

Increasing and Visualising Meme Effectiveness

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Abstract: *The Internet provides the ideal platform to disseminate messages which could potentially sway the opinions and behaviour of people. The ease, convenience, and transmission capabilities of the Internet facilitate the seamless transfer and replication of messages at a rapid speed. Memes are popular ideas, messages, or styles that can be used as narrative networks to create influence. Social networking sites on the Internet are being used to rapidly send out memes. However, in order for a meme to become popular it is imperative that the message initially captures the attention of users. This paper proposes a framework of high-level factors that can help increase the effectiveness of a meme. Furthermore, the visualisation of meme proliferation is studied.*

Keywords: *Meme, Proliferation, Narrative Networks, Social Networking*

Introduction

The Merriam Webster Dictionary (Merriam-Webster 2014) defines a ‘meme’ as an idea, behaviour, style, or usage that spreads between people within a culture group. The word ‘meme’ originally came from the 1976 book *The Selfish Gene* by Richard Dawkins which refers to a unit of cultural knowledge that is passed between people and reprinted (Dawkins 2006). Examples of memes from Dawkins include melodies, catchphrases, fashion, and the technology of building arches. The evolution of the Internet has given viral messages an enormous boost (Chielens 2002-2003). Currently, memes have become synonymous with messages that go viral by creating interest with the use of humour, video, wittiness, cynicism, imagery, or poetry. Thus, memes have the potential to influence behaviour and opinions. As soon as a popular meme is formulated, users retweet, follow, favourite, and reply to these entertaining, amusing, controversial, humorous, or informative messages.

Blackmore (2000) has explained that memes spread themselves indiscriminately irrespective of whether they are useful, neutral, or harmful. She explains that a marvellous scientific idea or technological invention may disseminate because it has a valuable contribution, but a song like Jingle Bells is not useful but spreads because people are attracted to its melody. Other memes could also be of little use like chain letters, pyramid schemes, or promotions for slimming diets, and potential medical cures. Thus, by understanding what makes a meme effective, one can also help to create awareness about memes that negatively influence people.

Associated with the idea of meme are narrative networks. Narrative networks develop from stories that help create identity in a community of shared interests. As far back as 2001, Arquilla and Rondfeldt (2001) described how some narratives could be used for manipulative purposes through the establishment of connections in a network. Arquilla and Rondfeldt

explain that disinformation, misrepresentation, and even deception can be used in narratives. In the media, questionable storylines can be depicted, such as the origin of the 9/11 terrorist attacks. Woodworth (2014) talks about claims that it was not a terrorist attack, but a cover-up from the U.S. government. Likewise, the disappearance of the Malaysian passenger plane in 2014 also gives rise to great speculation (Quinn & Branigan 2014). A narrative could be created to label the event a conspiracy by the Malaysian government (Adams 2014).

In 2011, the Defence Advanced Research Projects Agency (DARPA) invited proposals for narratives (in the form of books, propaganda, stories, or ideas) to make people think, with the aim of developing hidden messages to influence vulnerable people (Yirka 2011). DARPA is the Pentagon's division that was tasked with developing innovative technology for the U.S. Department of Defense (Heyes 2012). The invited proposals called for narratives that would be able to sway human opinion and behaviour by influencing memory, emotions, judgment, and identity (DARPA 2011).

Furthermore, if the influential effect of narratives is considered, there lies the potential to also influence political opinion, to cause violent outbreaks, and to develop insurgent behaviour. Post (2007) explains that the Internet has been used to proliferate the ideology of right-wing extremism as well as of Islam. After surfing on the Internet and viewing extremist messages, individuals can be driven to carry out computer based attacks. Narratives over the Internet and social networks are playing an influential role in creating negative opinions and behaviour. Narratives that are spread through memes could thus be used as weapons to develop negative perceptions. Narratives could serve as a weapon to hijack the mind and to plant false but believable stories (Heyes 2012).

Cialdini and Trost (1998) looked at the development of acceptable norms. Preferences can be created within a social network and actions by deviant members can be discouraged (Cialdini & Trost 1998). Likewise, if malicious behaviour is condoned within a social network, negative norms can be established and accepted. Terrorist groups have the capability to create negative narratives on their websites and on their social networks in order to promote violent acts, protests, and dissident behaviour. The media or other special interest groups could also create narratives in the form of memes on social networks in order to promote specific ideas and responsive behaviour.

Social networks facilitate storytelling, which in turn supports narrative psychology (Renando 2011). Through interaction on social media, individuals can share their experiences and receive responses. This interaction helps contribute to narrative psychology. The Arab Spring events demonstrate how narratives in social media can influence society. Encouragement to protest and to oppose a current government was strongly advocated in the social media of Egypt, Syria, and of other Arabian regions. Social media, its rise and new activist uses, has played a critical role in mobilizing and empowering citizens, as well as in shaping opinions and influencing change (Huang 2011).

In order for an idea or message to propagate and to become a meme on social networks, the dynamics of adoption should be considered. Kempe, Klinber, and Tardos (2003) explain that to start a viral marketing campaign it is important to target a few influential members in a network. As in the case of a meme, a key aspect of making a message go viral will be finding influential members who can disseminate the content to a wide audience.

