White Paper

Social Media reactions analysis on Windows10 Operating Systems Upgrade

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Introduction

On July 29, 2015, Microsoft launched Windows 10 Operating System as an upgrade to their existing operating system. Windows 10 was offered as a free update to many users of Windows 7 and 8. In the past, Microsoft had a mixed track record with its major Windows OS releases, so people are curious about the feedback on Windows 10. We expect Windows 10 should be an upgraded version to Windows 8 what Windows 7 was to Windows Vista - a more polished, more stable and more successful system blended with features from its unbeloved predecessor (Richter, 2015). Windows 10 upgrade has attracted much attention over various social media platforms such as Twitter, Facebook, news articles, blogs, etc. Windows 10 received positive reviews upon its release on July 29, 2015, mostly for its decision to remove the user interface mechanics introduced by windows 8 in non-touch environments. However, criticism for Windows 10 began immediately after with some of the notable issues popping up as operating system restricted users from taking control of major operations like the automatic updates and transmission of data over cloud, users prompted with non-comprehensible error messages, graphics and DVD driver failures, system crashes during installation, frequent reboots, etc. This analysis focuses mainly on such reactions shown by consumers through Twitter, a social media platform. The discussions are directed towards how such reactions acted as immediate and useful feedback to resolve some of these issues and the analysis also touches upon the impact on consumers' decision making based on these reactions.

Background

The scope of this paper is limited to analysis of social media reactions on Twitter using hashtags which we thought were relevant to Windows 10 OS upgrade. Primary focus was on analyzing the recent Windows 10 operating system software release by Microsoft Corporation to answer the proposed research questions given below. As social media communities grow day-by-day, reactions on such media becomes highly visible and the emotions shared have started to gain immense value to the Organizations about their products. Twitter is one such media that is gaining a lot of attention in this regards and a number of researches have surfaced to correlate people reactions with their decision making like purchasing stocks, buying a brand's product, etc., based on tweets.

Literature Review

The literature review related to this paper was done by performing search on various related topics based on social media, social media as a monitoring tool, role of social media, sentiment analysis, social media and performance management, content analysis, customer relationship, brand marketing, stock market and social media, etc., on databases like Google scholar, academia.edu. Our research on the related work involved mix of different social media platforms like - Twitter, Facebook, YouTube, Blogs, News articles, etc.

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Asur and Huberman (2010) used Twitter to forecast box-office revenues of movies. They showed that a simple model built from the rate at which tweets are created about particular topics could outperform market-based predictors. Tumasjan et al. (2010) analyzed Twitter messages mentioning parties and politicians prior to the German federal election 2009 and found that the mere number of tweets reflects voter preferences and comes close to traditional election polls. In their research, Gilbert and Karahalios (2010) looked up over 20 million posts from the LiveJournal website to create an index of the US national mood, which they call the Anxiety Index. They found that when this index rose sharply, the S&P 500 ended the day marginally lower than is expected. This reveals to us that depending on reactions on social media, people's decision gets affected about buying or selling of stocks.

Zhang et al (2011), in their research, have correlated posts about a stock on Yahoo!Finance and Motley's Fool with the actual stock price, predicting the closing price of the stock of the next day based on what people say today on Yahoo!Finance, on the Web and Blogs about a stock title (Gloor et al. 2009). In the paper, they have described about their early work trying to predict stock market indicators such as Dow Jones, NASDAQ and S&P 500 by analyzing Twitter posts. They found that emotional tweet percentage significantly negatively correlated with Dow Jones, NASDAQ and S&P 500, but displayed significant positive correlation to VIX. It therefore seems that just checking on twitter for emotional outbursts of any kind gives a predictor of how the stock market will be doing the next day.

Hailiang et al (2011) in their study to examine the effect of an emerging new media on financial markets provides evidence that sentiment revealed through Seeking Alpha, a popular social-media platform has a larger and longer-lasting impact on stock returns than views expressed in the Wall Street Journal. Their research, however, does not allow to infer whether sentiment revealed in social media contains actual value-relevant news about a firm or whether investors react to spurious publicity.

Bollen et al (2011), in their research, investigate whether measurements of collective mood states derived from large-scale Twitter feeds are correlated to the value of the Dow Jones Industrial Average (DJIA) over time. Behavioral economics tells us that emotions can profoundly affect individual behavior and decision-making. They analyzed the text content of daily Twitter feeds by two mood tracking tools, namely OpinionFinder that measures positive vs. negative mood and Google-Profile of Mood States (GPOMS) that measures mood in terms of 6 dimensions (Calm, Alert, Sure, Vital, Kind, and Happy). They found an accuracy of 86.7% in predicting the daily up and down changes in the closing values of the DJIA and a reduction of the Mean Average Percentage Error (MAPE) by more than 6%. These studies indicate that social media has a telling effect on consumers' decision making activities and these reactions could be used by Organizations to better enhance their business.

