

Forwarding Messages in Mobile Social Networks: An Exploratory Study

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The telecom industry is investing a lot of resources into traditional advertising despite the fact that many users often turn to their social environment for advice. Social relationships are one of the oldest media which are nowadays “empowered” by communication services. This makes it possible to take a look at users’ social context and gain insights into the referral behaviour of customers. In this exploratory study some results are presented which allow a new perspective on users and highlight the possibilities of social network analysis. Finally, it is stated that this knowledge is applicable for a new type of marketing and enhances the development of new services.

1 Introduction

Of course, it is not as simple as stated above but still there is less doubt that marketers are pushing the limits when it comes to shaping a shiny image, lowering churn, stimulating traffic or promoting new services. From the user perspective, it is very hard to decide whether a particular pricing plan is suitable or if a specific technical feature is really necessary, particularly if you are part of the majority of the customer segment which is not really into it. Some users are increasingly annoyed and react with denial despite having general interest in “useful” services.

User needs, attitudes and behaviour are not only shaped by individual characteristics, but also by their social environments. The referral behaviour is of particular interest because it can be a form of promoting products and services to others. On a more abstract and general level this process can be seen as the passing of information about innovations within a social network. Through social network analysis a clearer view on this referral behaviour is possible.

2 Social Networks and Passing Along Information

Social networks consist of relationships (ties) between individual actors. They build up a structure which differs from other networks with a more random tie distribution. For instance, people tend to reciprocate relations as a basic rule in human communication. Furthermore, actors with strong ties [1] – intense personal relationships – tend to build relationships with common actors as a result of their mutual exchange. In that way communication efforts are also being bundled, if you look for a formal explanation. Areas with clustered actors are effective for local transmission processes and, if seen as communities, they can provide social stability. Communities develop norms that are crucial for forming attitudes towards innovation [2].

2.1 Passing Along Messages

The spreading of information can be observed in daily online communication, as some people tend to forward e-mails with funny content to other users. Although the advertising industry tries to harness this by promoting “viral content”, little is known about the actual underlying communication processes.

One study [3] examines the passing along of e-mails as an episodic process. These researchers examine the individual perception of such messages, as well as motivations to forward them. To a large degree, their findings implicitly point towards relational characteristics. In other words, users try to “stay in contact” with more distant persons or send specific content to persons with a similar mindset. The estimation of such aspects depends very much on previous social interactions. Therefore, besides looking at the message content itself, looking at communication ties is essential as this might give an explanation for the structural diffusion of information.

Forwarding content via the mobile phone has been observed within the realm of political mobilisation. An overview of descriptive case studies [4] shows that some mobile messages can reach a significant amount of people within a short period of time. This resulted in thousands of people gathering in public places to demonstrate against a political situation. In one case it is mentioned that an operator measured a significant increase in mobile communication traffic. Furthermore, the studies indicate that the forwarding behaviour not only occurs in times of “breaking news” but also happens with niche content within sociocultural milieus.

2.2 Qualitative Illustrations

The following example should illustrate that forwarding messages is also part of everyday mobile communication. It is taken from a 2005 qualitative study on MMS usage scenarios in Switzerland. In the very middle of the following chart (Figure 1) you can see