Social currency in a social network refers to the amount of influence that a member has. Social currency can be raised by growing friends/followers and through regular updates about activities, updates, and interests. Such interaction in a social network helps a user become more popular. When users respond with personalised messages, instead of automated communication, trust can develop. Well-liked users can post messages that proliferate at a rapid rate as they have more friends/followers who they are in contact with.

Many factors can influence the effectiveness of memes. Trust, influence, and content are some of the factors that should be considered. An experiment was carried out to determine what key factors can help increase the effectiveness of memes for potential use as narrative networks. This paper discusses the results of the experiment, as well as how the effectiveness of memes can be visualised.

Proposed Framework to Increase Meme Effectiveness

When a person is interested in a message on a social network, the message can be mentioned, retweeted, or replied to. Therefore, multiple responses to a message can help create a meme and generate further interest in the meme topic.

Veerasamy and Labuschagne (2013) show that, in order to assess whether a social networking account can be trusted, it is important to study the profile's picture, friends, activities, albums, and responses. This can help gain information about the behaviour and personality of the account holder. An interactive account is more likely to have messages that generate responses. An account with many contacts may have a higher social status, which has the potential to create influence as the account is able to reach a wide audience.

Another method of enticing users to respond to messages is through emotive, controversial, or positive words. Advertisers often use these principles when marketing a product or service. Berger authored a book *Contagious, Why Things Catch On* (2013), in which he explains a model called STEPPS. STEPPS stands for the concepts of Social Currency, Triggers, Public, Practical Value, and Stories. These concepts will be briefly explained in order to show how they can be used to create an influential message.

The first concept in STEPPS is Social Currency which refers to enhancing a person's social status by being informed about the latest trends and interesting issues. Stories, exaggeration, and novel ideas can contribute to social currency. When scheme benefits like discounts or special offers are promoted, social currency can also grow.

The second concept in STEPPS is Triggers which represents stimuli that spark an association with another idea. Recurrent triggers, linking words, and alliteration can help generate a response. Critical comments can also spark interest in a topic.

The third concept that can be applied from the STEPPS model is Emotion. When gentle words are used, compassion and kindness can be triggered. However, negative words can also arouse anger and offense. Humour usually creates light-heartedness and amusement.

The fourth concept in the STEPPS model is the very clear idea of Public. If an idea is not placed in the public eye, it is unlikely that it will be picked up. Messages need to be presented on public forums in order to get exposure.

The second “P” in the STEPPS model represents Practical Value. Ideas that help save time, improve health, or save money are popular as users are provided with a beneficial service. Special offers, deals, health tips, and educational information provide valuable advice and knowledge.

The last concept in the STEPPS model is Stories. Many people enjoy listening to epic stories. The curiosity that is generated by storytelling can be used as a marketing tactic. Storytelling can also utilise the other concepts in the STEPPS model. For example, stories can increase social currency by describing impressive situations, they can be practical, or they can contain emotion by relating awe-inspiring tales.

The discussion moves on to other ideas to increase meme effectiveness. Young (2012) states that devising a completely new idea that goes viral is difficult and sometimes it is just a case of good luck. Young suggests that popular ideas should be borrowed. Furthermore, Blackmore (2000) states that memes develop from variations or blending of older ones as they are passed on to other people. However, some ideas can make a meme more attractive. These include:

- **Newness**--When new ideas or breaking news emerges, readers become interested in finding the source with the latest information.
- **Emotion**--Enticement can be generated through words that draw readers in. Words like ‘WOW’, ‘OMG’, and ‘Scary!’ attract a reader’s attention.
- **Targeted**--Users who have similar ideas or activities can develop into communities of interest on social networks. Messages can be sent to like-minded people and thus, through targeted distribution, they can reach those who will most benefit from the information.
- **Richness**--Messages can contain text, links, images, and videos. When various forms of media are utilised, more senses are stimulated which can enhance the user experience.

Quodosi (2012) discusses different techniques for designing memes to generate interest. These include technique such as:

- **Communication**--In social networks, messages are usually short and straight-forward. Simple messages are more effective than those that are text heavy.
- **Image**--Visual objects attract readers’ attention. Bernstein (2012) has also indicated that videos can have a significant effect in causing a message to go viral. He describes how many companies have created memes on YouTube as part of their advertising strategy. Images and video material promote richness of content, which can help create a stronger impression than text alone.
- **Appeal**--Memes draw people in through fascination, curiosity, amusement, or distraction. Emotion, enticement, and attraction can all help to lure attention towards a message.

Garun (2012) discusses how following the right people can help find and filter content that is going viral. People tend to rely on the judgement of their friends and on other reliable sources. The credibility of content is enhanced through consistent postings by frequent contacts.

Furthermore, Brandon (2013) explains numerous ideas that can be incorporated to increase meme effectiveness. These include:

- **Repetition**--Posting the same link multiple times. Users may conduct ‘drive-bys’ on social networking sites and thus miss some content on one site but view it on another.
- **Reciprocation**--Following contacts back, especially those with similar interests or high social currency (a large number of followers). Following those with social currency can help generate a league of new followers in reciprocation.
- **Frequent interaction**--Encouraging frequent interaction can develop relationships and trust. When communicating with big corporations, like a hotel chain, a personalised response creates assurance in the brand. Regular contact creates a channel for more open communication.
- **Personality**--Responding to messages directly helps demonstrate that the account is legitimate. Users do not appreciate automated or random messages as they lack information or seem suspicious. Random messages may have been generated by a bot and automated answers are impersonal. Humour, politeness, and attention to detail can show personality and thoughtfulness.