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Research Questions

- How does consumer reactions on social media act as immediate and useful feedback to an Organization's product release?
- How can social media reactions influence consumer's decision making abilities like upgrading a software, purchasing a stock of an Organization after a product release?

Methods and Procedures

Data Collection:

The data was collected using NodeXL, topsy.com, netlytic.org, social networks and text analyzer tools using hashtags like '#windows10', '#windows10 awesome', '#windows10fail', '#windowsinsider', '#somethinghappened', '#windows10 nasdaq' and official accounts such as @Windows, @Microsoft etc.

Structural Analysis:

On analyzing the gathered data from Twitter and after loading the same to Gephi, the nodes were classified into communities based on their tweets, Location, type of business involved with, type of groups, etc. We extracted the location data using the NodeXL functionality, once the data was extracted from the twitter we configured the data into .CSV file where the vertices/nodes where mapped with the location of the tweet. This dataset was imported into an online analytic tool 'Cartodb.com' which processed the data and configured the location column in such a way that the data is indicated on the map. The tool provides multiple ways to highlight or annotate the data out of which 'Heat map' is being used to showcase the location factor for the structural analysis.

Content Analysis:

Analyzing trend maps of Hashtags: We analyzed the trends of twitter hashtags '#windows10 awesome', '#windows10fail', '#somethinghappened' using topsy.com analytic tool. By combining the trend maps for '#windows10 awesome' and '#windows10fail', we were able to find a pattern of tweets and helped us understand how consumers felt about the upgrade. Using this pattern, we were able to perform content analysis on certain tweets that included these hashtags which were crucial to our findings.

Sentiment analysis/ Text analysis: This was done with the help of an online social network analysis tool 'Netlytic.org'. The data was imported in to the tool directly by keying in the relevant hashtags '#windows10 awesome', '#windows10fail', '#windows10' and choosing twitter as the media to download from. Once the data was loaded into the tool, the sentiment analysis of the tweets was done on a per-Tweet basis where words extracted from the tweets where classified into categories like - appearance, feelings (good), feelings (bad), quantity, shape, size, sound, taste, time and touch. These categories were formed based on the set of common phrases that we could expect in the '140 characters' limited tweets. Once the dataset was imported into Netlytic.org, it processed the tweets to capture phrases and classifying those into different categories.

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Social Media effect on Stock market: Content analysis was also performed for '#windows10 nasdaq' to find if the social media reactions have any implications on stock market prices for the organizations involved. Focus was mainly on to find out if the tweets using these hashtags are propagating messages that will impact consumers' decision making to purchase stocks of Microsoft.

Structural Analysis for Windows10 Upgrade

Results and findings:

The graphs shown below are the results obtained from Gephi for structural analysis, heat map for location based structural analysis from Cartodb.com, trend maps for tweets from Topsy.com, Tree maps for sentiment analysis from Netyltic.org. These visualizations are discussed in detail under the Discussions section.
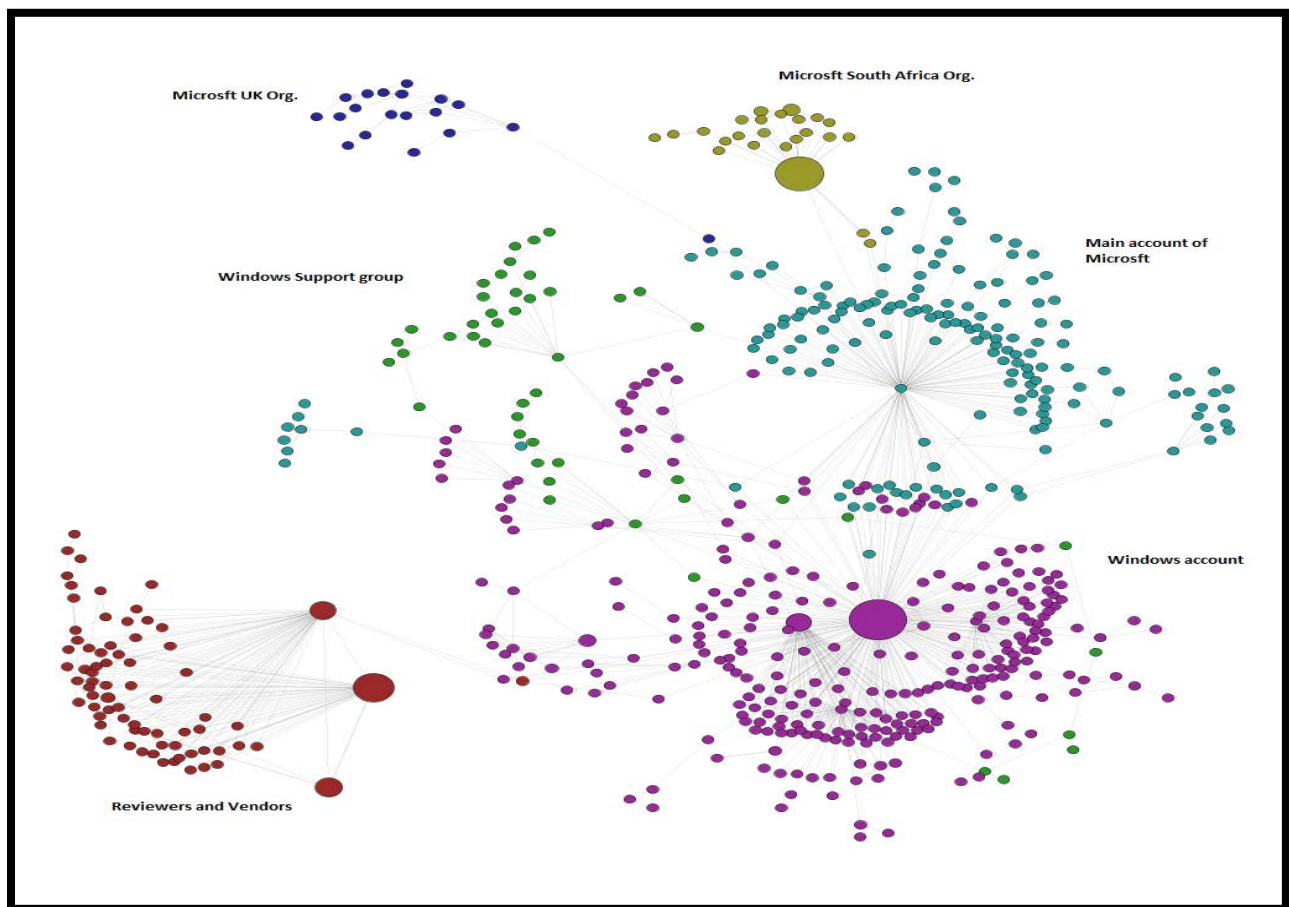