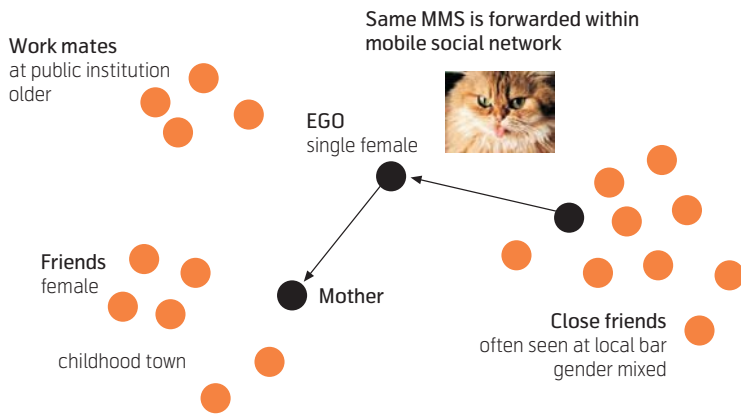


Figure 1 Sample sketch of a personal social network

what is called ego in social network analysis. It is a 30 year old single woman living on the outskirts of a Swiss city. During interviews persons wrote down names based on “name generating” questions such as who do you talk to about important issues. In the next step these name tags were positioned around “ego”, so that closer persons indicate an intense exchange. Furthermore, names were grouped by the amount of contact these actors have with each other. You can recognise in our example that actors are grouped in different activities (see Figure 1). After this task the sketch was used as a reference during the interviews to reduce cognitive effort.

A starting point to the discussion was the pictures that participants had on their phone. A young woman described the following scenario: “I was hanging out with a friend at the local pub. For some reason we went through the pictures we had on our phones as is the case with picture books. Since I like animals my friend forwarded to me a neat picture of a cat, which I passed on to my mother as she also likes these kinds of pictures.” This description provides rich contextual information about a particular forwarding scenario. The behaviour seems to rely on a very subjective salience of the content having the power to bridge a gap between local communities, as her mother lives in another town (see Figure 1).

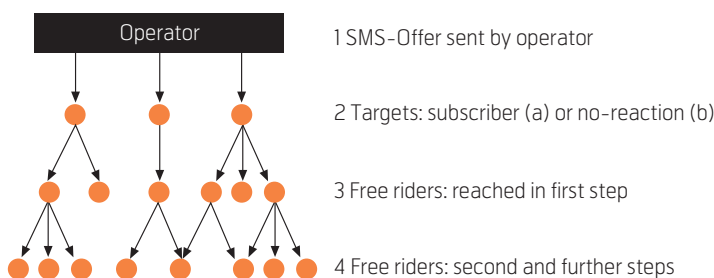


Figure 2 Assumed communication process

One could say that the previously described forwarding is only a marginal phenomenon. In another study, based on a four day private communication diary of about 60 people, there is evidence that this occurs more often than anticipated, as several participants reported such usage scenarios. According to a rough estimation about 1% of all private mobile communication can be categorized as mobile forwarding. At first sight, this might be a small figure, though from a revenue point of view it should not be underestimated. It is also worth mentioning that forwarding generates even more communication as people usually start follow-up communication mainly with peripheral members of their social network, as was mentioned earlier with the reciprocity mechanism in social networks.

3 The Free Rider Phenomenon in Campaigns

Forwarding behaviour has been assumed in campaign activities of a mobile operator. It has been noticed several times that a considerable amount of customers had not been directly targeted by an SMS-campaign but have participated in an exclusive promotional offer. In the following discussion these users outside the target group will be called “free riders”.

3.1 Research Setting

Since the offer was very poorly communicated by other channels it was assumed that the target audience had forwarded the particular SMS-offer to others. Due to regulations it was impossible to exclude free riders from participating in the offer. These customers lowered campaign profitability. But from a research point of view the phenomenon provides an opportunity to study the tie structure of this diffusion network. The situation very much reminds us of a classical media influence model of a Two- or Multi-Step-Flow in communication [5], where certain members of society act as hubs or multipliers of certain messages (see Figure 2).

The aim of this exploratory study was to find a way to measure the diffusion process and provide more evidence for the forwarding assumption. The approach was to consider all direct communication that has occurred between involved actors. The direct forwarding itself could not be measured but was inferred from the communication ties.

The data was provided by a telecom operator and analysed with respect to privacy regulations. Due to regulations from the company absolute values can only be provided partially. The data consisted of the aggregated monthly mobile communication from a period after which a chosen campaign was conducted.

The data had to be carefully prepared so that connections represent as much social characteristics as possible and not artefacts such as those originating from reversed billing of content services. This connection data has been joined with demographic characteristics of actors, if available. The network consisted of several thousand nodes. This dimension of the network makes it difficult to apply regular methods of social network analysis.

