Social Profiles of Virtual Communities

Johannes Hummel
=mcm*institute*, University of St.Gallen
Johannes.Hummel@unisg.ch

Ulrike Lechner
Dept. for Computer Science, University of Bremen
lechner@informatik.uni-bremen.de

Abstract: *The phenomenon "virtual community" reflects the social, political and economic impact of information and communications technology changing the architecture of interaction. We present an approach to describe and manage the social environments of transactions that are provided in virtual communities. In this paper, we explore virtual communities, their novel social structures and the dynamics of the social momentum of communities. We present an empirical study of fifty virtual communities.*

Keywords: Virtual Community, Business Model, Network Effects, Peer-to-Peer Computing

1 Introduction and Motivation

Among the challenges of the digital economy are the design and implementation of business models and of the information systems to implement those business models. "Virtual community" is a business model of the digital economy [2,3]. Two architectural features distinguish it. First, the members of the community contribute to the creation of economic value - often on an equal basis - as peers [23]. Second, transactions and their social environment are linked such that the social environment contributes to the value creation.

This social environment and the link between the social environment and transactions are of studied in this paper. We consider communities on "traditional" Web-based community platforms and peer-to-peer infrastructures. Currently, there is a lack of understanding of how to manage social networks and how to support the social environment and their management by services. We propose a social profile of communities. The social environment of communities however can only be managed to some extent - communities have a strong social momentum. We model and discuss this social momentum in terms of network theory.

The paper is organized as follows. We explore the social environment virtual communities provide and its relevance (Sect.2). We profile the social environment for genres of business relevant communities (Sect. 3) and explore finally the social momentum of virtual communities (Sect. 4). We conclude the paper with a brief discussion of our findings.

2 Phenomenon "Virtual Community"

In this section, we describe virtual communities, their functions, and their role as a business model. First, we take a closer look at the technological facilitator for the development of these communities. Second, we explore the social perspective of virtual communities. We describe and define virtual communities and their development from a sociological phenomenon to a socio-economic business model

2.1 Interaction architectures

The information and communication technology of the Internet provides platforms for the creation of economic value through interaction. Three basic architectures for interaction can be differentiated.

Mass communication uni-directional · Mass customization interactive · Community multi-lateral

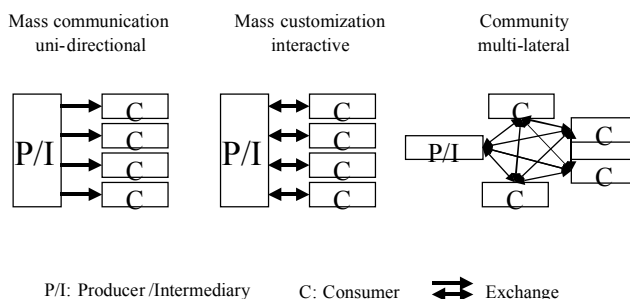P/I: Producer /Intermediary · C: Consumer · Exchange

Fig. 1 Interaction models

Unidirectional channels are the basis for the traditional mass communication. Easier and less costly interaction through the medium Internet has changed this transactional model profoundly. The new channels are interactive – content can be exchanged between consumer and producer or intermediary rather than transmitted from producers to consumers. Gradually, the architecture of interaction changes from a model with little feedback but with information asymmetry to an architecture where members interact on an equal basis - as peers. Mass customization is an example for architecture with interactive channels and information asymmetry. In virtual communities the members interact as peers - the model is symmetric.

Unidirectional, interactive and multi-lateral communication channels induce new architectures for the distribution of information and creation of economic value. Communication and transactions are being mapped from conventional to novel architectures. Transactions however are being embedded in a social environment. What do such social environments online look like? How relevant is it for the business purpose? Subsequently we give a literature overview to explore virtual communities as such online social environments. So, what is a community all about?

2.2 Virtual Communities

Over time, the perception of virtual communities has changed from a purely social phenomenon to a valid business model and further to the social environment in which transactions are being embedded [10].

2.2.1 Communities as sociological phenomenon

The first sociological definitions came from Taylor and Licklider who saw the community potential of electronic networks in 1968. They described their vision of a virtual community as "...in most fields they will consist of geographically separated members, sometimes grouped in small clusters and sometimes working individually. They will be communities not of common location but of common interest..." [14]. Probably the definition of Rheingold [17] is best known. Virtual communities are "...social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace" [17]. Other authors continue to carry on those social discus-

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sions. Godwin says, "...but in cyberspace, increasingly, the dream is not just 'owning a house' – it's living in the right neighborhood [4]". Jones speaks of "virtual settlement" [11]. Figallo stresses the meaning of common values writing, "...according to that definition, members of a community feel a part of it. They form relationships and bonds of trust with other members and with ... the community host. Those relationships lead to exchanges and interactions that bring value to members" [3].

From the view of computer-mediated communication, the most important elements of a virtual community are shared resources, common values, and reciprocal behavior. Whittaker et al. write "...members have a shared goal, interest, need,...engage in repeated, active participation,...have access to shared resources,...reciprocity of information,...shared context of social conventions..."[25]. Preece extends this view to include the necessity of common rules "...an online community consists of: People, who want to interact socially..., a shared purpose...that provides a reason for the community, policies ...that guide people's interactions (and) computer systems, to support and mediate social interaction..." [16].

Those authors describe that virtual communities meet deeply routed human needs and that they are in many respects similar to traditional "offline" communities to meet those needs.

2.2.2 Communities as socio-economic business model

Hagel and Armstrong broke with the view of virtual communities as sociological phenomenon [5]. They see in virtual communities a business model, which utilizes the possibilities of interactive communication architectures to increase revenues. Referring to Rheingold they define virtual communities "...but virtual communities are more than just a sociological phenomenon. What starts off as a group drawn together by common interests ends up as group with a critical mass of purchasing power, partly thanks to the fact that communities allow members to exchange information on such things as a product's price and quality" [5].