Figure: 1: Graph showing nodes and edges for tweets using hashtag #windows10

The below graph shows the location from where tweets got generated for hashtag '#windows10' between 07/26/2015 - 08/09/2015 in the form of a heat map. The darker shade represents the location having intense twitter activity when compared to locations having light shade. The heat map is spread over all the continents, which shows Europe with intense twitter activity amongst other continents.
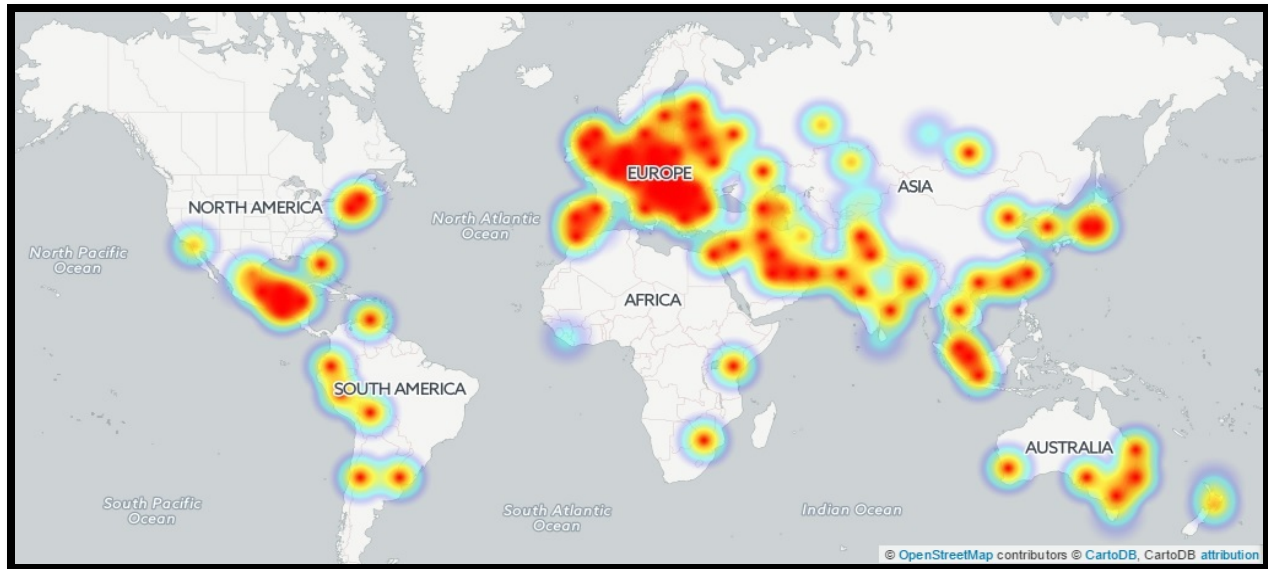
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Figure: 2: Heat map from Cartodb.com for hashtag '#windows10'

Discussion:

Network Visualization:

From figure 1 above, the network structure consists of 6 communities, with each community forming a cluster of nodes. These clusters have been formed considering different structural characteristics of nodes in the network. As you can see clusters of pink nodes towards the bottom of the graph which constitutes of more than 40% of nodes from the network, represents the pattern of tweets and re-tweets for Windows10 upgrade. In the cluster, @windows node has the highest betweenness centrality as they have been tagged in posts by other nodes forming the cluster. We can see a loop back edge on the windows node as windows must have re-tweeted its own tweets. Thus leading to a higher centrality value among the other nodes within the cluster.

