

COMMUNITIES - THE ROLE OF TECHNOLOGY

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ABSTRACT

Information and communication technology provides design options for the creation of economic value. We consider a particular architecture for the creation of economic value: the communication model of a community and its implementation in peer-to-peer computing architectures. We discuss the socio-economic model of a community, explore the social, political and economic impact of communities and describe the functions of communities and the way communities are being organized. We explore the role of technology in establishing communities and show how community models are being implemented with peer-to-peer architectures and discuss the impact for organization on industrial structures. We illustrate our approach with short cases of communities.

1. MOTIVATION AND INTRODUCTION

Information and communication technology provides novel media for the creation of economic value and, in particular, for communication as part of the creation of economic value. Three basic architectures for communication (depicted in **Figure 1**) can be differentiated.

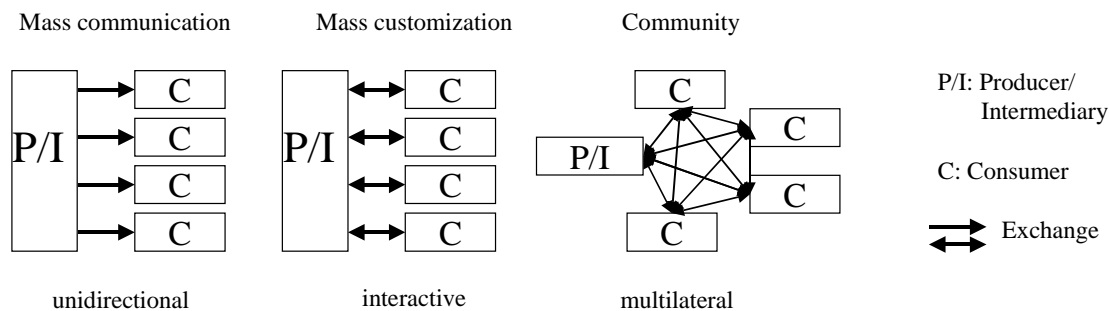


Figure 1: Communication models

In mass communication, the traditional model, communication is unidirectional. Information is produced and distributed to the consumers through channels which allow hardly any feedback or consumer contribution. In mass customization, communication channels are interactive – content can be exchanged between consumer and producer/intermediary rather than transmitted from producers to consumers. In mass customization, a little feedback from the consumer enables the producer/intermediary to tailor the communication to the indi-

vidual consumer. In the community model all interaction partners are able to communicate with each other. Information and communication technology refers to this architecture as peer-to-peer. All members of a community are able to participate in communication on an equal basis, i.e., as peers. Internet has a peer-to-peer architecture in the sense that every participant may initiate communication to anybody connected to this network. The World Wide Web and its technology allow everybody to publish and retrieve information.

Internet is basically a peer-to-peer architecture for communication. We argue that this has renewed communication as part of the creation of economic value. The peer-to-peer applications that facilitate peer-to-peer transactions might eventually renew the whole creation of economic value - more thoroughly than peer-to-peer architectures for communication. Currently, the predominant transaction on peer-to-peer architectures is the sharing of files and in particular of mp3-files. This might eventually change. The implications of peer-to-peer architectures on the creation of economic value that the organization of industrial sectors motivates this paper and our analysis of system architectures and peer-to-peer communication. Our approach is to discuss the notion of community, i.e. of peer-to-peer model for communication (Sect. 2) and the business model of community (Sect.3) with the functions of a community. We explore the role of technology for communities (Sect. 4) and show how services with peer-to-peer architectures implement the business model of community (Sect. 5). In this section, we also explore the limits of community models. In Sect. 6, we discuss the findings.

2. DEFINITIONS AND VIEWS OF “VIRTUAL COMMUNITY”

The term "virtual community" refers to communities in which electronic media facilitates communication, in particular, for communities where interaction takes place on the Internet. Online community is a synonym for "virtual community". Over time, various aspects of virtual or online communities have been discussed in literature: social, political, and economic aspects. As this discussion has taken place, the perception of virtual communities has changed from a social phenomenon to a valid business model (cf, (Hummel and Lechner, 2000)).

The creation of economic value in this business model results from the content and knowledge, the participants bring into the community (Timmers, 1998). The members of a community may contribute to the creation of economic value with various kinds of contributions: information, product reviews, recommendations, pieces of music, files to be shared. Virtual communities, however, provide the social and economic environment that meets human needs and the economic value that these communities contribute can hardly be separated from this context.

Virtual can be viewed through a sociological, economic, or technological prism. 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...” (Licklider and Taylor, 1968).

Probably the definition of Howard Rheingold (Rheingold, 1993) is best known. He defines virtual communities as purely related to the Internet. From his point of view, 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” (Rheingold, 1993). Later, he also emphasizes the importance of the connection between real and virtual communities. Due to his experience with the virtual community "The well" (well.com), he sees communities as “....a group of people who may or may not meet one another face-to-face, and who exchange words and ideas through the mediation of computer bulletin boards and networks” (Rheingold, 1994).

Godwin and Jones construct their argument in a similar manner. Godwin is of the opinion “...but in cyberspace, increasingly, the dream is not just ‘owning a house’ – it’s living in the right neighborhood (Godwin, 1994)”. Jones even speaks of "virtual settlement (Jones, 1997)". Figallo later 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 you, the community host. Those relationships lead to interactions that bring value to members” (Figallo, 1998).

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 in their definition “...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...”(Whittaker et al. 1997). 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...” (Preece, 2000).

Hagel and Armstrong were the first who broke with the view of virtual communities as sociological phenomenon (Hagel III and Armstrong, 1997). They see in virtual communities a business model, which uses the possibilities of communication on the Internet to create electronic marketplaces and to increase customer loyalty. 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”(Hagel III and Armstrong, 1997). (Hagel and Bughin, 2000) analyze the potential of communities to generate revenues.

The role of technology is to provide the platform that facilitates communication and the structures that structure and organize a community with its communication. We therefore consider a technological view of communities. It comprises the constituting components of communities that are necessary to design the physical part of a community - the community platform. The technological view defines a *community* as to be constituted by (1) a set of agents together with (2) a medium (Lechner and Schmid, 2000; Lechner and Schmid, 2000). *Agents* may be humans, software agents, organizational units – any entity that plays a role in the game of exchange and communication (Schmid, 1997).

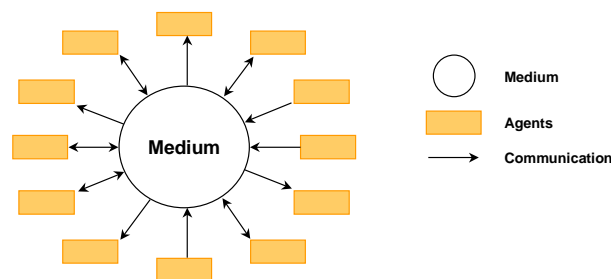


Figure 2: *Medium as Sphere for Communities (Schmid 1997)*

Media is seen as the sphere in which the agents interact. A medium consists of a channel system for the transport of information over space and time, a logic, for capturing syntax and semantics of the information and an organizational system (roles and protocols) for structuring the behavior of its agents (Schmid, 1997; Schmid, 1999). A community is characterized by a common language and world, by common values and interests.

Virtual communities and the discussion in the literature covers social, political and economic aspects of the design of communication and interaction online. Particular to online or virtual communities is that technology enables all members of the community to communicate with each other. This particular communication architecture of a community is considered to be a business model that is particular in the digital economy and it has social, political and economic implications. We consider those implications in the next section more in detail.

3. VIRTUAL COMMUNITIES AS SOCIO-ECONOMIC BUSINESS MODELS

Virtual communities are socio-economic business models and they fulfill social, political and economic functions. In the previous section, the various social, political and economic views of virtual community have been discussed. In this section we switch perspectives and discuss the social, political and economic

functions of communities in the creation of economic value. Regarding their *economic* functions, commercially-oriented virtual communities can contain all economic functions that are part of other intermediates. Beyond the function of intermediary, virtual communities also allow interaction between all participants – consumers, manufacturers, and third parties (e.g. associations). All of them benefit from a higher transparency with respect to the market and products and from a tremendous increase in the amount of available knowledge.

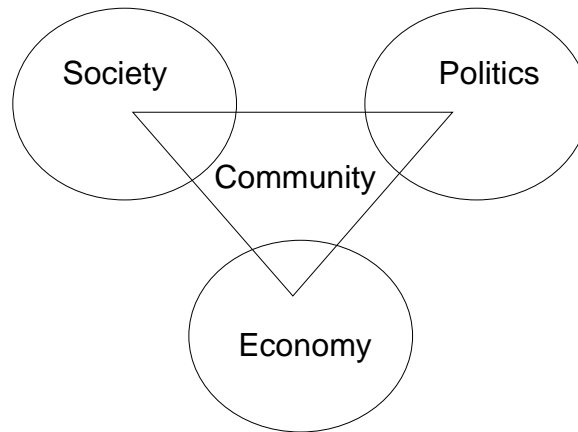


Figure 3: The three functions of virtual communities

The *social* function of a virtual community above all offers its members a familiar home. The sustainable acceptance of the community through its members and, linked to this, the surveillance of the community, are very much related to the ability of the community to fulfill this function. Second, it sometimes contains *political* functions. The influence of well-organized virtual communities on the development of politics and society can already be seen. The influence and its potential is based on the bundling and organization of single interests.

The success of virtual communities results especially from the combination of these different functions in one business model. As a result, the creation of an atmosphere of shared values and trust is made possible. Common values are a prerequisite for the community members to actually meet their interests. Mutual trust is a prerequisite for any community to prosper socially and economically.

A common set of values is distinguishing, e.g., valid and non valid propositions, good and bad products, ethical and non-ethical behavior are characteristic for a community. Those common values e.g., terms of use, are communicated by information about the community and its medium. They are implemented in the protocols which follow. Those common values can be enforced by the binding power of a medium in governing the agents. For example, a workflow system may enforce a user to perform a certain task - by not granting him other options than to follow a certain procedure. There are values that the platform cannot enforce the users to comply with. E.g., the workflow system can offer only one option to act - it cannot actually force any agent to perform this action.

Trust is another prerequisite for any community. Moreover, agents have to entrust processes and other agents and any piece of information within the community. The need for trust correlates with the inability to monitor and control other agents on which the welfare of an agent depends (Tan and Thoen, 2000). Moreover, trust reduces social complexity. It compensates the lack of ability to monitor as well as the lack of knowledge and understanding within a community.

A variety of means to establish common values and mutual trust have been developed. Communities (cf. e.g., epinion.com, dooyoo.com) collect product reviews by consumers on a neutral platform. Others (e.g., Amazon.com) collect reviews from customers and from other sources, as e.g., newspapers. Rating services, as e.g., on EBay (ebay.com), at the auctions on Amazon.com or the Kasbah (Maes et al. 1996) capture the trustworthiness of agents based on past performance. Moreover, trust in processes and agents are fostered by the public forum that a community constitutes. Non-compliance with the common values becomes public immediately with considerable damage to the business.

In all virtual communities, technology provides the platform that enables communication and services to structure the communication. Technology often plays a decisive role for those communities and the design space technology offers can lead to communities with novel social, political and economic structures. In the next section, we analyze the role of technology for virtual communities.

4. AGENT-ORIENTED AND MEDIUM-ORIENTED COMMUNITIES

Communities are considered to be a socio-economic business model. Technology "just" enables the community platform and the services for communities. These services shape the community and the communication within a community. The platform with its communication design is subject to design - other than social, political and economic functions, or trust and common values that result from the communication design. Therefore the role of technology for a community and for the design of the platform and services is of particular interest to us. We argue that the role of technology is increasing. The first communities emerged on Internet from a strong desire to communicate and still some communities emerge this way. In most cases, in particular in the economic relevant communities, the services of the platform play a decisive role in establishing a community. In this section, we explore this role.

Recall that we characterize communities by two components (1) a set of agents and (2) the medium. Accordingly, we distinguish (1) agent oriented communities - where the agents are mostly responsible for interaction - and (2) medium-oriented communities in which the medium predominantly shapes a community. We argue that medium-oriented communities gain in relevance.

4.1. Agent-Oriented Communities

Virtual communities employ a medium to facilitate communication. They rely on active contributions of the community members. Typically, the organization and social relations within those communities resemble traditional notions of real-world communities. Examples are the „Usenet“ and “the Well”.

The Usenet has emerged as a system of communities across various electronic networks. Each newsgroup is dedicated to a particular topic and constitutes a community of subscribers. Communication takes place asynchronously by posting and reading posted messages. Each user may subscribe all publicly available newsgroups and post information to all groups (with the exception of moderated groups). Particular to this community system is its openness and the impact on self-organization (technically and socially).

The Well (www.well.com) is considered to be the classical example for a system of communities. Its discussion forums are open only to subscribers of the service. Organization of the system of communities is done by the providers of the interaction platforms. Particular are the close and persistent social relations. Note that the Well has been founded to be accompanied by "real" meetings of the Online communities' members as to foster deeper social relations.

In such communities, the platform and its services mediate between the agents – similar to traditional media like newspapers, surface mail, meeting rooms. Those communities are more or less virtual counterparts to existing communities. They rely on active contribution and interest of the agents.

4.2. Medium-Oriented Communities

The motivation of people to contribute actively information is quite limited and active contribution in communities demands often some computer proficiency. Computer science provides the options to design media that play an active role in fostering the exchange of information within a community: The platform exchanges information: it gathers, evaluates and distributes this information.

Consider, e.g., the automatic recommendation services featured by many Online Shops. The community of customers shares information through those services - however this information is being autonomously gath-

ered, evaluated and distributed by the platform - and not contributed explicitly. The community and its interactions are digitized in form of profiles and business rules in personalization.

This kind of interaction among the community members is often more important than the members' active contributions. For instance, Amazon exchanges information between the customers in the recommendation service - to recommend books (and other goods) that had been bought by consumers with the same profile, or that may have not yet ordered online. Both active contributions and the computer generated communication are a value add for the consumer. However, it is probably not the explicit communication of reviews that makes the difference for the economic success.

The medium with its services does more than only communicate information - it may detect the organizational structure, e.g., based on preferences, from the interaction of users on the platform and develop hereby a digital representation of the community on the medium. Thus, a platform with its services may constitute a community with its organization.

4.3. The Role of Technology

From a historical perspective, the first virtual communities to emerge were agent-oriented communities in which electronic media provided just a virtual counterpart to a "real" place of interaction or a traditional medium. Only then, medium-oriented communities emerged, in which the medium itself played an active role in establishing a community and which have novel interaction designs. Those communities gain relevance with the increasing number of users and with the commercial interest in communities by their organizers. In many cases platforms and services are designed such that some agents form a community - without having interest to form one - such that the one who owns the platforms benefits from the social, political and economic functions of communities that a single intermediary alone never disposes of.

Only recently, the interest in novel designs of platforms, in particular, in peer-to-peer architectures surged. Examples as Napster and gnutella illustrate the impact of those systems on the creation of economic value. Those peer-to-peer architectures provide communities with services for peer-to-peer transactions. Up to now interaction in virtual communities is mostly "communication only". The peer-to-peer architectures enable peer-to-peer transactions. We argue that this increases the relevance of the socio-economic business model virtual community and the economic function of virtual communities. We argue also that the peer-to-peer architectures can change structures in the creation of economic value according to the community model for communication. In the next section, we analyze the restructuring of value chains due to peer-to-peer or community structures.

5. COMMUNITY ARCHITECTURES

In the previous section, the socio-economic business model and the role of technology for communities have been explored and we have illustrated how technology and the design of the platform with its services shapes a community. The communities and services that have been mentioned in the previous sections have dealt with the exchange of mere information. In this section, we illustrate that technology drives the development towards communities that perform transactions on the basis of novel platform and service architectures. Following (Booch et al. 1998), we consider an architecture as the set of all design decisions of a system. We focus on one particular design decision of a community and its platform - on the aspect of a (traditional) centralized architecture with information asymmetry and asymmetric communication vs. (novel) decentralized design with information and communication symmetry. We study three applications (1) information services, (2) price mechanisms and (3) the music sector. Common features they share are:

- A variety of coexisting business models and system architectures. Some are online counter parts of traditional business models and some feature novel designs.
- One can observe the trend towards decentralized design - towards a community.
- The community architectures have distinctive advantages concerning scalability and quality of service.

Our motivation in choosing those three cases is that gathering, processing and distributing information or price coordination are a part of almost every business model. The music sector online however illustrates the share power and speed at which things evolve - and that communities actually organize themselves online.

5.1. Information Services

The gathering, processing, evaluation and ranking of information are core competencies of information services such as search engines. Figure 4 depicts three value chains of search engines (1) of conventional search engines, (2) of Direct Hit (directhit.com) and (3) of Google (google.com).

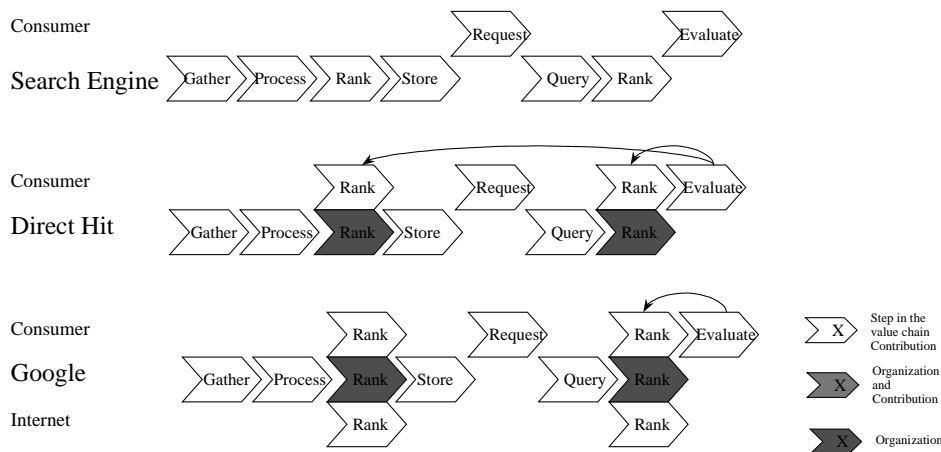


Figure 4: Value chains of search engines

We consider the steps (1) gathering information e.g. through robots, (2) the processing of this information including e.g. indexing (3) the ranking done to discriminate e.g. spam from valid pages, (4) the storing, (5) the request (by a user/consumer), (6) the query in the internal database (7) ranking of search results to compute an ordered list of results and (9) the evaluation results of the user to determine relevance. We consider three roles: consumer, search engine and Internet community. Let us describe the value chains.

Conventional search engines (Search engine), as e.g. Yahoo (yahoo.com) or Altavista (altavista.com) gather and process information, ranking and storing them in databases. The user (customer) requests information and the search engine performs a database search, ranks the results and responds. The customer then evaluates the results and chooses which links to follow. The search engine implements the knowledge of processing, rating, storing - the user only requests information and evaluates the results. This system architecture only uses the knowledge of programmers for processing and ranking information.

Direct hit makes the customer community take over the function of ranking. The links users follow are considered to be relevant and gain in relevance within the ranking. Direct Hit observes the behavior of users to detect the users' knowledge on good links, using it for ranking. Direct Hit just organizes the community. (the arrow in the value chain is dashed to represent the organization only function of direct hit). This search engine improves quality with the number of users. The distinctive advantage of this architecture is that the service learns the semantic level of "understanding" of users concerning relevant pages in general and specific domains in particular.

Google (google.com) lets the community contribute even more. Google organizes the consumers and the Internet as a whole to contribute to the ranking. The ranking of a page depends on the number and rating of the links that point towards this page. Hereby, the rating of a link correlates with the relevance of its source - only relevant information sources are "awarded" by users to be linked to. This means that Google leverages the information that is implicitly contained in the link structure of the Internet to a rating. Google provides only general heuristics (depicted as dashed arrows) and organizes the community.

This architecture draws the knowledge about good and relevant pages mainly from all the users on the Internet - they are supposed to know good pages and to implement this in links. Google also captures the "better kind" of knowledge: links already represent knowledge of relevant resources - not a guess which page might be relevant like at Direct Hit. Both Google and Direct Hit capture the general and syntactic knowledge -like conventional search engines- combined with the semantic level of understanding and the domain specific knowledge of users. Note that the approach of Google scales: the quality of service improves with size and link density of the Internet.

To sum up the community architectures of Information Services. Stages of the value chain are being taken over by a community and the information services just organize the community. The search engine observes the community and gains from it the "understanding" of relevant pages as well as domain specific and implicit knowledge that only humans used to dispose of. Thus, organizing the community has a value add wrt. quantity and quality of knowledge.

5.2. Price Mechanisms

In this section, we illustrate the roles that customer communities may play in price mechanisms. We consider (1) the conventional model as implemented e.g. in Online-Shops, (2) Priceline, (priceline.com) and (3) Powershopping, as e.g. implemented by letsbuyit.com. The value chains are depicted in Figure 5. We consider the stages (1) Production (2) Offer (3) Marketing (4) Coordination with distributing information, matching supply and demand, contracting and (5) accepting the offer. We consider the roles of Customers, Coordination Mechanism and Producer.

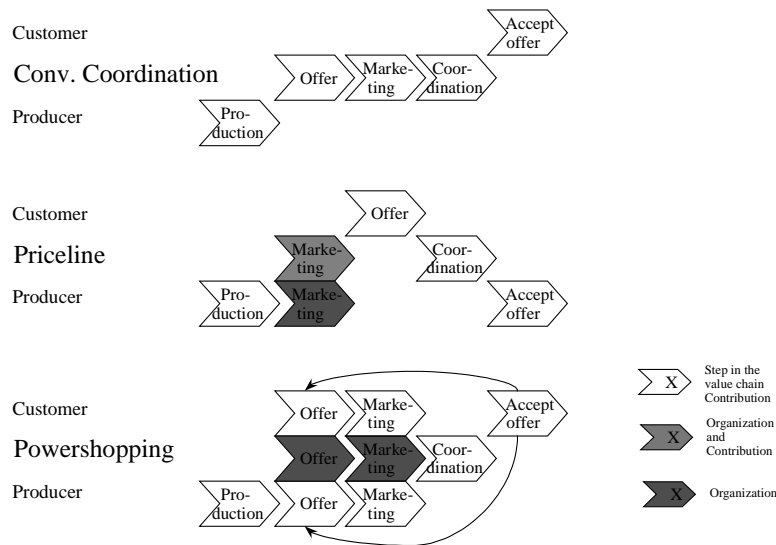


Figure 5: Value chains of price mechanisms

In a conventional model, as e.g. in an Online Shop, the goods or services are being produced. The intermediary offers the goods, does marketing and communication with the customers and coordinates offer and demand. The customer "only" accepts the offer.

At priceline.com, both producer and intermediary do marketing (producer for the product, intermediary for offer), whereas the customer makes the offer. The intermediary coordinates offer and supply and the producer accepts the offer. At Priceline, the roles of making and accepting an offer are being switched.

In Powershopping, the producer makes the offer that varies depending on the number of customers willing to accept it. I.e., that the customer influences the offer by accepting it (depicted with the arrow). Hereby, consumers, the intermediary and the producer do marketing and communication. In particular, the customers are motivated to communicate among each other and to persuade other consumers to join the buying community. The intermediary manages all the communication and particularly the communication among the customers.

In "price mechanisms", the customers gain influence. They take over the roles of making offers or at least of influencing offers and they take over roles in marketing. Recall the developments in information services and the discussion on values - in particular trust and the roles that a community takes over there.

Note, however, that in all three system architectures the customer has to employ an intermediary. Typically, intermediaries gain some revenue in actively acquiring and processing information about the individual customer. Customers eventually would strive towards autonomy on their user data. Agent technology can provide this kind of autonomy for the user (Maes et al. 1999; Vulkan, 1999).

5.3. Music Sector

The music sector online illustrates the close relation between business model and system architecture as well as the adaption of users to new architectures - on the basis of clear incentives. The traditional value chain of electronic media and the novel value chain of digital media is depicted in **Figure 6**.

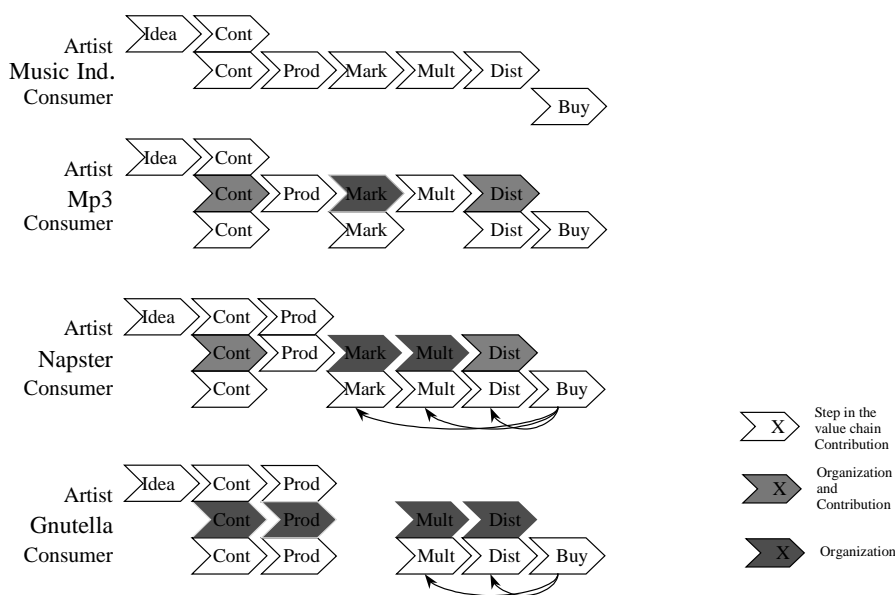


Figure 6: Value chains in the music industry

In terms of value creation, we distinguish seven steps in the value chain and a respective communication model. There are also seven steps in the *traditional uni-directional value chain of the music industry*. The artist is responsible for the creative part, the idea. The contents are established. Artists and music industry work together. Then, the product is packaged, marketed, copied (multiplied), and distributed. The music industry controls these stages in the creation of economic value. The role of the consumer consists of purchasing the product. This value chain is depicted as the classical value chain of the music industry in Figure 6 (Music Ind.). (Wössner, 2000).

The novel services for content management – MP3, