackson” account. Thus, the only metric that was different was the increased frequent interaction and following of other users. This finding provides valuable information to individual users of social networking sites like Twitter whose objective would be to create a following which subsequently could be used to exercise influence on. Another interesting finding was that although the number of favourites per tweet was low, the frequency of other Twitter users labelling the tweets as favourite

also increased as the number of followers increased. This indicates that memes posted by the “supr3m3travel” account during that time had value to the users within its follower’s network. In the experiment, not many contacts were initially made in the A test and thus this impeded the ability to have the message viewed and shared. However, during the B test, the number of contacts on the “sumpr3metravel” was increased by interacting and following new contacts. This in turn resulted in a reciprocal following of “supr3m3travel” and subsequently led to cluster of retweets and favourites.

Chielens (2002-2003) has explained that memes have to go through a “battle for the brain” and since there are a limited number of meme-carriers and the large amount of memes, there is a strong competition among memes. This results in some memes being passed on rapidly and others simply are fading away without any attention.

3. Future Work

The focus in this paper was on the design and implementation of factors for meme proliferation. Future work will entail investigating the effect of specific factors to determine whether they create a significant influence. This will help in the design of targeted and effective memes. Furthermore, the study can be expanded to the topic of security awareness to determine whether a positive influence can be created using memes.

4. Conclusion

Integration between society and the Internet has achieved critical mass. A member of society relies on the presence of the Internet to conduct daily activities which include leisure and work. As most humans are gregarious in nature the quest for information to improve social status has increased. The Internet provides copious sources of information generated by society. With the birth of Web 2.0 social networks provided a platform which allows for content creation between like minded people on any related topic. It is also in the human nature to implicitly trust the information obtained from reliable sources. However, the Internet is faceless and subsequently not all information is equal and can be nefarious in nature. Narrative networks have been proposed as a mechanism to influence society. The Internet together with the social networks is ideal platforms to implement narrative networks as part of a propaganda campaign and ultimate behavioural change. The use of memes could improve the successes of narrative networks.

The experiment investigated the initial factors required to establish trust and proliferate the developed memes. An unexpected finding highlighted that reciprocity especially on social networking sites could be used to establish trust. Subsequently the creditability of the user would increase to other members of the network. During the A/B test (the second phase), the account “supr3m3travel” saw a drastic increase in the number of followers once the user “supr3m3travel” interacted with other users and also actively followed other users. The effect of the increase in followers for the user “supr3m3travel” also demonstrated that content posted was perceived as valuable to the network as other users labelled the tweets as a favourite. In other words the influence of the user “supr3m3travel” increased in the network. Conversely the other account “jillhiiljackson” did not interact with other members in the network, the number of friends did not increase nor was any tweets deemed as valuable.

The success of memes not only lies within the design but also the platform where the memes are disseminated on. Social networking sites have exploded in the last few years and infiltrated society. Twitter provides a suitable platform for meme propagation as its design is developed around broadcasting to all users of the platform. The establishment of trust is fundamental to the success of memes. In other words members of a network would not share information from an untrusted source to other members. This helps keeps creditability intact. Trust factors are described as portraying human-like behaviour, for example having meaningful conversations, posting regular content, personalizing the user profile and having a legitimate following. The value of the user within a social networking is increased when relevant contributions are made to the network thus increasing the status of the individual and the group. The effectiveness of the meme is further increased if the content is original and has value in terms of usefulness and scarcity. In addition the evocation of emotions within the appropriate context would also increase the success of the meme.

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