The cluster highlighted in green towards the left of graph represent nodes which have tweeted the support center of windows as well as the windows insider account which handles user queries as well as feedback from the customers. This cluster also involves many tweets that highlighted issues after the OS upgrade to the twitter accounts @windowssupport and @windowsinsider. After analyzing further, most of the edges have been formed due to re-tweet of the solutions that are shared by support accounts as well as the @windows account.

Next is the cluster in Olive green color at the top which represents the Microsoft office of South Africa. Many other nodes in the cluster are employees associated with @microsoftsa who have tweeted about the upgrade event. It also includes the general public who have shared their reactions or have tweeted and re-tweeted about '#windows10' and 'microsoftsa' in their tweets. The Olive green and the light blue cluster are connected to each other via a bridge formed by @microsftsa and Microsoft node.

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These two nodes also form a hub in their own cluster being the most connected nodes in the network.

The red cluster in the bottom which is connected to other part of the network via a single node @marioarmstrong, a famous Emmy award winning radio and television talk show host, focusing on the areas of technology and digital lifestyle, forms a bridge to the rest of the network. Similarly, other nodes forming the cluster are accounted by various media websites that publish reviews, news, articles, and podcasts on technology and consumer electronics. Many nodes in this cluster mention the different vendors of Microsoft like-Dell, Lenovo, Acer, etc. These vendors are strongly associated with Microsoft/ Windows as various Microsoft products are used to configure their devices. This cluster is the most strongly connected compared to other clusters in the network, as the weight of edges has high value forming a connectedness within the cluster. Nodes in this cluster have formed a second-degree Egocentric network around the big nodes having the higher value of betweenness centrality.

Next is the cluster highlighted in blue, with the node @microsoft with highest Degree centrality value and even forming a bridge to other clusters in the network. Betweenness Centrality value for this node is low as you can see from the graph it just forms dyad connection with other nodes in the cluster and the maximum edges are directed towards it and not directed away from it. One possibility could be that other nodes in the network have tweeted about Microsoft or retweeted tweets on Microsoft account and Microsoft has not replied to any of its tweets forming one-directional edge inwards.

We were able to find a small cluster (almost a clique) highlighted in dark blue in the graph. After further analysis of each individual nodes, it was quite evident that those nodes were part of an organization line @microsoftuk. The nodes in the clique had tweeted about the upgrade event of '#windows10' and what can UK customers expect from the upgrade.

Location based visualization - Heat Map:

From figure 2 above, based on the overall distribution, maximum twitter activity was from the European, Middle East and the South-East Asian countries as people in these countries shared reaction on the social network. This pattern of heat map states that Windows operating system is widely used in these countries when compared to North America, where other operating systems such as Mac iOS, Linux, etc. are preferred over Windows. USA (North America), being the home of Apple, it is not surprising that not much activity was experienced over the social media for Windows10 upgrade in this continent (Chan, 2011). Moreover, the number of hits received by tracking websites on the internet sees an overwhelming increase in the traffic received from Windows-based machines from European and Asian countries in comparison OS X and Linux (Bott, 2013). However, in the case of mobile devices, Windows phone do lack market share over Android and iOS devices in these countries (Tech Blog, 2010). Hence, it could be a possibility that these reactions are shared based on the upgrade of the desktop version of Windows 10.

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**Content Analysis for Windows10 Upgrade**

Results and Findings:

