Measuring Influence on Twitter

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ABSTRACT
There are currently over 175 million Twitter accounts worldwide, making Twitter one of the most popular and most observed Social Media platform. But Twitter is not so much a social network where the exchange of personal information is facilitated – in fact, recent surveys state that it's not very social at all with a large amount of inactive accounts and a low motivation of engaging in dialogues [1]. Twitter has rather evolved into a pool of constantly updating information streams consisting of links, short status updates, and eyewitness news. Among the millions of users, a small percentage is what is called the group of influencers or alpha users. They have a large, active audience that consumes and multiplies the content published by the influencer. Thus, an influencer's content – whether it is plain text or links – is distributed in a number of micro-networks and receives attention from a large amount of users even though they might not even be direct followers of the influencer. The further the content is spread, the further the influence of the user reaches.

There are various tools that enable performance measurement on Social Media. Some only sum up numbers such as the amount of followers or mentions gained on Twitter; others interpret the numbers and rate the performance using a specific algorithm. An example for the latter is Klout, a popular service that will be looked at more closely, focusing on the question of how Klout calculates its scores which serve as a means of measuring success of Twitter usage.

The research purpose of this paper is to determine a grounded approach for measuring social networking potential of individual Twitter users.

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Algorithms, Measurement, Human Factors

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Social Media, Twitter, Social Networking Potential, Social Network Analysis

1. INTRODUCTION
Information which is deemed valuable spreads on the micro-blogging platform Twitter via a series of super hubs, influencers or alpha users that reach a large audience of attentive and engaged users. Apart from these super hubs where thousands of users retrieve information snippets, pyramid-formed or circular social micro-networks that evolve around each active user [2] also contribute to the spread of information. The concept of the strength of weak ties is also applicable to Twitter [3]. On Twitter, this means that following users who are not part of a personal, strongly intertied social network results in a greater amount of novel information.

In this paper, we will briefly explain the basic functions and communication possibilities on Twitter and their interpretation in the context of social influence, considering the three different processes of attitude change. Then we will analyse existing rating systems designed for Twitter. Finally, the Top 10 Twitter users in Austria will be analysed, using various methods of determining influence and comparing these methods with each other in order to identify strengths and weaknesses of existing grading concepts. A new and simple approach to measuring social networking potential (SNP), a figure that determines the ability to influence a certain audience [4], shall be developed in the course of this paper.

1.1 Twitter functionalities and performance indicators in brief
Twitter allows publishing status updates called "tweets" with a maximum length of 140 characters. Users can subscribe to updates from other users by "following" them. The status updates can be passively consumed on the one hand, or be used as the basis for interaction on the other hand. The most important content-oriented interaction is what is called "retweeting", a method of repeating a tweet and publishing it for one's own followers. Twitter and third-party Twitter clients facilitate retweets with one click, making it a very commonly used function. Conversation-oriented interactions include private direct messages that can be read by the recipient only. Using the character @ in front of a username is called "mention" and is another conversation-orientation interaction possibility that enables a public dialogue between two or more users. Research suggests that Twitter is rather content-oriented with networks evolving around topics and subjects rather than individual people and their conversations (see [1]).

A figure which is often discussed as a performance indicator on Twitter is the *Follower/Following Ratio* (r_f). It compares the amount of users who have subscribed to the updates of user A

with the number of users that user A is following. The higher the result, the more people are interested in the user's status updates without the user needing to show interest in their status updates first. If the result is smaller than 1, the user is likely to be considered a mass-follower who follows other users for the sole purpose of gaining more users himself. This figure alone can, however, lead to misinterpretations and must always be viewed in context with the total amount of followers and interaction ratios.

To detect how many of A's tweets imply a reaction from the audience, the *Retweet and Mention Ratio* (r_{RT}) can be determined. This is the amount of tweets that are amplified or lead to a communicative action between user A and another user divided by the total amount of tweets of user A.

It is of course relevant how many different individual users interact with user A. For this purpose, the *Interactor Ratio* (r_i) must be determined. This is the number of individual users who retweet content or mention user A divided by the total amount of followers of user A.