Timmers considers "Virtual Community" to be a business model in which "The ultimate value ... [comes] from the members (customers or partners) who add their information ... ".

For Hagel and Armstrong as well as for Timmers the emphasis in the socio-economic business models lies on "economic". They favor models where community organizers manage communities to increase revenues online. Currently, virtual communities meet those expectations only partly [6]. Today, the emphasis is again more on "Socio". The Cluetrain Manifesto [13] emphasizes the social aspects in "markets to be conversations" with a transaction being just "an exclamation mark at the end of a sentence".

Thus virtual communities provide the social environment for transactions and community members contribute to building value online by forming that kind of virtual environment. Over time a number of communities have emerged and they distinguish themselves not only by the actors and their roles - but also by their social environment. What are those genres of virtual communities? What do the respective social environments look like?

2.3 Genres of business-related communities

Today, the business model of virtual communities is well differentiated. According to business purpose, actors and their roles five genres of communities are distinguished.
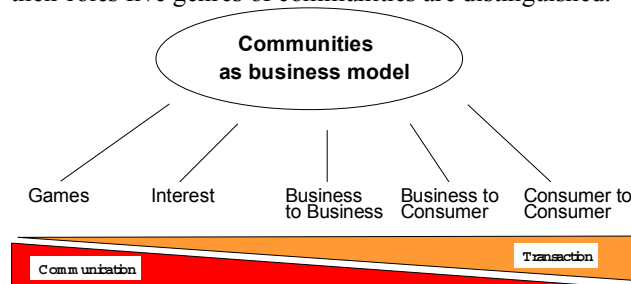

Fig. 2 Genres of business-relevant communities

Gaming communities offer an artificial environment as playground for interactive gaming with other members. Prominent examples are ultima online (uo.com) or muds (Multi-user dungeons).

Communities of *interest* are forums for meeting people with common interest. Examples are The Well or Usenet.

In *Business-to-Business* (B2B) communities, people of the same profession meet, interact on business-related issues, and carry out transactions. Examples are communities that meet on business-to-business marketplaces as CommerceOne (commerceone.com) or on VerticalNet (vertical.net) *Business-to-Consumer* (B2C) communities create a trustworthy environment where consumers are more willing to buy from the shop(s). Examples are Amazon.com, where the community of customers contributes reviews, recommendations, eBay.com where the community of auction participants rate the trustworthiness of transaction partners.

In *Consumer-to-Consumer* (C2C) communities, individuals exchange and trade goods with no commercial intermediary being involved. Examples are the communities that share mp3 files as on Napster.com.

In all these five types of communities, the social structure of community life plays an important role. In gaming communities, participants create amazingly strong social structures, as they explore resources, deal with each other, or build their community home. In communities of interest, the participants contribute their own content and react to content brought in by others - and those contents are linked with the social structure of the community, e.g., in customization and individualization. Content that is contributed by the community members is often higher valued than content contributed by the organizer. In this case, the individual credibility of community members spills over to the transactions. Through contribution community members are able to gain online reputation from other participants, which encourages them for further contributions and interactions.

In all three transaction-oriented communities (B2B, B2C, and C2C) we find also a social atmosphere - to a different extent. This social atmosphere is created through especially two kinds of contributions from members to the community.

- The first one is information, such as news or files, which is created by participants and shared or exchanged between participants.
- The second one is information that reflects the social atmosphere online. Examples are recommendations, reviews, ratings of buyers and sellers.

Note that technology plays an important role in fostering the interaction and contribution. The medium observes some interactions, detects the social structure in terms of profiles and interests, and communicates the respective information to the consumers. Examples are recommender systems like the one of Amazon that recommends books and other goods to customers. Most likely, such a communication does not meet the need for social relationships - but it seems to be effective and the contributions that the consumers need to make are "cheap" for the consumers and all consumers contribute on an equal basis - every transaction that is made contributes to the pool of information available online.

Summarizing the above remarks - the social atmosphere of virtual communities encourages people to stay, communicate and do transactions. The organizer of a community uses and manages the social elements for business purposes. Subsequently we present the main results of an empirical study of the social atmosphere of virtual communities.

3 Social Profiles

Virtual communities differ in the business purposes, ways to create value and the contributions of the community to the creation of economic value. The previous section (Section 2) illustrates the wide range of design of virtual communities. The main challenge for the management of those communities is the management of the social environment. Communities as complex social systems cannot simply be "founded". They have to develop themselves over time, given an environment, in which the participants feels comfortable and in which visitors eventually transition to contributing active members. Therefore, the management of virtual communities needs to understand the underlying social aspects of communities to create an environment.

In this section, we present a study of the social profiles of virtual communities and the features that can be used to manage the social network of a virtual community. We discuss the findings of an empirical research in this area, which was conducted by Hummel and Becker in 2001 [9].

3.1 The Model

The need for social relations is common to both virtual (or online) and offline communities. We follow Wellmann [24] and consider virtual communities as "just" a kind of (offline) community in which communication is enabled mainly by electronic media. The model of the social network originates in sociological research on communities. In describing virtual communities, we follow the approach of Hamman and Hillery [7] [8]. Hamman defines four constitutional elements of a community. A community is characterized by

(1) A clearly defined group of actors
(2) The interaction between the members
(3) The bonding among the members
(4) And the common place.