When a meme is effective, it can go viral. Godin (2013) has found that the key factor for creating a virus is to look at the source of infection. In order for a virus to become effective, it needs to come into contact with many targets. Similarly, in the case of a meme, the more people it reaches the more effective it will be.

In this section, various concepts were discussed relating to increasing the effectiveness of a meme. An experiment was then conducted based on these concepts. **Figure 1**, below shows a summary of the most pertinent issues identified to be tested in the experiment for meme effectiveness. Due to time restrictions, only three of the STEPPS concepts were applied in the experiment carried out in the Twitter platform. Some of the concepts in **Figure 1** are specific to Twitter but have a relatable concept that can be applied to other social networks. For example, a retweet is comparable to a repost of a message and followers can be seen as the number of contacts.

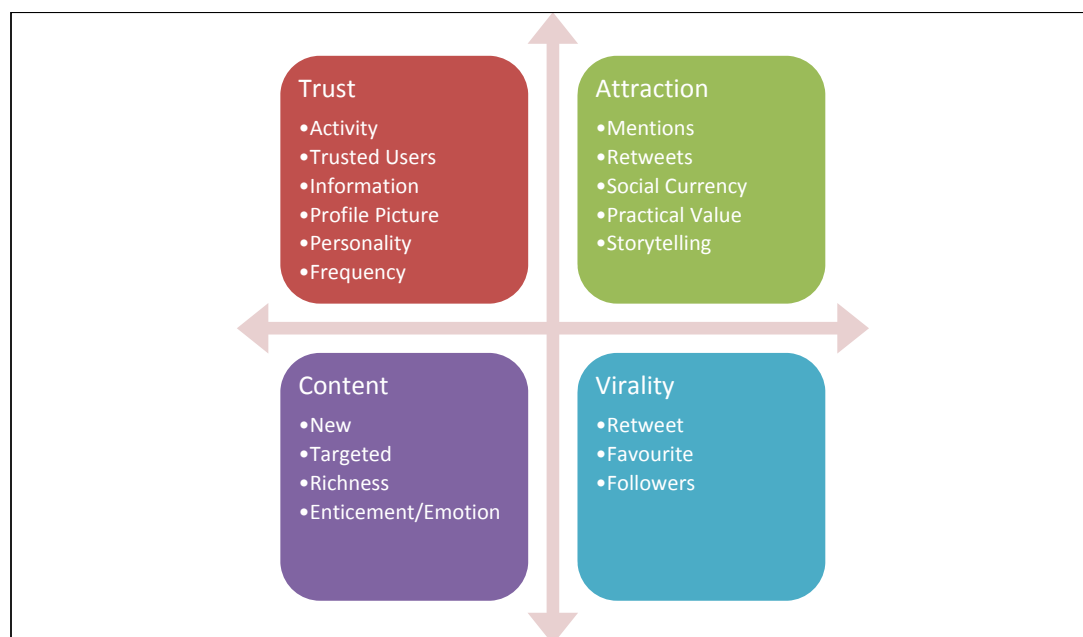


Figure 1: Meme Effectiveness Framework

In the next section, the experiment incorporating the meme effectiveness framework is discussed.

Experiment Design and Implementation

This experiment utilised an ‘A/B testing’ approach. With this approach, the tests could determine the effect of specific concepts in the framework. In order to determine the effectiveness of memes, the accounts needed to be established and a mechanism devised to collect the data. Twitter was selected due its popularity and convenience of message posting. Twitter is a broadcasting platform and thus messages can easily be viewed by the public. Messages in Twitter are referred to as tweets and have a maximum of 140 characters. Furthermore, Twitter has an Application Program Interface (API) through which developers can access tweet data.

For the experiment, two Twitter accounts were created, namely ‘supr3m3travel’ and ‘jillhilljackson’. One account was geared toward users who enjoyed travelling while the other account did not target any specific audience. On both accounts, trust was established by personalising the account with a profile picture, by using regular interaction, by including information about activities, and by finding other trusted contacts. The creation of trust on the account strived to create credibility and to help make future memes more effective.

On the development side, an account was created for each of the two users to access the Twitter API (Twitter.com 2014). Since ‘supr3m3travel’ cannot access the data of ‘jillhilljackson’, the development account would provide the capability to extract relevant data for each account. The method ‘Get status/retweets/ids’ lists the users who retweeted a message from a specific user.

For the data collection, a system was programmatically developed to connect weekly and to extract the tweet data via the API. This would allow sufficient time for the meme to spread. In this experiment, the data collected was the creation data, identification number for the tweet (ID), the number of retweets, the number of favourites, and the number of followers per tweet. In the context of this research, the ID was a unique number used as an input to determine which users had retweeted a tweet. Therefore, this could only be carried out if the number of retweets was greater than zero. Three metrics were used to assess the effectiveness of the meme: number of retweets, number of favourites, and the growth in followers.