The below visualization (figure 3) shows the trend map for hashtag '#somethinghappened' between 07/21 - 08/20. This shows that the number of tweets for that # were more during the early days of software release and decreased gradually.
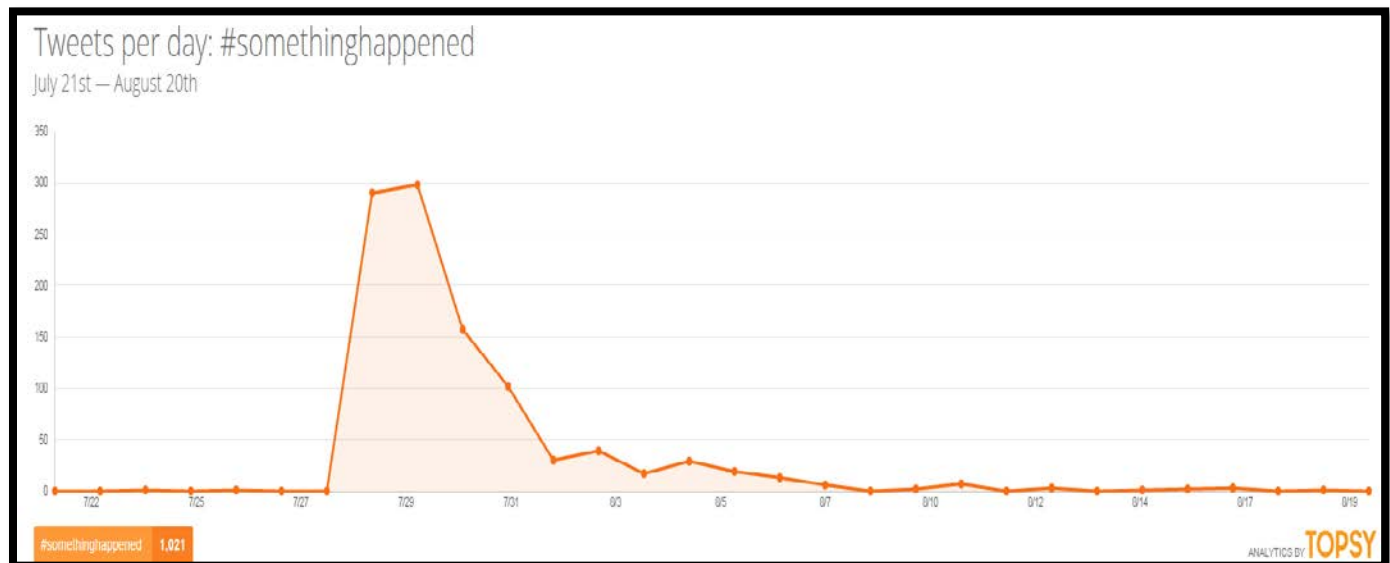
Courtesy: www.topsy.com
Figure: 3: Trend map from Topsy.com for hashtag '#somethinghappened'
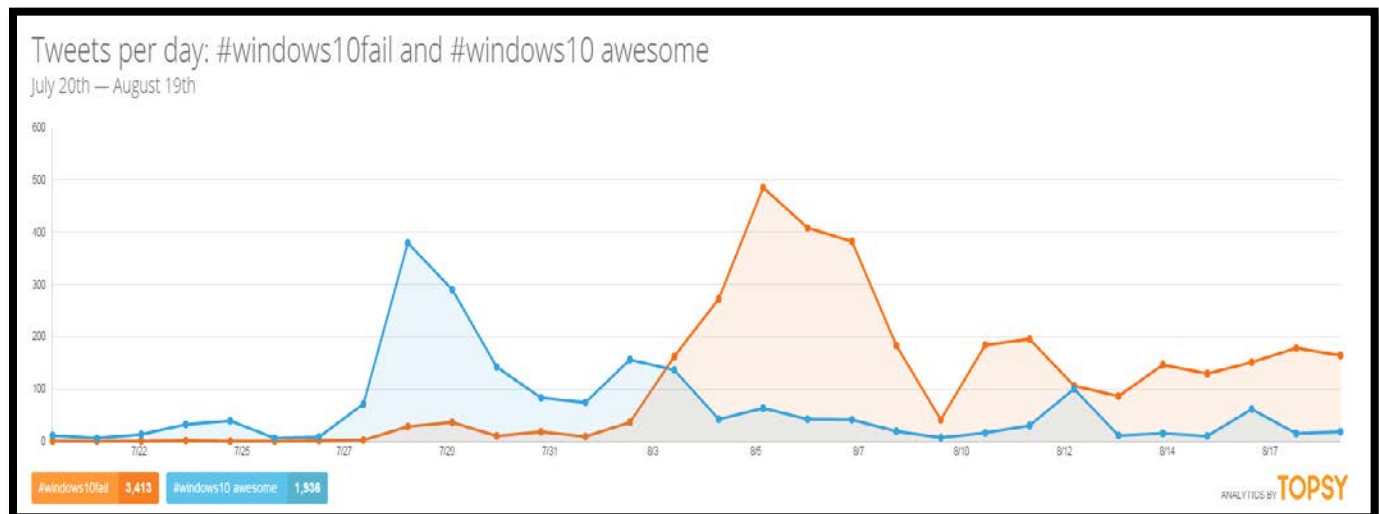
Courtesy: www.topsy.com
 Figure: 4: Trend map for hashtags '#windows10 awesome' and '#windows10fail'

The above visualization (figure 4) shows the trend maps for '#windows10 awesome' and '#windows10fail' between the dates 07/20 to 08/19. The graph shows us that during the