2. RELATED WORK AND EXISTING RATING APPROACHES

Measuring influence and social networking potential on Twitter has been discussed in various other papers as well as in numerous blogs and online media. Related scientific work on Twitter includes approaches which measure influence by not only taking followers and interactions into account, but also by analysing topical similarities with the help of a ranking method similar to PageRank [5]. An interesting aspect of this work is that in the analysed sample of Singapore-based users a high reciprocity (e.g., mutual following relationship) was found. This highly reciprocal social network structure cannot be observed with the top 10 Twitter users in Austria as will be shown in the following sections. This is due to the fact the most super hubs are followed by many other users, but do not follow back equally as they only follow friends or other super hubs which provide novel information.

Other approaches define different types of influence on Twitter, namely indegree, retweet and mention influence [6]. This specific paper concluded that each indicator leads to a different ranking of users and that indegree, i.e. the number of followers a user has, reveals little about the actual influence of a user. Retweet influence is strongly content-oriented, whereas a high mention influence suggests a high value of the user's name.

The closely related topics of tweeting dynamics and the prediction of content popularity and information spreading have also been discussed in various papers, e.g. [7], which suggests that twitter actions and thus influence are crucially influenced by "hidden networks" which consist of closer relationships between network nodes than a mere follower/following relationship.

2.1 Existing rating services

Due to Twitter's openly available API, there are numerous rating services that, on the one hand, calculate a score for individual users, and, on the other hand, compare scores of twitter users to create a rating.

A very popular and commonly used online rating service in this sector is Klout [8] which determines user performance on Twitter, Facebook and LinkedIn. The service works with numerous partners who integrate Klout scores in their products (e.g. the Social CRM platform Radian6). Klout measures, as it states on its website, a user's overall online influence with a score ranging from 1 to 100, with 100 being the highest amount of possible influence. Klout analyses more than 25 variables, also offering the possibility to combine the scores from all three analysed platforms. The complex algorithm used to calculate the score is not published and cannot be reconstructed but Klout states that it sees influence as the "ability to drive people to action", thus making replies and retweets the most important factors. According to the calculated score, Klout places the user in a so-called influence matrix with 16 possible classifications created from the combination of eight attributes.

Another service in this sector is the tool Twitter Grader [9] which also calculates a score out of 100. The algorithm used is also kept secret, however it is communicated that considered factors include number of followers, Twitter Grader score of followers, number of tweets, update recency, follower/following ratio, and engagement, i.e retweet and mention ratio. Further services which calculate an influence score and have been reviewed in expert blogs include Twitalyzer, PeerIndex, and Tweetlevel.

3. TOP 10 TWITTER USERS IN AUSTRIA

In order to evaluate different influence and performance figures, the list of the current Top 10 Twitterers in Austria, ranked by the number of their Austrian followers (i.e., who have stated that a location in Austria is their hometown), will be analysed. The following tables 1 and 2 show the number of followers each of the user has in Austria and the amount of followers in total as well as the amount of tweets, the number of users the respective Twitterer is following and the number of lists the respective user is part of. These data with exception of the number of followers in Austria [10] are available on each Twitter profile and have been collected on March 7th, 2011.

Table 1. Top 10 Twitter users in Austria.

	Twitter user	Followers AT	Followers
1	ArminWolf	8157	19385
2	misik	2727	5598
3	martinblumenau	2287	3966
4	corinnamilborn	2129	3679
5	franzku	2071	15538
6	webstandardat	1948	4046
7	derStandardat	1887	3337
8	Helge	1853	2885
9	profilonline	1800	3115
10	georgholzer	1776	3588

Table 2. Top 10 Twitter users in Austria: Tweets, Following, Lists.