Figure 2, below, contains the A/B testing strategy for the experiments. It shows the high-level strategy that was used in the different time periods of data collection. The memes were designed using the concepts shown in the Meme Effectiveness Framework (**Figure 1**). Twitter has a 140 character limit and therefore designing memes within this character limit while incorporating concepts like storytelling, practicality, social currency, and request for retweets posed a challenge. The concepts from the framework were therefore applied as far as possible considering the platform constraints.

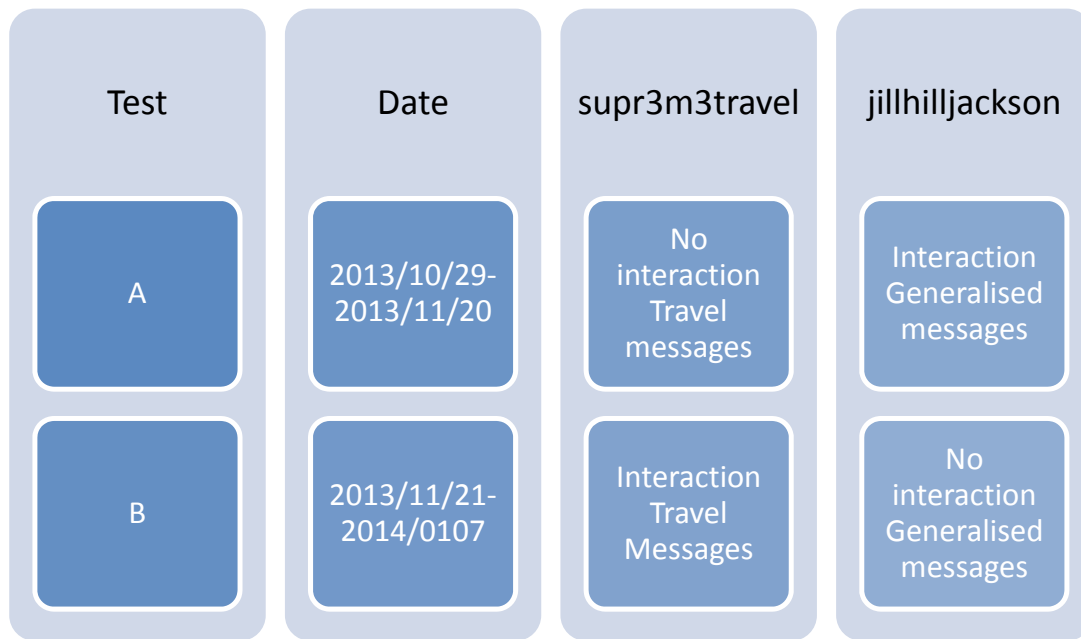


Figure 2: A/B Testing Setup

The initial test (Test A) commenced on 29 October 2013 and ended on 20 November 2013. During this collection period, interaction (replying) on the ‘jillhilljackson’ was carried out, as well as posting of generalised messages. On the ‘supr3m3travel’ account, no interaction was carried out in the A test. Memes related to travelling were posted on the ‘supr3m3travel’ account.

The second test (Test B) started on 21 November 2013 and concluded on 7 January 2013. In the B test, the strategies for the two accounts with respect to interaction was exchanged. The ‘supr3m3travel’ account now interacted with contacts and followed others back. On the ‘jillhilljackson’ account interaction was stopped.

Data Results

After running the experiment during the specified time periods, the growth in followers was measured (shown in **Figure 3**, below). **Figure 3** shows that the number of followers on the ‘supr3m3travel’ account strongly increased during the B test, which included frequent interaction and following of contacts. The changing of the strategy during the B test had a strong impact on the increase of followers. During the A test on the ‘jillhilljackson’ account, even though interaction was carried out, the number of followers only increased slightly.