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early days of software release, '#windows10 awesome' was tweeted more than '#windows10fail' and gradually the trend reversed. In the following pictures obtained from netyltic.org website upon analyzing the twitter dataset for hashtags '#windows10', '#windows10 awesome', '#windows10fail', the graphs show the sentiment analysis based on the text used in the tweets. The pictures are visualized as "Treemap" graph where netyltic.org's keyword extractor mines words and phrases to represent broader concepts such as positive vs negative words. The below Treemap graph (figure 5) for hashtag '#windows10 awesome' shows that the words extracted from the tweets where aggregated into the categories and it is evident from the graph that feelings (good) displaying the bigger rectangle compared to other branches in the Treemap. Treemap graph (figure 6) for hashtag '#windows10fail' displays the hierarchical structure with feelings (bad) towards the left and a tiny rectangle with category shape towards the extreme right. Treemap graph (figure 7) shares the overall sentiments of the reactions shown on twitter by the consumers, reviewers, vendors, Microsoft, etc. with feelings (bad) being the bigger branch in the hierarchy of this map.
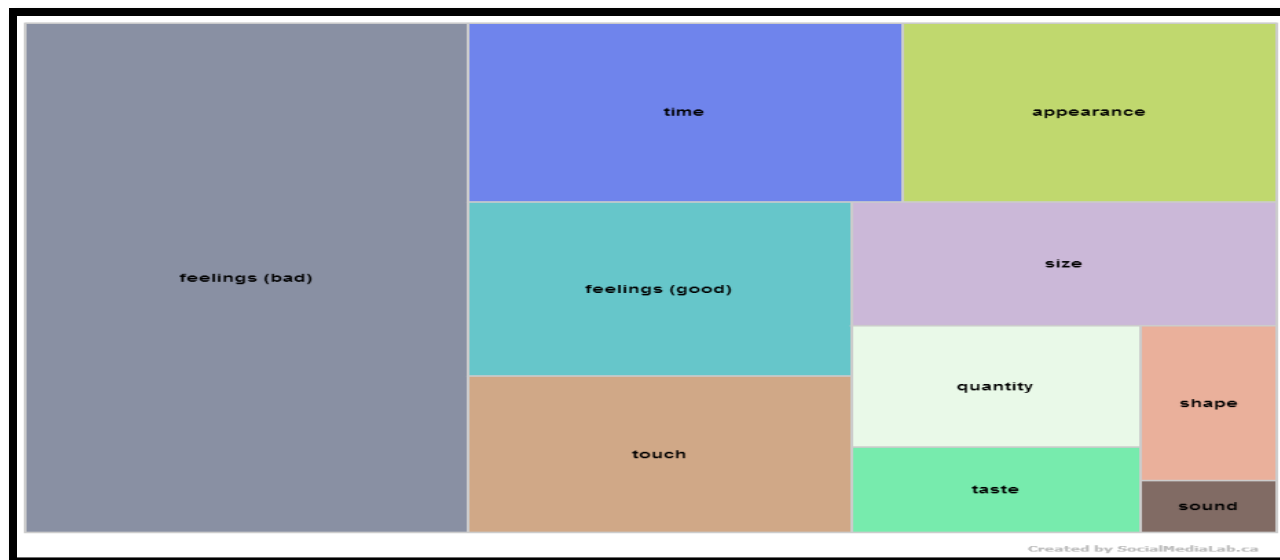

Courtesy: www.netyltic.org

Figure: 5: Sentiment analysis of text in tweets about '#windows10 awesome'
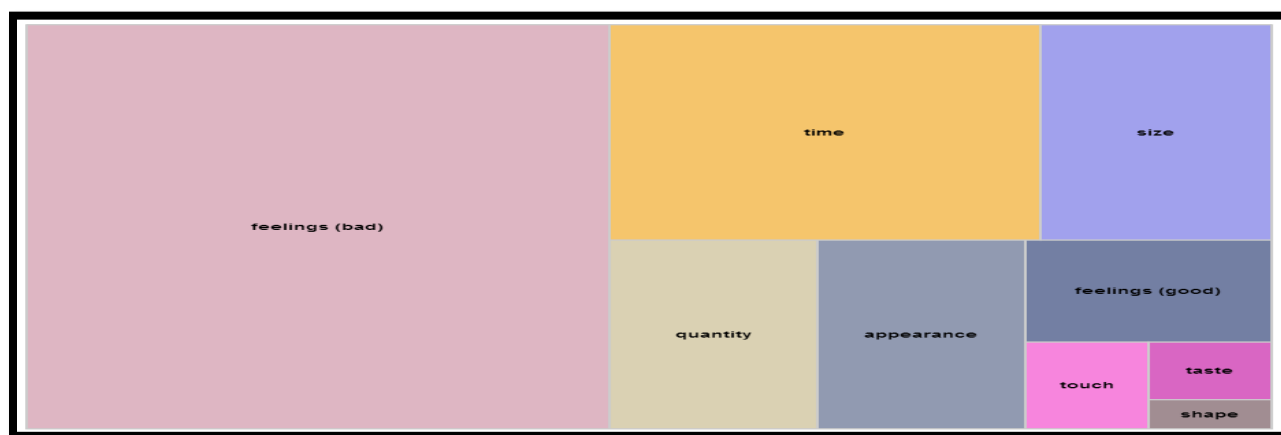
Courtesy: www.netyltic.org