	Twitter user	# of Tweets	Following	# of lists
1	ArminWolf	5459	149	788
2	misik	1316	2442	367
3	martinblumenau	868	1121	256

4	corinnamilborn	4081	1826	338
5	franzku	2783	15456	312
6	webstandardat	12638	1038	367
7	derStandardat	2863	354	286
8	Helge	6562	323	349
9	profilonline	744	147	246
10	georgholzer	11401	743	354

Austria's Top 10 Twitter users are mostly journalists and media who tweet news updates but also personal opinions on current events and developments in social, political and scientific topics. With the exception of ArminWolf who is in the lead with almost three times as many followers of the runner up, all Twitterers are followed by about 1,700 to 2,800 users from Austria. For the further calculation, however, the number of total followers will be taken into account because Twitter is not limited by any country's boundaries.

Table 3. Follower/Following Ratio, Retweet and Mention Ratio, Interactor Ratio and Klout score of each Twitterer.

Twitter user	r_f	r_{RT}	r_i	Klout score
ArminWolf	130,1	16,5 %	3,4 %	60
misik	2,3	4,3 %	0,8 %	44
martinblumenau	3,5	9,3 %	1,8 %	46
corinnamilborn	2,0	15,0 %	9,9 %	57
franzku	1,0	5,0 %	0,7 %	49
webstandardat	3,9	5,9 %	8,9 %	58
derStandardat	9,4	3,5 %	1,7 %	44
Helge	8,9	8,7 %	13,2 %	57
profilonline	21,2	4,8 %	1,0 %	41
georgholzer	4,8	8,1 %	12,0 %	58

Table 3 illustrates different performance indicators as well as the Klout scores for the top 10 Austrian Twitter users. When it comes to the most often used metric for measuring success on Twitter, followers, ArminWolf, franzku and misik lead the list (see Table 1). However, when it comes to the amount or interactions with other users e.g. by retweets or mentions, ArminWolf is still in the lead but franzku and misik are found on ranks 7 and 9 respectively. Ranks 2 and 3 are occupied by corinnamilborn and martinblumenau, meaning their tweets are more likely to lead to an interaction than the others' tweets. When looking at the interactor ratio, it can be observed that Helge, georgholzer and corinnamilborn communicate with the highest number of individual Twitter users.

3.1 Indicators of influence on Twitter

When interpreting these different numbers and ratings, it must initially be considered what indicates influence. For this purpose the funnel of information processing can be taken into account. It states that information must first be perceived and consumed before it triggers an action.

This model of influence can be considered especially when the influence is based on communicated content or messages, not by attributes such as family bonds or celebrity status (this might cause an action without previous tweets). Perceiving content on Twitter usually means that one has subscribed to the updates of another. It is thus a prerequisite for a relationship bond on Twitter that user A has subscribed to user B's tweets. After the consumption of content, the user may choose to amplify the messages by retweeting them or may choose to comment on the content by communicating with the original publisher. This may cause a change in sentiment or entail an action. In this case, user B has been influenced by user A.

The above stated numbers and the amount of followers in particular show tendencies concerning the influence of a Twitterer. In general, having many followers can constitute a higher influence as more people seem to be interested in the user.

On Twitter, a strong focus is laid on enlarging one's network of followers. It can be observed that a large part of Twitter users retweet and amplify content which is considered as entertaining, useful or breaking news. The motivation behind this behaviour has not yet been thoroughly investigated, but it is presumed that the user expresses agreement and liking with the amplification of content on the one hand; on the other hand, he wishes to establish himself as an information hub and gain social influence.

In this context, three different possibilities of how users react to an influencing attempt are presented by Kelman [11]:

Compliance means that user A publicly agrees with user B and keeps any disagreeing thoughts and opinions to himself. This process might trigger a retweet if A perceives the content published by user B as popular and helpful for establishing A's own reputation and social status on Twitter.

Identification means that A follows an influential person who is liked, respected and/or has a celebrity status. The process is rather conversation-oriented as A will try to interact with B not because of the content published, but because of B's status.

Internalization is the process of accepting a belief or behaviour both publicly and privately. This process is rather content-oriented than conversation-oriented and stands for the most impacting social influence process possible. Internalization triggers recommendations, retweets and also dialogues.