For the case study a campaign was chosen aimed at all low/mid SMS users. The promotional offer was based on last month's billing amount and a small opt-in fee to send unlimited SMS for the coming month. The direct response rate was 2.1 %, which was relatively low compared to other campaigns. In contrast, the free rider population was significantly larger, consisting of mainly female actors, as it has already been noticed in other campaigns.

3.2 Indications for a Network Diffusion Process

In the following, single analyses are being described which by no means should be considered complete. Rather, it is the objective to show the possibilities and difficulties regarding social network analysis based on communication data. To start with, the results refer to the actors' function as message multipliers. Subsequently, the denser knit realm within the network is examined and finally the overall structure of the network is illustrated.

Direct ties between the target group (Figure 2: 2) and the free riders (Figure 2: 3) can be regarded as a first indicator for transmission of message multipliers. The calculations show that 18.1 % of the target group's participants (Figure 2: 2a) have direct ties to the free riders' group. Out of the large number of non-reacting people (Figure 2: 2b) in the target group, 7.3 % of the actors are in direct contact with a free rider. Considering absolute numbers non-reacting people still have more free rider contacts.

Due to these results the forwarding assumption is regarded as being supported in that there are direct ties between the target group and the free riders.

However, with regard to the interpretation of a possible spreading process via these ties certain aspects need to be considered, above all economies of scale. The more extensive a group of actors is within a network, the bigger is the likelihood of direct ties. Due to its size the large number of non-reacting people within the target group must therefore have more direct ties with free riders than the smaller group of participants. Due to the low reaction rate of the target group it can be assumed that the SMS offer is being ignored as unrequested advertising. On the other hand, the few participants in the campaign may perceive the offer positively and forward it for exactly that reason. The larger part of actors with direct ties to the free riders in the small group of participants could be an indicator of that. Of course, from a formal point of view, both one single and an indirect tie between the target group and the free rider can be sufficient for an overall spreading process.

Actors as Message Multipliers

Below the network function is addressed in which some actors forward their information to several other actors and therefore might promote the spreading as hubs (see Figure 2). Based on the data at hand this analysis clarifies if such behaviour is possible in the observed network.

The analysis shows that from the target group 87.1 % of the actors in touch with free riders have contact to a single follower and that almost 13 % of the actors have contact to more than one follower (Chart 1). If only the ties between the free riders are considered (Figure 2: 3+4) more than 44 % of them have more than one follower (not in the chart). Two participants have a maximum number of 13 followers. That reinforces the assumption that some actors can forward their message to several other actors and therefore act as multipliers.

Indication of Tie Preferences

According to a homophily mechanism, ties preferably exist between actors with similar characteristics, and it can be assumed that forwarding occurs the same way. As mentioned before, in most of the cases female actors are involved in the free rider phe-

Messages	Number of followers						
	1	2	3	4	5	6<	Total
Multipliers							
Target group	87.1 %	11.0 %	1.6 %	0.3 %	0.1 %	0.0 %	100.0 %
Free riders (1st to 2nd step)	79.7 %	16.3 %	3.3 %	0.6 %	0.1 %	0.0 %	100.0 %
Free riders (2nd to 3rd step)	81.7 %	15.4 %	2.6 %	0.0 %	0.0 %	0.4 %	100.0 %

Chart 1 Actors with ties to one or more followers

Sender	Receiver		Total
	Female	Male	
Female	74.4 %	24.7 %	100.0 %
Male	56.6 %	41.9 %	100.0 %

Chart 2 Crosstabulation of communication ties according to gender

nomenon. This is particularly the case in the campaign examined. Whereas the majority of the participants are men (see Figure 2: 2a) the free riders consist of a majority of women (Figure 2: 3+4). This might be due to the fact that a large proportion of men were approached directly via SMS and that there is only a small number of male actors to be found outside of the target group. For a statistically significant statement, it is therefore vital to assess the relative under-, and over-representation. Calculations thereto show that women are over-represented by more than 20 % in the free rider population. For a spreading between genders explanations are sought in the formation of ties between the actors. According to the tendency towards homophily it can be assumed that there might be more ties between women than men. This analysis is applied to outbound ties of actors from the target group with direct contact to free riders (Figure 2: 2-3).