Figure: 6: Sentiment analysis of text used in tweets about '#windows10fail'

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Courtesy: www.netyltic.org

Figure: 7: Sentiment analysis of text used in tweets about '#windows10'

Discussion:

Trend maps (figure 3 & 4) show us that during the early days of Windows 10 OS upgrade was launched, people tweeted about how awesome the product was. This was evident from the graph which showed spikes between 07/27 - 07/31, however, after 08/01, the tweets decreased drastically, on the other hand, tweets about fail started to surface and gradually increases through 08/05. We could also see that there were decreasing slopes after 08/05 until 08/07, again the tweets being to increase following a heartbeat pattern.

Upon analyzing the tweets, it was found that when consumers tweet '#windows10fail' with an associated problem like graphics driver failure, frequent reboots, bad error messages, bad response time, installation issues, these messages are reverted back by solutions from Microsoft support groups or by other technology experts on the same day or sooner, hence, the consumers were able to receive solution to their problems quickly, resulting in less tweets with this hashtag. However, when a new problem shows up with the install, consumers start tweeting back again with the fail hashtag, which is duly noted by the support and experts giving their resolutions in turn. This pattern is what we see as trend map with consumers tweeting their problems, gets resolution, and tweets about new problem again and so on. And as we go from 07/29 - 08/19, though the fail hashtags follow a heartbeat pattern, we see that the number of tweets for each spike gets reduced chronologically. This pattern tells us that the tweets from consumers over social media act as an effective feedback to Organization to work on their product issues and respond back to consumers with the resolution. While doing so, not just the Organization is able to help, like in a conventional support method, where consumer calls or mails the Organization's support group and waits for a resolution, in this case, there were people outside of the Organization like technology experts, experienced workers on the platform pitched in to help the consumers. As this give and take policy becomes a win-win

situation, we could see the tweets coming down in a day or two for that particular issue until a new issue pops up. Eventually, we believe this trend to flat line sooner with no tweets with fail hashtag. If that happens, with just by using social media reactions, an Organization can effectively solve problems raised by consumers without comprising a lot of time and manpower.

Another example to prove this as seen in this upgrade activity was that there was an early outbreak which went viral about a non-comprehensive error message '#somethinghappened' (figure 4) prompted while installation. This was highly tweeted between 07/28 - 07/29, Microsoft took note of this viral tweet and worked on it immediately to fix this issue and resolved it, resulting in less tweet after 07/31. This clearly shows the tweets helped the Organization, if it was any other conventional method, it may have taken a few days to understand the magnitude of this issue and provide a fix. In addition, immediately after the issue was tweeted, there were a number of technology expert sites that published ways to fix this issue and started to tweet links to resolve this.

The tweets on '#windows10fail' also provided insight into how consumers rate their peer's tweets and decide based on what they have tweeted. There was a tweet as shown below:
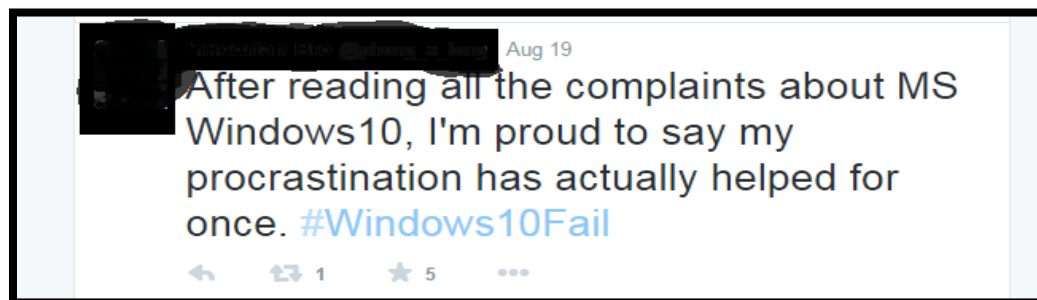
Courtesy: www.twitter.com

As seen above this person has seen the tweets about Windows10 Fail and valued the tweets and hence feels good about not installing the software. This shows us that, consumer reactions can influence others on the decisions they make especially if the product is new. From figure 3 we also find an evidence supporting this fact, initially when the software OS was released, consumers or users tweeted heavily about '#windows10 awesome' but when they started to see the issues with the installation and '#windows10fail' was getting high attention, tweets on 'awesome' got reduced implying indirectly that since there were other consumers tweeting about 'fail', fellow consumers refrained from tweeting 'awesome'. These examples tell us that consumer reactions on social media may have an influencing effect on other consumers in decision making.