This model of Hamman defines the four dimensions of the social profiles of communities depicted in Fig. 3.
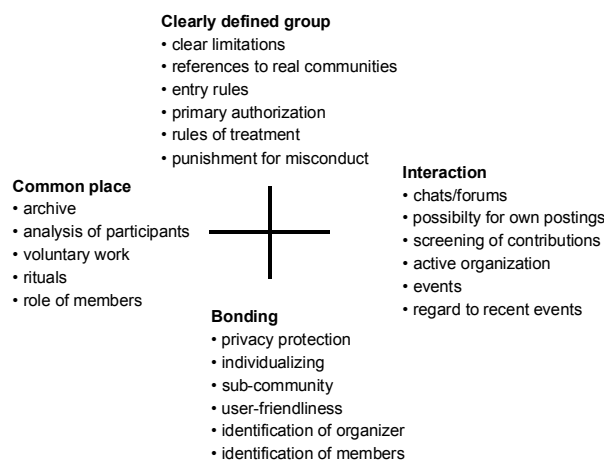

Fig. 3: The four dimensions and the features

Each dimension is implemented by a number of features and management activities. Those features are explained below and depicted in Fig. 3 - along with the dimensions that they define.

3.2 Design of the empirical study

In this research fifty communities (ten of each genre) were examined for their community designs. Becker and Hummel conducted the empirical research and more details can be found in [9].

To capture the profile of a virtual community, each feature is given a mark ranging from 1-6. The highest mark "6" is given to a community, if the activity or the feature is done/used most intensive compared to the other communities in the sample. The mark "0" is given in absence of a feature or activity or if it is not used at all.

The arithmetic means of the ten communities is the mark of the feature of the genre. The arithmetic means of all the features of a genre is the mark of the dimension. Community profiles consist of four dimensions.

Subsequently, the main results of the study are discussed.

3.3 Dimension "Clearly defined group of actors"

This dimension describes the interest and motivation that makes a community interact and the way that such an interacting group distinguishes itself from its context. The definition of a target group determines the focus of interaction and through this the potential for value creation.

Seven features define a clear focus of the community. A precise content focus (clear limitation) that is well communicated defines the target group of potential members. This content limitation is defined e.g., through textual descriptions of the community (e.g. well.com) or by the community name or URL (e.g. momsonline.com). The relations to the context of a community need to be given. In particular, the virtual communities in B2B have close relations to existing offline communities, as e.g., a community of trading partners; multi-user game communities have little relation to existing "offline" communities.

Complex entry rules that define how to join a community shape a group. Such rules limit the entry to the community to those people, who are really interested in. Farmpartner.com for example asks to sign a written contract and send it back before granting participation.

Access rules (primary authorization) with restricted access to areas are one more feature to define a community. Many communities have member-only areas that require

primary authorization to enter. Through such authorization a community is in control of who joins. This authorized login areas are found mostly in C2C and game-communities as e.g. asheroncall.com.

Another way of shaping the focus of the community is code of conduct (rules of treatment). This code can be defined either through a community organizer or the community members themselves. This feature is typically best developed in game communities and a community of interest (e.g. again, the well.com), the lowest extension is found in B2B communities.
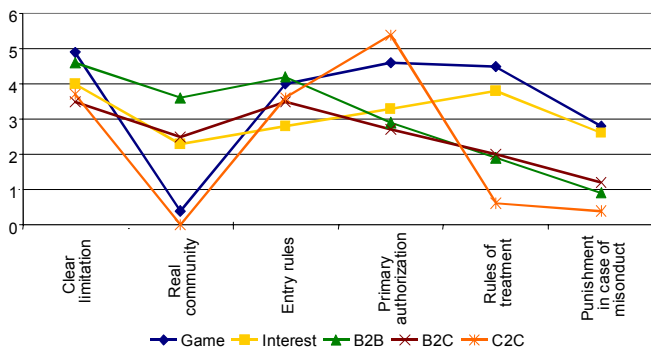
Fig. 4 Extensions group-profile

Having rules is one characteristic property - being able to govern the members such that they adhere to the rules is a different thing. The feature "punishment" captures the sanction mechanisms and ways of punishments. Some communities of interest or game-communities use sanctions (e.g. the temporary closing down of characters in uo.com), but overall, the extension of this feature is rather low as the possibilities for real sanctions are limited in a virtual world. Fig. 4 depicts the profile of the five genres of virtual communities. All genres shape the community, but to a different extent. The reason for the differences can explain with the business purposes. As the research shows, game communities and communities of interest try to narrow the focus the most. The reason for this might be, that these communities depend very much on tight and continuous membership, which only occurs – as sociologists' show - in smaller groups, since it allows the mutual evaluation of the users and their contributions among themselves. Transaction oriented communities, which are usually aiming for a high number of potential customers and where social interaction is relatively seen not so important are aiming at a broader scope - the more members the more choice - the better for the community.

3.4 Dimension "Interaction"

In this dimension the kind and quality of interaction is being captured. Community is always the result of interaction and the possibility for interaction and actual interaction may eventually let community emerge. Various authors argue (e.g. different contributions in [22]), that social interaction in virtual communities does not differ fundamentally from that in other kinds of communities. In interaction the users become acquainted, develop personal linkages and form themselves finally into a (virtual) community. There are different motivations for interaction - entertainment, the desire to talk to other people with shared interests. In any case the mere interaction is linked to emotions and the desire to have a role within a community and some sort of a "home".
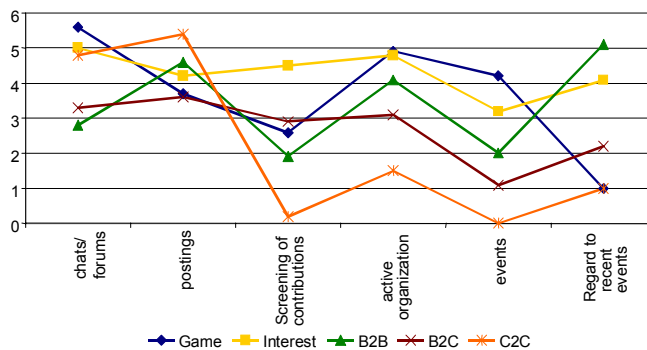
Fig. 5 Extensions in social interaction

Social interaction on Internet today is done almost exclusively through text and therefore it is easily comprehensible and storable. The new media may make conversations persistent such that it can be retrieved on demand later.