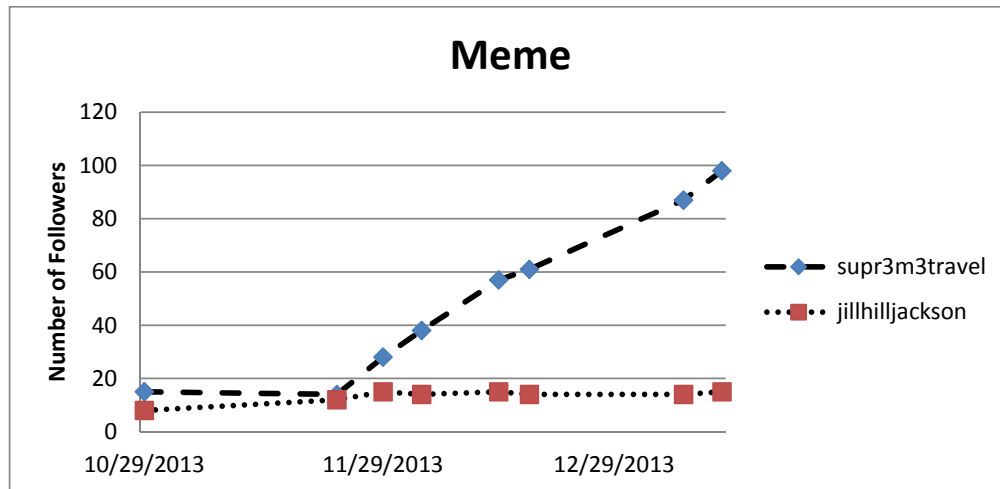


Figure 3: Growth in Number of Followers

Retweets and favourites received a low number of responses on the ‘jillhilljackson’ account (see **Figure 4**, below). However, the number of favourites and retweets on the ‘supr3m3travel’ account (see **Figure 5**, below) increased during the B phase of testing. The contributing factor was the increased frequent interaction and the following of other users. This finding shows the value of influence of users on Twitter. While the number of favourites and retweets was small on both accounts, the ‘supr3m3travel’ account did show an increase as the number of followers grew. This indicates that the memes posted on the ‘supr3m3travel’ account were found to be interesting by the contacts within this network. In the initial phase, Test A, not many new contacts were established and due to the results from the B test, this indicates the impediment to have the messages viewed and shared. During the B test, contacts on the ‘supr3m3travel’ account were increased through interaction and growing followers. Followers in turn reciprocated and responded to messages.

Initially, since the number of followers on both accounts was very low, the number of retweets and favourites was also very low. However, as the number of followers on the ‘supr3m3travel’ account increased steadily, followers became interested in comments posted and thus tweeted and favoured more comments. Reciprocating comments, showing one’s personality, and regularly interacting with contacts can generate interest to follow a contact back. Growth in one’s contacts can thereafter help with the spreading of a meme as the message becomes more public.

The results from the experiment were shown graphically, but further work was carried out to depict the results in a more dynamic manner. The discussion moves on to an implementation of improved visualisation of the results.

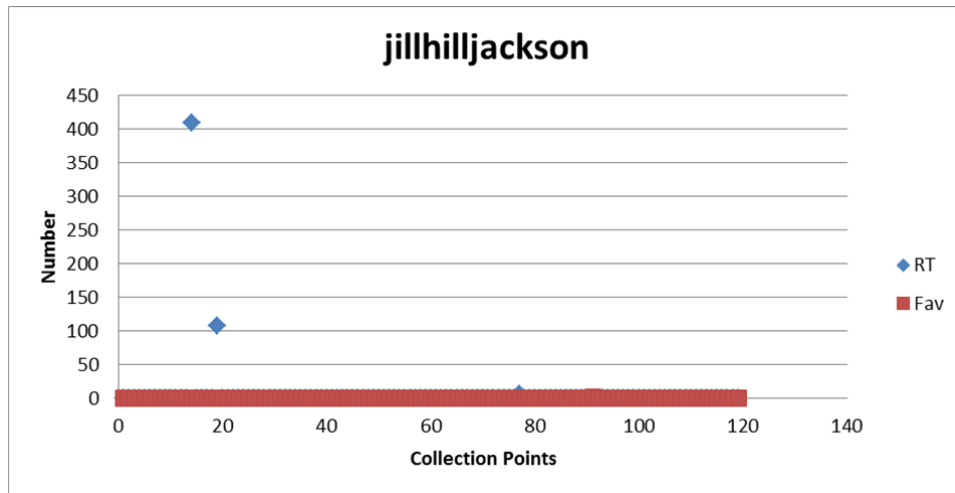


Figure 4: Number of Retweets and Favourites on jillhilljackson

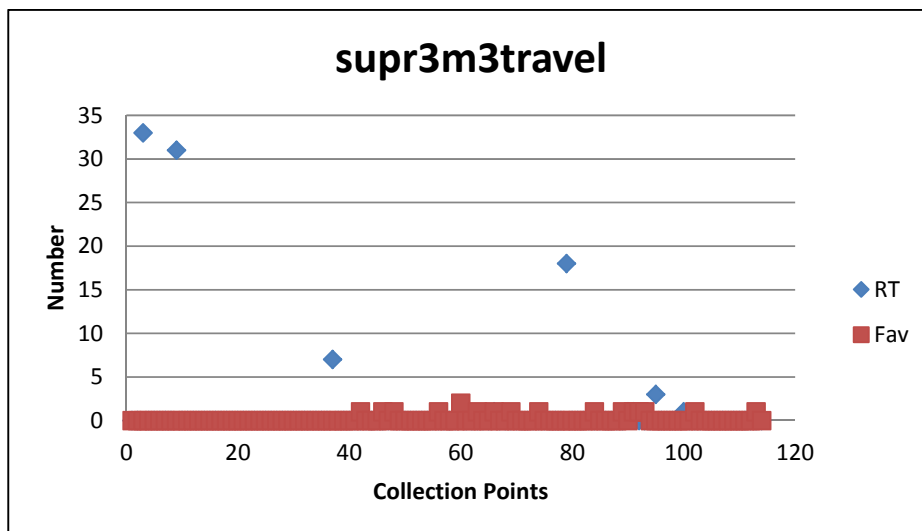


Figure 5: Number of Retweets and Favourites on supr3m3travel

Visualization

The use of information visualization provides a richer mechanism to analyse and to explore data. A comparison of free visualization tools within the domain of network security highlighted that the use of visualization could improve the identification of nefarious activities more effectively than the use of textual reporting (Abbott-McCune *et al.* 2008). The following section describes the use of information visualization together with social network analysis (SNA).

Cook and Holder (2007) describe social network analysis as the study of social interactions between humans. Social networking sites provide platforms which enable people to communicate with each other. Moreover, these platforms also collect and store these interactions. The use of visualization could graphically illustrate the social interactions between entities on social networking sites and subsequently assist in exploring ‘cause and effect’ events. This is demonstrated by Tumasjan *et al.* (2010) who analyzed Twitter data to reveal political sentiment during the German federal election in 2009.

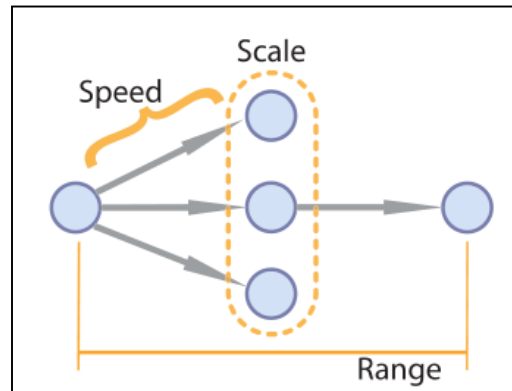


Figure 6: Diffusion Tree {Predicting the Speed}

Yang and Counts (2010) constructed a model that depicts three propagation attributes associated with information diffusion. These three attributes are depicted in **Figure 7**, above. They also found that the tweet itself has more effect on dissemination than the user does. The speed, scale, and the range denote not only how quickly the information will propagate but also how many entities would be exposed. For example, on 2 March 2014, Ellen DeGeneres created a tweet at the Oscars which generated 1 million retweets in just 45 minutes (Prakash 2014) and by 18 March 2014 the retweet count was over 3.4 million (Bubbles.com 2014). It should be noted that Ellen DeGeneres has an extensive following on Twitter, which allows for maximum propagation of a tweet. Normal users of Twitter have substantially fewer followers. Subsequently, the propagation time allowed for each posted tweet is seven days.

The tweet data was collected for analysis and the results were subsequently visualised. The data from the database was used by a web application to visualise the tweets. The original tweets were posted and data was collected after a period of time elapsed. This strategy ensured the tweets had sufficient time to propagate on the Twitter platform. In other words, the effectiveness of a tweet decreases with time but users might find the tweet still has value after a certain period of time has elapsed. The number of retweets, favourites, and followers were extracted from the database to determine the effectiveness of the meme with regards to the scale and range attributes--in other words, to determine the path of the tweet and how many users were exposed to the tweet.

The retweet information was used to calculate the path the meme traversed through the social network. Only tweets with a high number of retweets were selected for further analysis. Each of these tweets had to be individually queried to determine which nodes retweeted the tweet. The final data sample only consisted of tweets created by the twitter accounts used during this study. It is important to note that only retweet information can be collected if the tweet originated from the user who is collecting the data. For example if the user 'Jack_and_Jill' created a tweet then only the user 'Jack_and_Jill' would be able to extract the data to show who the other users were who retweeted the tweet. The visualization consists of two functions:

- It can indicate the 'retweet' numbers for the individual tweets. This allows the operator to select the tweet with the higher impact.
- It can illustrate the path of users who 'retweeted' the tweet and also the number of followers for each user (node) in the chain.

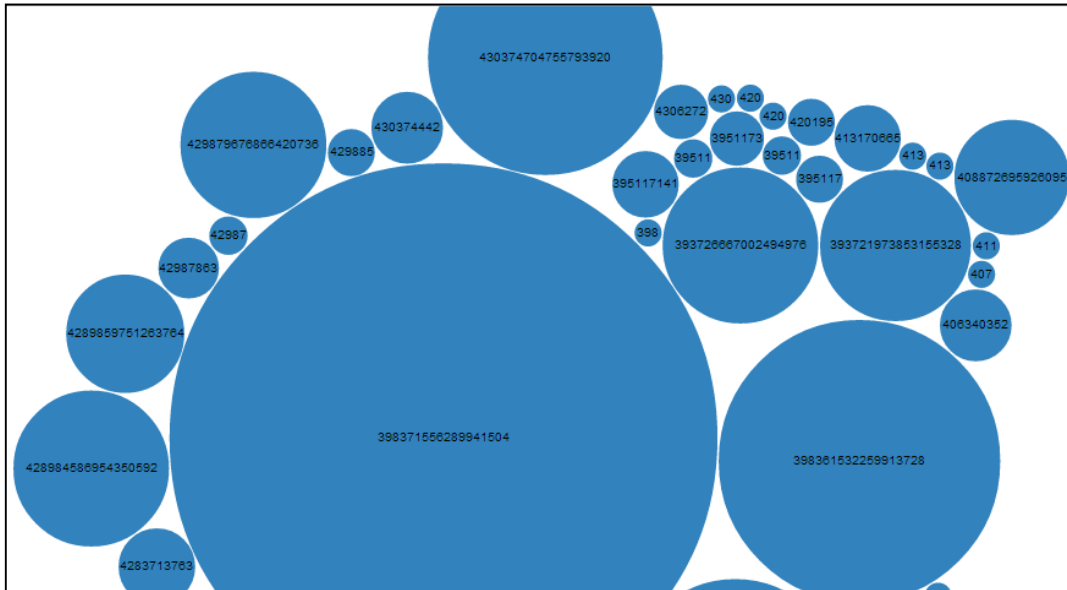


Figure 7: TweetId Visualisation

Figure 7, above, shows the visual representation of each tweet collected. The larger the circle, the higher the number of times the tweet was retweeted. This provides a graphic representation of effective tweets as these were endorsed by users who found the tweet valuable and subsequently shared the tweet with their own network. Typically, in order for a meme to spread, it is important to reach a user with a large number of followers and the effectiveness could be quantified by the number of endorsements received through retweets and favourites. For the visualisation implementation, each tweet is assigned a corresponding unique ID obtained from the Twitter platform. Each tweet created on Twitter is assigned a unique identifier. This data is extracted from the collected data. Thus, in **Figure 7**, the tweet ID is used to determine who all the users were who endorsed the tweet. The use of visualization of the social network also illustrated the location of strong and weak ties (see **Figure 8**, below). Strong ties refer to the closest friends and family and subsequently they are classified as the social network. People who do not form part of the social network of a person are considered weak ties. However, the importance of this particular group is highlighted by Granovetter (1973). Weak ties provide perspectives outside of the social network, which are beneficial in the collection of new information that in turn could be used to benefit the rest of the social network.

Figure 9, below, depicts the transmission of a retweet and thus the spread of a meme. The arrows between nodes show the transmission from different users and thus how the message was dispersed. Python scripts were used to create the graphic visualisation in a web application. The operator can identify a tweet for which to display its path in a social network. Hence, the visualisation tool helps to provide graphic information about which tweets had a strong dissemination impact. This tool therefore helps to visualise the collected data and to show the path of a meme and the strong influence of certain nodes in a social network.

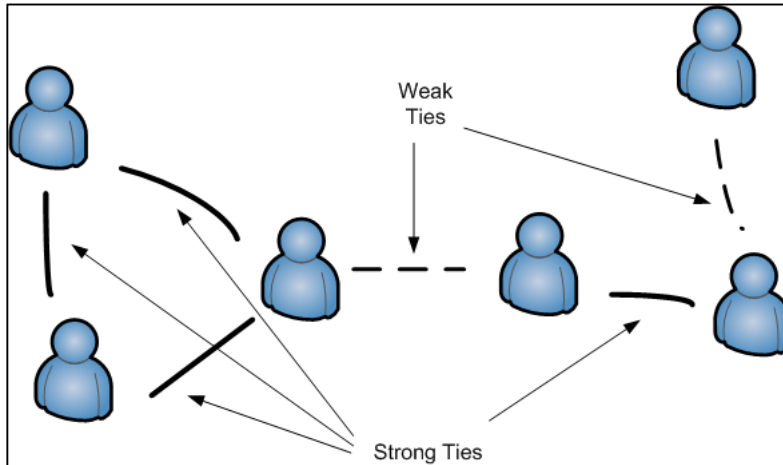


Figure 8: Weak and String Ties

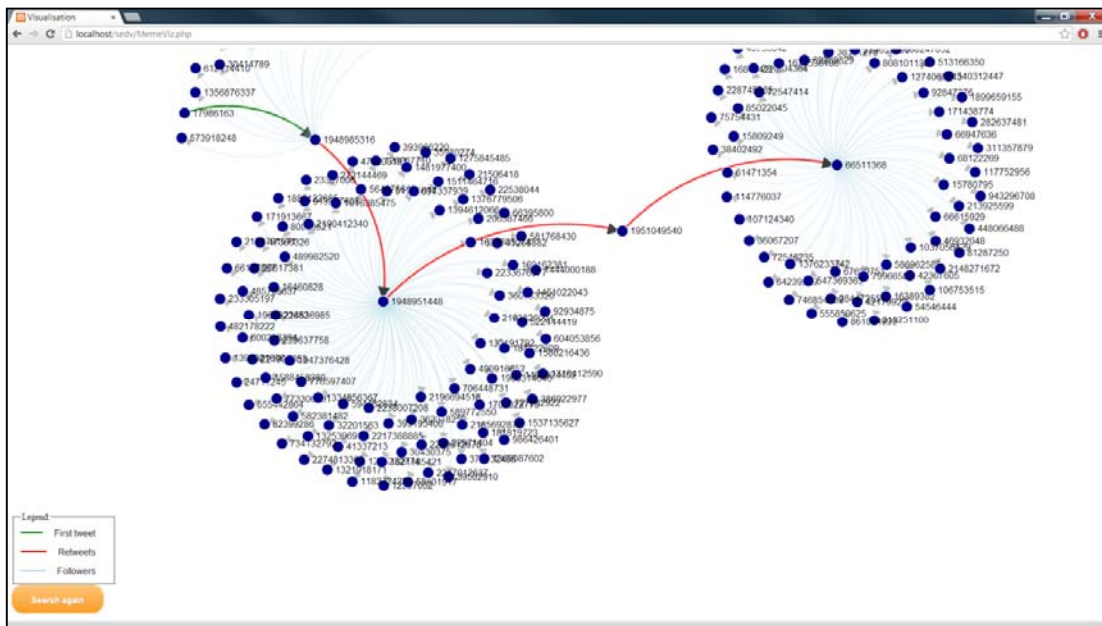


Figure 9: Retweet Visualisation

Next, each node in the propagating path activity is analysed. The identification of nodes that are highly active within a network is important as these nodes could have higher influence than nodes who demonstrate low activity. Nodes which are represented as users on social media sites could have a high following as their tweets could appear more on the Twitter timeline. Subsequently, like-minded users would follow the user. Conversely, users who tweet with less frequency would appear less on the Twitter timeline and subsequently would decrease their visibility that could result in a lower following. Each user identified in the propagating path depicted in **Figure 9** is individually analysed to determine how active he or she is on Twitter. The last 20 tweets for each user were selected and graphically visualised as seen in **Figure 10**, below. Mendoza (2010) conducted a study on the use of Twitter during an earthquake in Chile and one of the findings showed the average number of tweets created per user was 6.59. Also in 2009, Zarrella (2009) reported the average number of tweets per user per day was measures at 4.422. Therefore, analysing the last 20 tweets could indicate users who are more active than others. As seen in **Figure 10**, only one user (17986163)

demonstrates high activity and this is reflected by the high concentration of tweets per day. In other words, the graph shows high number of tweets for consecutive days. In contrast, user 66511368's last 20 tweets are spread over a period of time. This demonstrates this user is not very active but does use the platform regularly.

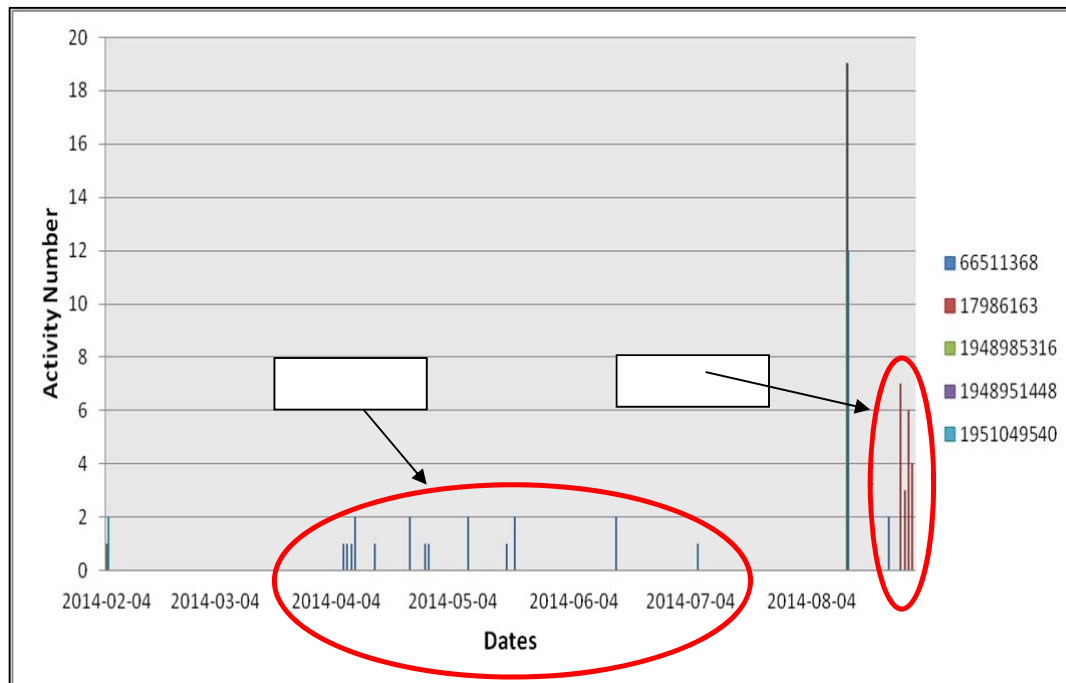


Figure 10: User Activity

The analysis of the user activity has identified key nodes within the network which have not only demonstrated high usage of Twitter but which have also shown regular use. Adding these nodes to a social network could increase the potential for tweet propagation.

Conclusion

This study explained the various ways of attracting attention to a meme and also having it spread. Memes could potentially be used to create narrative networks which create influence on behaviour and opinions. To generate interest in a meme, the principles of Social Currency, Triggers, Emotion, Practical Value, Public, and Stories can be used. However, in order for a meme to spread, it is essential to have a large enough target audience to propagate it to. Not only should a meme attract attention from its content, but it also needs to be posted in a sufficiently large forum to attract attention. This paper shows that to increase the probability of going viral, a social networking account from which a meme is to be spread needs to apply additional principles like Credibility (Trusted Users), Publicity (Increased users), Frequency, Interaction, Reciprocation, and Personality. This will help create trust and grow the audience so that a meme spreads. Essentially, by becoming more public, there is greater chance that a meme can spread. The significance of an influential node should be taken into consideration. Messages transmitted from nodes with a strong influence (large number of followers, frequent interaction, and influence) have the potential to become successful memes. Furthermore, the visualisation of meme propagation and social network nodes can help analyse the path traversed as well as the identification of influential nodes in a social network.

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