The results (see Chart 2) make clear that women as a group have significantly more communication ties with women than with men. On the other hand, men show a relatively balanced value with regard to communication between genders at the particular interface examined.

Analogue analyses with regard to age categories confirm this tendency to a “homogenous communication” (ref. Chart 3). Teens communicate mostly with teens, young adults with young adults, etc. An exception to this rule represented in the present analysis is older people; they have more contact to the younger age segments (see Chart 3).

Sender	Receiver				Total
	>19 years	20-30 years	31-54 years	<55 years	
>19 years	69.8 %	20.9 %	8.4 %	0.9 %	100.0 %
20-30 years	14.6 %	61.2 %	22.0 %	2.2 %	100.0 %
31-54 years	15.3 %	25.8 %	54.7 %	4.3 %	100.0 %
<55 years	12.2 %	30.9 %	47.7 %	9.2 %	100.0 %

Chart 3 Crosstabulation of communication ties according to age

Taken as a whole, the assumption is confirmed in that there is an increased contact between actors of similar socio-demographic characteristics. With regard to the spreading process, this serves as an explanation for the constitution of the free rider population. In a way, the analysis confirms some sort of a stereotype: women communicate more often with women than with men.

Tendencies for Local Clustering

Actors with a strong social tie tend to crosslink themselves. Such structures indicate local transmission processes in networks and explain, amongst other things, how this can lead to quick local spreading of information. The hypothesis postulates that so-called closed triads, three actors being completely interlinked, can be found in the network examined.

In the triad census all the possible tie formations between three actors are counted. In the network of the free riders a few closed triads can be found. For comparison the frequency expectation values in a random network with the same amount of actors and ties are being calculated. These estimations are at zero for the found triad formations. That means that there are social forces in the examined network which indicate a locally strong interlinked communication flow. This statement is confirmed by statistical comparison but does not offer additional insight. It is somehow apparent that structural characteristics in random networks differ from social communication networks particularly if they are comprehensive. Still, the present analyses show that there is a tendency for local clustering in certain areas of the examined network. The question arises whether further structural patterns can be identified.

Processing of extensive network data is feasible with the computer program Pajek [6]. It offers suitable algorithms for appropriate data reduction. The “Core” method reduces the number of ties in an iterative process in order to identify strongly networked areas within the network. These elements can be extracted. The procedure being done with free rider link data results in a small amount of cliques besides the