In the first two features we consider interaction services. Communication services as chats or forums support mostly online communication and many online sites use those means to facilitate social interaction. Community communication services were used most intensively in game communities, communities of interest and C2C communities. We were surprised that some sites as e.g. ricardo.de, which claim to be community sites, do not offer such services at all. The means are different, reaching from entertainment up to recommendations of recommender systems.

The feature "posting" captures "contribution of contents" by users as one way to stimulate social interaction. Examples are contributions of offers, links to other WebPages, files etc. All genres of communities offered this possibility, it was used most intensive in file-sharing C2C communities, but also at B2B communities as e.g. holzboerse.de.

The next features deal with the management of the interaction. One aspect in management is the screening of member-contributed contents. In feature "screening" we captured, to which extent the organizer is moderating the community, by monitoring the suitability of contribution and is deleting unsuitable content. Astonishingly enough, we found that none of the communities heavily utilized this feature. Matching contributions, i.e., the management that contributions suit to the community focus and adhere to the community values, and individualizing the services are two major possibilities to increase the value of the community for the participant. There may be three reasons for this low activity, first the fear of being accused of censorship, second the huge resources needed for moderating large communities and third the trustworthiness of the contents - community members do not trust a collection of streamlined contents and value an online discourse high [13,19]. B2C communities were most active in this field, as community interaction is perceived to be very important for foster selling - and many of the contributions are of low quality.

Moderation by an active community organizer or moderator and online events to foster interaction of the community members are two more features in managing interaction. Both features used most in the communication oriented community types as netnoir.com (interest) or asheroncall.com (game), where a very intensive interaction is necessary and the only means to keep the community lively.

A moderator may define establish and control codes of conduct as, e.g., the Netiquette or gaming rules and have agreed upon rules to modify the organization if necessary.

This holds also for B2B but significantly lower for B2C and C2C. The management processes are in B2C and C2C communities often implemented on the community platform that is governed by an actor - those communities have hardly any need to manage the organization themselves.

Events are utilized in community types with a lot of social interaction (Interest, Game and partly also B2B) to stir interaction for a short time, to enrich the interaction, e.g., with new topics, with intense interaction. Community members typically tolerate short, intense interaction - whereas a high volume is not tolerated. Also such events help to build the community a home and to bond among each other and to the common place. Examples are online discussions with prominent stars, special events as the ghosts at Halloween, wars, weddings or tournaments at ultima online.

The last feature of this dimension is called "regard to external events". Interaction within communities can be triggered by events that are external to the online communities. Examples are discussions of politics, the stock market or other features. Communities may be designed to structure and organization to react on such events. We found the highest regard in B2B-communities as baunetz.de, where intensive discussions about several events take place. Gaming communities however have in the most cases by nature no possibility to regard to external events. (This might eventually differ in mobile games). When one compares all the features, the transaction oriented B2B and B2C communities have the lowest interaction level - while C2C communities use interaction features more selectively.

3.5 Dimension "Bonding"

This dimension describes the social network of the community - the bonding among community participants. This bonding is the glue that ties together any kind of social network. Bonding is pivotal in any genre of community and, in particular, in the business-related ones since bonding increases loyalty, which is one of the most important value drivers within communities [5]. Being acquainted with the community or trust to community members are just a few examples on how the bonding can manifest itself.

The first two features, privacy protection and individualization deal with the digital representations of the individual and the social structure of a community.

Privacy protection is in particular relevant, when the members prefer to stay anonymous, as e.g., in the case of game communities, or because a community is opposed to using data on the community for marketing or other business purposes. We found strong privacy protection means, e.g., at avalon.mud.de or at stepstone.de.

In individualization, we mark the use of individualization and customization technology. This technology is utilized best at communication-oriented communities. Transaction oriented communities however have no interest in individualization, as they need standards for proceeding transactions and since people have an interest in accessing all information and all possible transaction partners.

With "sub communities" we denote the building of communities within communities. Those sub communities are often dedicated to a special aspect of the topic discussed in the large community - and many communities have some form of niches where "special interest groups" can interact without participation of the whole community. In some cases community members can found such communities

themselves. The possibility to found sub-communities were to a broader extent only used in communities of interest as e.g. tripod.de, where the members create new discussion circles around a special theme. On the other hand, this feature makes no sense in C2C, where a wide range of products and transaction partners is important.

Concerning usability (user-friendliness), all communities, more precisely the interfaces to the community platforms of the communities considered in the sample are already very user friendly [9] The community organizers note the importance of this feature.

The last two features deal with the organization of the community. Community members and community organizers need to be represented and distinguished.

The role and digital representation of the community organizer with its commercial interest distinguishes itself in almost all communities. The highest extents reach B2C communities that feature the role of community organizer very clearly. The lowest extent is found in C2C communities, where organizers play a minor role - and where the community often opposes the organizers.