These three possibilities may be extended by two more factors that are relevant in the content consumption process on Twitter but have an inferior role in the influencing process. The first factor is *Neglect*: Content posted by another user is ignored due to its irrelevance for the receiver. The second factor is *Disagreement*: When A strongly disagrees with B, it is likely that A will express his or her disagreement and comment on B's content, or that A will even "unfollow" B.

4. DEVELOPMENT OF A FIGURE FOR SOCIAL NETWORKING POTENTIAL ON TWITTER

Literature review and an analysis of existing rating services have led to the conclusion that every approach is different from the others in terms of algorithm and emphases on different individual factors, thereby resulting in different rankings of sample users. This is due to the fact that there is no consent on what indicates influence on Twitter.

A focus on nothing more but the amount of followers as displayed in the Austrian Twitter Charts is not advisable as, on the one

hand, many users follow a very large amount of other Twitterers hoping to gain a mutual follow and often succeed. On the other hand, there are several ventures that offer follow clicks for a certain amount of money. It is primarily positive interactions and reactions that determine the success of a user. When focusing on conversation-oriented interactions, the interaction ratio r_i is of interest in particular. When focusing on the content-oriented interactions, the retweet and mention ratio r_{RT} must be looked at carefully. As Twitter is primarily content-oriented but influence is largely dependent on personal relations, both aspects must be considered in the calculation process.

The two ratios are summed up and divided by 2 to calculate the social networking potential (SNP). A score of 100 % means that all tweets of the user are acted upon and all followers interact with the user. It is possible that the score is higher than 100 % if a tweet is retweeted or the user is mentioned more often than he publishes tweets himself. The social networking potential states ergo the potential of interactions within the network of followers on Twitter.

Table 4. Ranking of Top 10 Austrian Twitter Users according to social networking potential.

	Twitter user	SNP
1	corinnamilborn	12,45%
2	Helge	10,95%
3	georgholzer	10,05%
4	ArminWolf	9,95%
5	webstandardat	7,4%
6	martinblumenau	5,55%
7	profilonline	2,9%
8	franzku	2,85%
9	derStandardat	2,6%
10	misik	2,55%

The user corinnamilborn is most influential user; whereas misik, although positioned on rank 2 in the Austrian Twitter charts, is not as influential within his network of followers. Multiplying the SNP with the daily amount of tweets published (which can, for example, be obtained with the tool howoftendoyoutweet.com) by the respective user results in the daily Social Networking Potential.

5. CONCLUSION AND DISCUSSION

This approach offers a quantitative method of determining Twitter SNP. It takes into account the number of followers, of individual interactors, retweets, mentions and the total amount of tweets. This indicator is deliberately kept simple in order to serve as a basis for further investigation of influence. The new ranking of Austria's Top 10 Twitter users shows some similarities to e.g. the Klout score. Differences can be observed especially with the users who have a very large amount of followers, especially ArminWolf. This user drops to rank 4 when his influence is measured with the SNP. The emphasis on the amount of followers is very dominant in existing rating systems and is deliberately omitted in this approach. Followers are without doubt important as they amplify the content but quantity does not equal quality and a small audience of engaged users is worth more than a large audience of less active users. The approach presented in this paper lacks a rating of a user's followers and including this rating in the calculation. This issue will be addressed in future work.

What has also not yet been considered in this SNP indicator is the quality of interactions which would be a valuable compliment to this quantitative approach. Categorizing mentions by keywords to generate a sentiment rating and researching how negative mentions take effect on influence on Twitter is another issue that needs to be investigated.

Social networking potential changes as rapidly as follower numbers and update frequency change over a certain period of time. The Twitter SNP as calculated above can therefore only be a snap-shot of the current relationship ties and network interactivity.

The next step in proceeding to work on this topic and on a method of analysing SNP of Twitter users would be the development of an application that obtains the data required for the analysis. The application to be developed calculates the SNP and evaluates the closer micro-network of the user, meaning the users that interact with user A on a regular basis. By repeating this step for the users in A's closer micro-network, a wide range of influence ties and Twitter information highways can be visualised.

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