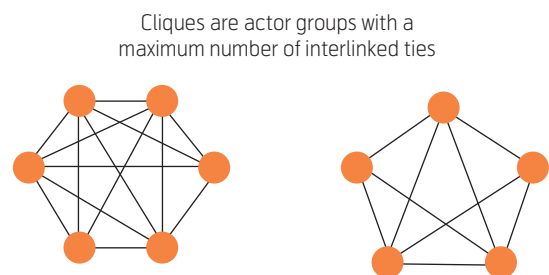


Figure 3 Identified cliques in the examined network

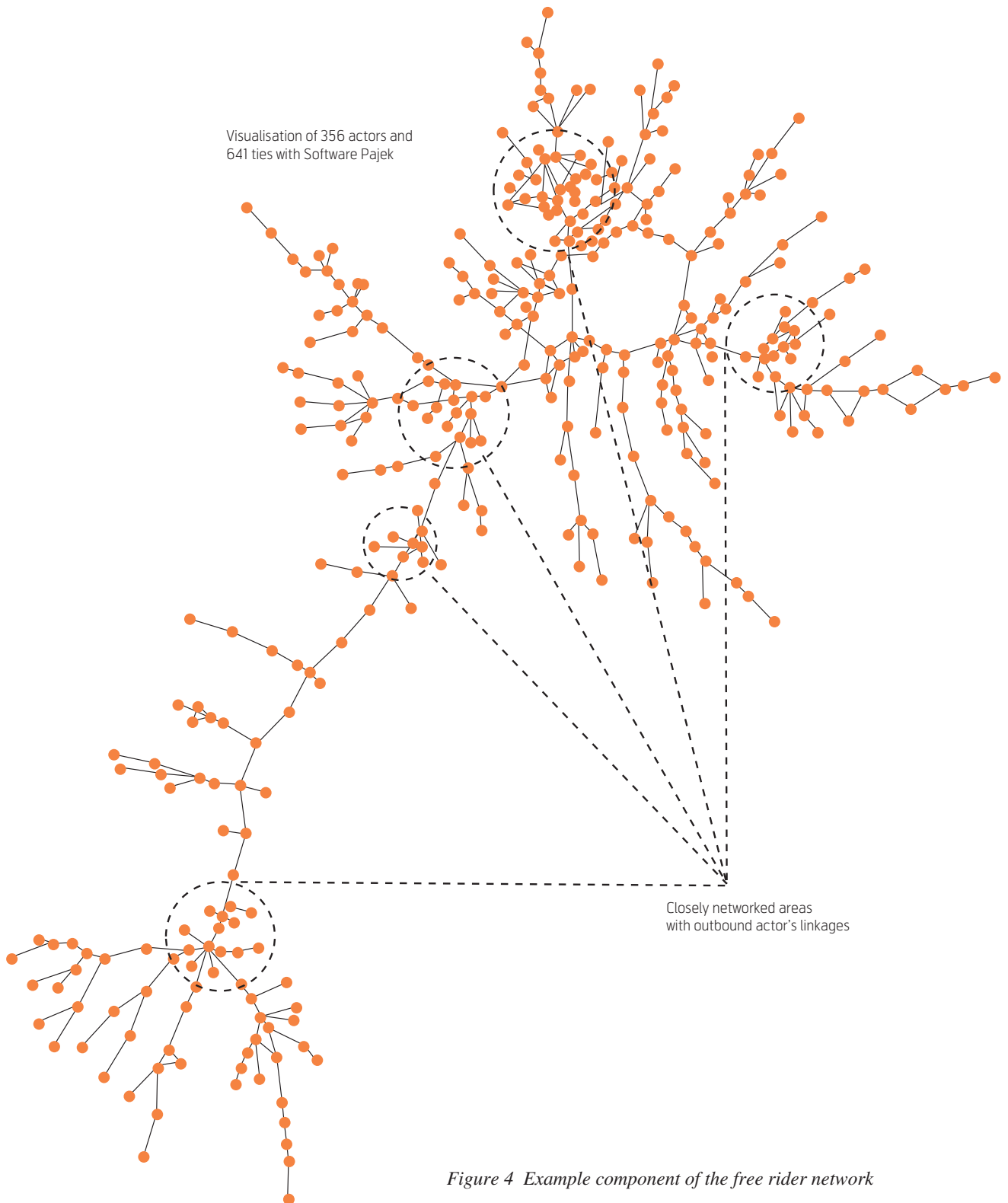


Figure 4 Example component of the free rider network

already mentioned triads. Cliques are actor groups with a maximum number of interlinked ties (Figure 3).

These cliques should not be overestimated as they are only rarely observed within the whole network. Nevertheless, the results testify closely networked areas which can be interpreted as communities. This particularly applies because the ties between the actors are based on the joint characteristics of the campaign participation and the assumed sharing of

information. The sense of community is an important issue for a sustainable acceptance of innovation in general. This has been known for a long time but social analysis of communication data offers new opportunities to monitor structural properties of these processes.