Concerning the digital representation of community members, the digital identity of community members is less prominent and consists often only of a name as basis for member-to-member communication. Identification seems to be important when participants can directly interact. Accordingly, the highest extent is found in communities of interest as e.g. thirdage.com, where the members are identifiable or at least represented through e-mail accounts.
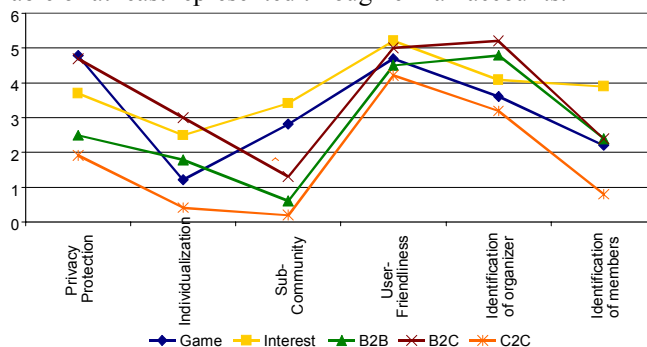

Fig. 6 Use of features to intensify bonding

Note that the types of communities have very similar profiles in this dimensions -they distinguish themselves mainly in the extent in which they use the feature - and hardly in the weight of the features - genres rank high or lower than others in most features.

3.6 Dimension "Common place"

The dimension "common place" subsumes the description of a virtual community as a meeting point and the medium as a social place, where participants feel "at home".

As we know today, in terms of the development of clear roles, or of hierarchies there is no differentiation between virtual and other spaces. The reason for this lies most likely in the individual perception of the behavior of the different persons within a social space. Therefore, simplified spoken, the traditional sociological concept of the social space seems to be valid also in the Internet, but with the difference, that here the social space is separated from the physical dimension. On Internet, distance to the social space is equal for everybody and social space is equal far away for all users and a particular space can be multiplied without

reference to other social spaces. This means that the design of a particular social space needs particular attention - to design it in a way that it separates from other online places and that the community feels at home at its place.
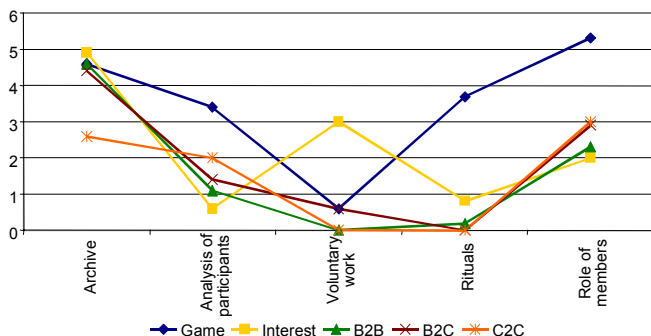

Fig. 7 Features for the common place

Different features are able to support the creation of a "common place". Archives are one of the most important ones. In all kinds of virtual communities we found in the established ones often an archived history, which is comprehensible for new members and enables them to reconstruct the emergence of the existing rules and special habits on the handling of topics. Good archives (e.g. baunetz.de) show the history of individual members as well as of the community itself. In good archives, profiles of the individual members allow them to reflect their own behavior or learn more about the others. The possibilities to learn about oneself (cf. feature role of members) or about the other participants are to a higher extension only given within game-communities (e.g. asheroncall.com).

Feature "analysis of participants" captures the whether and how intense the users are observed, e.g., in a recommender system from those conclusions.

Volunteerism, i.e., the contribution of volunteer work to the community and its development is not being very much used. Volunteerism was more or less only possible in communities of interest, where Sub-Communities (e.g. ivillage.com) have a long tradition. One exception is here the International community of chess players - where volunteers take over much of the management of the community

Also online culture or rituals which can be used to create a special community feeling and to show the specialty of the community in contrast to the environment where only found in closer game-communities, where the participants obviously stayed long enough to develop those (e.g. everquest.com). As rituals would not fit to the characteristics of usually rational transactions they could not be found in those communities.

Not astonishing, in game communities we found also the most differentiated role system. Some of those role systems have clear hierarchies as in real communities (e.g. uo.com). But also in all other types of communities we found some kind of role system. This could be a status as junior, senior, expert (bn.com) or a role like buyer or seller or - especially in C2C-Communities the explicit statement that all members are on the same level.

Note that all kinds of virtual communities rely heavily on archives, roles for members and allow community members to take on special roles. Game communities invest the most in building up a feeling of a common place. This seems plausible as some members of this kind of community obvi-

ously transfer already parts of their social life to these communities when staying there most of their spare time.

3.7 Community profiles

For the community profiles, the dimensions are being aggregated. In the community profile, the arithmetic means of the features of dimensions is summarized to a single mark. The community profile captures in how far a community utilizes a particular feature.
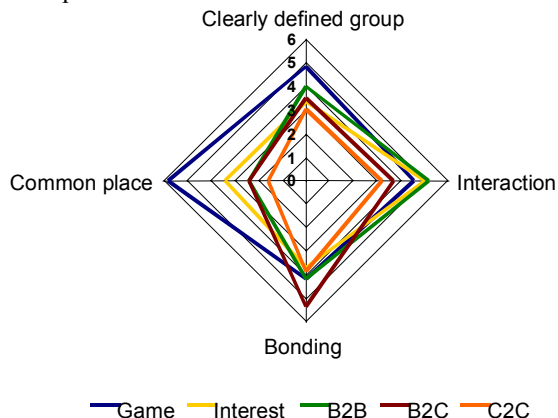

Fig. 8 Community profiles

The social profiles of the five community genres are depicted in Fig. 8. The different communities adapt different kinds of platforms - and the organizers of virtual communities utilize already the available features and activities mentioned above quite consciously to support their respective economic objectives. To explain the interaction of the social and economic aspects in virtual communities we take a look on the three central functions of virtual communities.

One function of virtual communities is to be a "stage to present oneself". Communities in this sense are part of an entertainment economy. The most important examples are game communities, but also communities of interest. Game communities create often a quite realistic social environment to promote an intensive community feeling. Contrary to other types of virtual communities they use thereby also extensively community features, which promote the development of a feeling of a common and familiar place. The extent of the success of those activities can be seen at various game communities, where members spent a huge amount of their spare time. The supervisors of these virtual playgrounds succeed obviously to create a common place, where the members feel at home and where they turn gladly back and stay for a long time. However this alone does not suffice. Also in the other dimensions such virtual communities have extensive activities and highly used features. Therefore, with all required caution the conclusion might be drawn, that virtual communities use possible features in all four dimensions in an increasing amount, the more they try to imitate "real" social environments. Thus, for example the prerequisite for the required high density in interaction between the members is also a clearly defined group, which supports a continuous participation and a small group size.