Upon this assumption, while doing twitter search and content analysis for '#windows10 nasdaq', we found the below tweet about an article discussing a topic on Microsoft stock market after Windows10 release. The article (Cho, 2015) cautions readers about investing on Microsoft based on their new OS release. It says that there were a number of issues raised from software installation and this could mean that the stock prices may

take a hit. This article could have a telling effect on the consumers who comes across this on social media like twitter and influence their decision to purchase stocks of Microsoft in the near future. This would cloud their decision and make them think wary about investing with Microsoft. This instance definitely shows that the content shared on social medial like twitter may have a considerable influence on consumers' decision making abilities.

Courtesy: www.twitter.com

Sentiment/Text analysis to capture sentiments from the Twitter reactions shared by users was performed on the hashtags, '#windows10 awesome' for the positive aspects, '#windows10Fail' for the negative and '#windows10' to analyze the overall reactions shared socially. From figure 3 & 5, the initial sudden reaction was positive. People described the upgrade in various positive words such as fast OS, great, good, luck, etc. This initial reaction could be positive as, Windows10 was made free for an upgrade to Windows 7 and Window 8 users. Additionally, way before the upgrade for the past one year, Microsoft was promoting the new Windows10 OS, which kept the consumers anxious about it. Moreover, enhancements to the UI/UX added more fuel to users' curiosity, as the new OS had the traditional 'Start Menu' back, similar to what it had for 'Windows 7', which is still the top Operating System favored over more than 190 countries (Bott, 2013). Additionally, the upgrade saw Internet Explorer being replaced with the new 'Microsoft Edge'.

After the initial positive ratings for the Windows10 upgrade, there was a steep decline in the admiration rate by the users who after the upgrade started analyzing and using internal functionalities of the new OS system. However, initially users faced the issue with the '#somethinghappened' error, as already seen above. This increased the heat amongst the users which was reacted socially by using phrases like – bad, annoyed, tired, funny, etc. However, this issue did not last long as Microsoft dev team quickly reacted to these feedbacks provided by users which helped in solving the issue. But the heated reactions did not stop here, surfacing back again with another hashtag '#windows10fail', users with low-level configurations were affected by slow processing time. For few, the device got heated up as Windows10 consumed more bandwidth than its lower OS version. Many users even requested windows support to help them downgrade to their old OS configuration, as they were scared of losing their saved data from the system if their hardware gets corrupted. Hence, we could even see from the scattered plot there was a

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gradual increase in the number of tweets received for '#windows10fail' on the social media.

Considering all the scenarios through which Windows10 upgrade has been, it did not have a smooth transition from the old Windows 8/8.1 OS to Windows10. However, the timely feedback shared on social media by the consumers helped @windowsinsider and @windows support react quickly and in a timely manner to help and solve issues faced during and post upgrade, which has helped them reduce the negative reactions on the social media.

Limitations and future work

There are several limitations to the work presented in this paper. For example, with respect to twitter data, spam accounts on social media and fake accounts could be a major issue in getting the appropriate data. The data which we extracted into NodeXL is limited to only 2 weeks prior to the date of capture. So we could not gather data or the reactions shared in the past before the upgrade. Sentiment/Text analysis performed on Netlytic.org had some limitations in the manner it was mining words from the tweets. It considered individual words to be present in the tweet to classify it under each category, however the original intention of the word mentioned in the tweet was exactly opposite, which could be understood only if the entire sentence was manipulated. Most of these were because the users had commented sarcastically including certain key words which sounded like feeling good but they were actually conveying something bad and vice versa. Also, this paper does not show any quantifiable proof about social media reactions having any relations to consumers' decision to purchase stocks of an Organization. We try to provide recommendations based on the trend analysis rather than the factual data. The paper only suggests that reactions shared on social media might have potential to cloud the consumer decisions. Our future work would consider experimenting on the factual data to arrive at impacts on actual stock prices, and also analyzing individual Twitter accounts to better understand additional demographic variables of the analyzed data, such as age, gender, device information, etc.

Conclusion

Based on the structural analysis, we were able to find that the tweets were mostly from countries where Windows OS is primarily used and the reactions were mostly from people involved with the parent Organization Microsoft, in addition to a prominent cluster of reviewers and vendors. Based on the results from the content/sentiment analysis, we suggest that social media reactions play an important role in acting as feedback to the Organizations in their endeavor to promote or sell new or enhanced version of the products. In addition, these reactions have a considerable influence on consumers' decision making abilities. Though this paper does not show any proof about if social media reactions directly impact stock market decisions, we believe the reactions themselves could act as influencers and could make consumers wary about purchasing the stocks.

Word Count: 4374

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