Visualisation of Network Components

Components are stand-alone elements without ties between each other within a network. The forwarding

of messages may be reduced to those kinds of “islands”. It can be assumed that the free rider network is not completely linked up but rather consists of several components with different sizes. The following analysis is limited to the ties between free riders.

The analysed network consists of components as was expected. But more than half of them consist only of isolated actors or one tie between two actors. 8.8 % of the free riders are in components with three to five members, 18.3 % in larger components of 6 to 356 actors. One component could be identified consisting of 1,518 free riders. The results clearly show that an overall snowballing effect, with a message being sent out by one actor to all the others, can be seen as a rather unlikely scenario.

The value of network visualisations is sometimes criticised in research for not offering added value compared to numerical figures. The advantage of visualisations lies essentially in the possibility to make complex structures more evident. Visualisations definitely provide an insight when dealing with comprehensive datasets. However, the illustrations must be reduced regarding the number of actors. An overview is hardly possible with visualisations of more than 1000 actors. Therefore, in the previous figure a single component of the entire network has been visualised. Some of the preceding triad constellations can be seen.

The visualisations of other components from the free rider network show similar structural patterns. In overlapping areas of actors’ linkages paths there appear stronger linked actor communities (ref. Figure 4). This resembles less a typical social network than a social transport network similar to an underground system that provides transport from areas of high population density via single linkages to the periphery. According to other research [7] it is assumed that the spreading process has begun at the periphery of networked areas moving towards the centre and then causing a fit in the diffusion process.

4 Conclusion

This article is based on the proposition that the social environment of users must be given great importance. In order to be able to influence the needs and behaviour of users, not only individual psychological variables are important but also the social environment. This applies particularly if innovations are services that enable people to communicate. Therefore it is important to look at the use of communication services from the perspective of social network analysis. Before presenting some implications of this exploratory study about message diffusion the findings are

briefly summarised. These results are not conclusive and are mainly intended to point out the possibilities of analysing the aspects of social relationships in communication.

The findings presented from qualitative case studies confirm that the forwarding of messages is also taking place via mobile phones and can be put down to tie characteristics. The starting point for the present case study is the assumption that actors from a campaign target group forward a promotional offer to actors outside of the target group by SMS and that they profit from the offer (free riders). From a communication research perspective this phenomenon offers the unique possibility to analyse “mobile word-of-mouth”.

All in all, the findings support the assumption that messages are forwarded via the actors’ social network. Most results can be interpreted as the network having an accelerating function for diffusion. This becomes apparent in the manner that some actors can act as multipliers in the network and that ties are predominantly set between actors with similar socio-demographic characteristics. The structuring of the network shows single triads and cliques which can be interpreted as communities. From these densely networked areas outbound actors’ linkages can be identified in visualisations which point to a comprehensive spreading process.

The executed analysis illustrates that with SMS campaigns, a deliberate control of diffusion is likely to be difficult since the spreading can be caused by a rather large amount of actors within the target group. There is hardly a snowballing effect where only a few key actors infiltrate all free riders. It is also possible that free riders receive their information through one or more neighbouring actors. Furthermore, large numbers of independent groups can be found as single components within the network. The accelerating effect of networks should therefore rather be used in a positive manner and strengthened. Taking these considerations as a starting point, one should concentrate less on nodal customer segmentation, as in traditional marketing, and more on network based interventions [8]. The basic idea is to consider actors’ social environment and to take into account their natural informational and persuasive function as hubs within communities, instead of putting resources into conventional media campaigns.

Another implication of social network analysis concerns the development of new services. Web2.0-applications are elementarily based on connecting to other nodes. Lots of current online “networking platforms” are significantly determined by technical

possibilities so that some actors establish contact with as many actors as possible. There is of course a reason for this behaviour because every link acts as potential resources, but to enhance Web2.0-services crucial social mechanisms could be taken more into consideration and transferred into the online realm. For instance, this could be done on the tie level of networks by an increased support of reciprocity experience in the form of suitable presence information of remote actors. Another approach could be to make a community status of certain users more apparent based on their intense triadic communication between each other.

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