A second function of virtual communities can be the generation and transfer of knowledge. This is true especially for communities of interest or to certain extent also for B2B-communities. According to the results of the research they often try to increase the interaction of the users above the average level. Since the interaction, as already mentioned above, promotes already the bonding, they need

however quite often just minor features in the dimensions of bonding. Besides that, in particular in B2B-communities, there is often also not too much restriction of a group, since those communities are eager for a high number of transactions. Since the emotional component is already clearly less developed in all these communities than e.g. in game communities, the common place is not so important any more. These types of communities are in this dimension more restricted than game communities.

Finally, a third function of virtual communities is to create a trustworthy transaction environment and to attract a sufficient number of users to a certain place. In this case, the community concept is primarily used to stimulate transactions. The organizers often put special attention on activities and features, which increase the bonding of the participants. This can be explained through the nature of trust, which develops after a certain time and therefore needs returning users and a mutual knowing of each other. This seems to be the case in particular for transaction-oriented B2B and B2C communities, where the organizer has a commercial interest to support transactions. The results from the research appear plausible for several reasons. On the one hand the intensity of interaction is often smaller than in other types of virtual communities. This is partly due to the often provided just limited possibilities, partly due to the number and the needs of the users. Therefore the effects on the bonding of the participants are smaller. Furthermore the marketing costs are smaller as well. The marketing costs for the acquisition of new customers are one of the most important factors on the creation of profit in transaction-oriented business models. Moreover, the meaning of a common place is however not very high. Participants stay usually only a short time in here and a rather sober and transaction process determined by rationally efficiency criteria does not need emotional elements. Also the extension of a clearly defined group is here, in particular in B2C-communities often consciously rather far, in order to address as many customers as possible.

The connections described above apply also to C2C-communities. Their average profile is however clearly smaller in all four dimensions than the other forms of transaction-oriented communities. This reflects the strongly transaction-oriented needs of the users on the one hand, and, second, the specialties of the peer-to-peer technology. With some technologies there is even no possibility for interaction any more. On the other hand this reflects also the difficulties of this genre of community to establish itself as a business model. Until now, none of the examined communities takes transaction fees. The incentive for the organizer for binding users consists therefore primarily of achieving the critical mass of users, which is necessary due to the underlying mechanics of network effects. Therefore he will obviously also take no efforts to limit the size of the group.

Summarizing the results of the research described above, it is obvious, that the activities and features of the community, which shape the social momentum are subject to a clearly rational economic calculation of the organizer, who uses the specialty of the Internet – the interactivity- for an increase in economic value of the business model and for the maximization of profit. Virtual communities mark thereby a further step in an increasing understanding of the potential of the Internet for getting connected to the customer and doing business with her. The interactive and thus also increasingly powerful customer leads however to new challenges for the management of these kinds of business models. The main challenge is the management of a complex social system with his internal network effects. Therefore, virtual communities can hardly be founded; they have to develop themselves out of a social momentum. This dynamics is to be explored in the following section.

4 Community Dynamics

Communities with their social network emerge from interaction and evolve with interaction from a social momentum. In the previous section, we have considered the services and the use of those services and management activities that create such a social environment. Management of the social environment is only possible to some extent - the social network within a community needs to develop its momentum. In this section, we explore this community dynamics.

Various authors have studied the dynamics of communities. Preece [16] explores the social networks within communities and the design of services to support a desired behavior, [12] the dynamics of growth within virtual communities, [5,6] the financial benefit from community organizing. Those authors are mainly interested in the effects of the size - not in the complex interplay between social factors - as we are.

We proceed as follows. After a collection of seminal definitions (Sect. 4.1), we explore the dynamics, services and strategies of community growth (Sect. 4.2). Then, we study the social network with its internal dynamics, its services and its stabilizing power (Sect. 4.3). We conclude this section with a discussion of peer-to-peer and its inherent system dynamics.

4.1 Definitions - Feedback and Network Effects

Note that the definitions of this section are taken mostly from [20]. According to *Metcalfe's Law,* the value of a network corresponds to $n*(n$-1$)$ where n is the number of nodes. When the value of a product to a user depends on how many other users are using it, economists' say that this product exhibits *network externalities*, or *network effects. Positive network effects* describe that the value of a network increases with the number of nodes - *negative network effects* occur when the value decreases with an increase of nodes. *Feedback effects* describe the impact of an action later in time. Positive feedback effects denote a positive impact and negative a negative impact. Positive feedback effects result in the big getting bigger and the small get smaller while negative feedback effects result in the big getting smaller and the small get bigger. Positive effects polarize while negative feedback effects stabilize a network.

To analyze effects we employ system theory. A system is represented as a graph with the nodes representing the factors that contribute to an effect. The interdependencies or correlations between factors are depicted as the directed edges of the graph and they are adorned with "+" for a positive and with "-" for a negative correlation.

4.2 The Growth of Virtual Communities

Interaction and contribution of the members to the creation of economic value both characterize virtual communities. Both to interaction and contribution positive network effects apply, since an increase of potential communication partners and an increase in contributions may make it worthwhile for others to join. Armstrong and Hagel or Shapiro

and Varian stress that Metcalfe's law applies to the value of a community [2,20] and this pattern of network externalities and feedback effects motivates the socio-economic business model of virtual communities of Hagel and Armstrong or Timmers [5,23].

Community platforms and community organizers offer a variety of features (or services) to support or trigger growth.

Many of those services rely on the community model of direct interaction and on established social relations. Examples are invitations (e.g., the email services of Amazon, Groove or of ICQ) and services for sending pieces information via email to friends, incentives to invite and integrate new members to a community.

Many focus groups grow best in a grass root manner by word of mouth - those communities grow along established social relations. E.g., Napster never used classical marketing - the news spread either over word of mouth or via news on that "novel, evil, copyright infringing service". The classical unidirectional marketing channels, as e.g., advertisements, only work basically in open communities with little social relations and low boundaries for newcomers or in transaction oriented communities. B2B and B2C communities rely quite heavily on conventional marketing.

The model of purely positive feedback effects is however rather euphemistic and seems to hold only to some extent - from a certain size on the positive network effect can turn into a negative one. From this point the further increase in number of members decreases the value for every member of the community due to increasing complexity [15]. Reasons can be information overload, loss of quality or loss of focus. Due to this the community as a social network has to find ways to get along with scalability, which we discuss later on.

4.3 The Social Dynamics within Communities

Growth in terms of number of members and contributions is just one aspect of how communities and their social networks eventually evolve. In large communities, all the factors that characterize a community deteriorate - communities with an intense social network are typically rather small and to keep communities small, negative feedback effects exist that stabilize communities and limit their growth.

In Fig. 9 the social network is depicted. We identify four systems of network effects, which we label Content, Loyalty, Profiles and Focus.
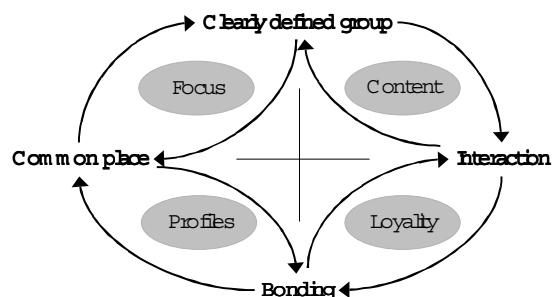

Fig. 9 Social network

The *content* that is exchanged within a community is defined by the community and its interest and in terms of language and values on the one hand and the actual interaction on the other hand. Interaction increases the available contents and the available contents increase the group being interested in them or the common knowledge of groups. The common knowledge may also work as a boundary against

newcomers - and these are the negative network effects that balance the positive ones that originate from size and content.

The *loyalty* of a group can be defined in terms of the social relations within a group and to the place. Such social relations increase the interaction within a group as well as the bonding of a community to the platform or its community organizer. Increasing the bonding increases the quantity and often also the quality of interactions and the social relations and bonding to a place draws the interaction of a community to a place. The lock-in of a community to the platform is part of this factor. Loyalty however constitutes also as a boundary that makes it difficult for outsiders to join a community. Again there is a possibly strong negative network effect here.

The profile of a community member and the system of profiles of a community distinguish a member of the community resp. the community as a whole. Profiles and systems of profiles capture the information that is available within the community and the digital representation of community members. The better those are, the more likely they bond the community to the place with its representation. The better the systems of such profiles - the more likely the community members interact and develop a social network. A good profile system again works as a boundary to the outside world. Newcomers do not have good profiles and it takes time to integrate them into a structure.

The *focus* of a community is determined by the common language, common values, common interest and motivation to contribute. Any group has such a focus and the focus determines the place with the available contents, the services and the motivation to shape this place according to the needs of a community to "feel at home" while being at this place. A place designed to meet the needs of a group distinguishes a group and helps it to perceive and maintain the focus. A clear focus and the feeling at home at a common place shapes the community - but again, a well-defined group is not open to newcomers to join.

Those four dimensions show that there are both negative and positive feedback effects. Both need to be considered to design a community and both need to be considered for the definition of the social momentum of a community. The crucial issue is the balance and a scalable design can help to manage growth while pertaining a social quality within a community. What does such a scalable design look like?

4.4 Scalability

The two previous subsections explored the momentum of virtual communities from two perspectives: the dynamics of growth and the social dynamics within communities. The two objectives of having a large interaction network and an intense social network within a community are to some extent contradictory as we have discussed above. Services and the structuring and organization of interaction may change communities that the two goals can be achieved. This is what we explore in this subsection. We consider the scalability of virtual communities, the services and organizational structures that make communities scalable.

Communities do not scale - not all factors scale with the size of a community, with the number of members, the number of transactions and the quantity of information; too much interaction results in information overload, too much contents or members make the community loose its focus and too many members loosen the social relations and di-

minish the motivation for many members to contribute; Often the growth of a virtual community results in a take-over by passive members, lurkers and free riders. Various authors have observed that kind of negative feedback and network effects and the resulting decline of virtual communities [1,12,16-18].

This conflict of reachability of a large number of members vs. the richness of social relations seems to be inherent to communities. There are two options; to split up communities or scalable service and interaction design:.

Splitting up communities - once different foci have been developed within a community, when communication becomes too much or divides up into several threads is one of the options (cf Sect. Dimension "Interaction and sub communities in Fig. 5). The classical example for the splitting up strategy is the Usenet. Bulletin boards with too many communication threads spin off threads following an agreed upon procedure. Splitting up is however, only an option in communities with loose social networks - like in Usenet.

Scalable interaction services are the second option to deal with an increase in the number of members and the number of interactions. One important service that makes communities scalable with the number of members is archives. Pull communication is less prone to result in information overload than a "push". Asynchronous communication is perceived to scale better than synchronous communication. An archive may make much of the communication of "Newbies" obsolete (cf. chat/forms in Fig. 5, archives in Fig. 7).
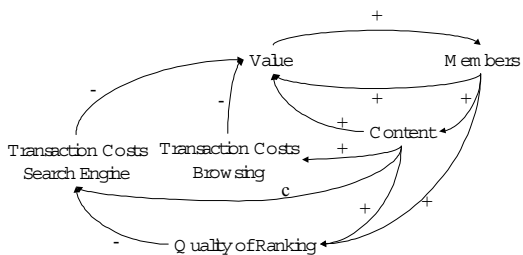

Fig. 10 Feedback effects for search engines

The design of services is crucial for scalability. A service may neutralize a negative feedback or reverse a negative to a positive effect. One example for this is search engines. Let us explain the feedback effects of search engines as depicted in Fig. 10. The contents available within a community -to some extent- contributed from the community members. More members contribute more contents and this increases the value of the network, which motivates users to join - network externalities and positive feedback patterns apply.

But, when one considers location of information and the transaction costs for locating as part of the network the system dynamics changes. There is a positive correlation between quantity of contents and the transaction costs for locating information via browsing. An increase of those transaction costs decreases the network value and results in a negative correlation between contents and value.

For a search engine this is different. The transaction costs of using a standard search engine can be assumed to be independent of the quantity of contents, i.e., they are constant (the respective edge is adorned with "c").

Some search engines however feature a smart design with positive correlations between quantity of contents to value. This positive feedback effect is based on a correlation of the quality of search results on the one hand and the

number of searches performed, the number of users and quantity of available contents on the other hand.

The ranking of the search results has turned out to be the crucial factor for the users - and not the mere quantity of available information (cf. searchenginewatch.com). Search engines as directhit.com or google.com are designed such that the quality of the ranking has a positive correlation with the number of users and the number of contents. The more users direct hit has, the better the ranking gets, the ranking of google improves with the number of contents and the number of links (cf. searchenginewatch.com).

Generally speaking, the role of the medium is to structure and organize the communication and to make interaction persistent [21]. Filtering and aggregating information makes it also an important means to make interaction scalable. Examples are the "best of" lists, ratings or ranking of transaction partners based on past performances (cf. Fig. 6 and Fig. 7), or the various forms of digital representations as they are used in games.

Let us have a look on the scalability of the virtual communities of the empirical study. The precondition for network externalities is contributions of community members to the community and its creation of economic value. Here the communities differ widely.

Communities are means to participate through contribution and interaction to the creation of economic value - but this does not necessarily scale. A high amount of contribution typically is managed both by splitting up and in the design of services. In ultima online, the gaming software mediates e.g., the impact of fights and trades on the digital representations of players and players may found and design their own villages and cities - to avoid overcrowding of places online. In all other communities, directory structures organize the community systems that result from splitting up communities - there are directories of bulletin boards, newsgroups, and discussion forums. Mediation takes places through "best of" or "most popular" lists, histories of contributions are summarized in a single reliability ranking or simply in the number of contributions.

There are communities with hardly any means for the community to participate to the creation of economic value or to interaction - and therefore there is hardly any necessity for splitting up or designing interaction services scalable.

The relation between contribution of the single member to the creation of economic value and the perceived value of the community is a crucial issue. A positive feedback makes a community grow, negative feedback stabilizes the community. Here peer-to-peer infrastructures distinguish themselves from conventional (client-server based) platforms in terms of the feedback. In a peer-to-peer network the members make high contributions in terms of resources - in addition to the contents.

Let us discuss the system describing the relation between value, number of members, contributed and available resources depicted in

Fig. 11.

The kernel is the network effect of a correlation between value and members.

The right side captures the "global perspective". The more members the more storage capacity, bandwidth and computing power is available in the network to the disposal of the community members; the number of members and quantity of resources correlate with the value. The left side

describes the individual perspective with feedback on content contributions. An increase in content contributions increases the contributions storage capacity, computing power and bandwidth - a download costs the one who contributed contents bandwidth and processing power in the download. Those contributions diminish the network value for the contributing user. Worse, this decrease of value is related to the number of users - the more users the higher the contribution gets since more users eventually means more downloads [1].
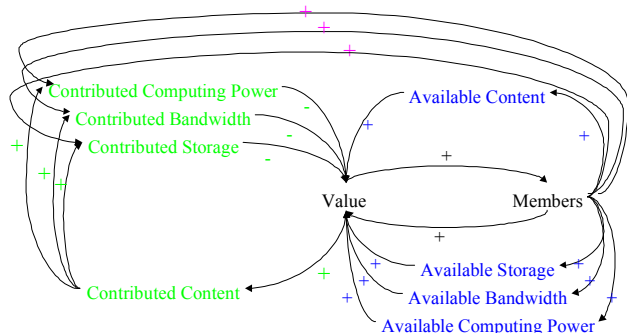

Fig. 11 System dynamics in Peer-to-Peer

Thus, in peer-to-peer the negative feedback effects are inherent – only a social environment or a social effect on the contribution can compensate them. That negative feedback effect is both curse and blessing for virtual communities. It stabilizes the community and such an investment of resources gets most likely accompanied by a strong interest and motivation to participate actively in a community. Thus, peer-to-peer is a real chance for online communities - without a strong management. Social networks are however needed to make peer-to-peer a success - not too many people tolerate the above mentioned negative feedback effects. And this brings us back to the starting point - to virtual communities as a sociological phenomenon and the need for social environments for the transactions.

5 Concluding Remarks and Discussion

The communication and transaction architecture of virtual communities is one example how information and communication technology renews the creation of economic value. In a virtual community, all members interact, all contribute to the creation of economic value and peer-to-peer architectures facilitate transactions among peers. Particular to this new business logic of virtual communities is the role of the community as a social construct to the actual transaction and the combination of social interaction with transactions. In this paper we explore the design of this social environment for transactions. The empirical study of virtual communities shows that the social profile and the dynamics of the social momentum of communities differ according to the business purpose. The design and management of such social networks is not well understood and the emerging peer-to-peer architectures provide new chances and challenges for this design.

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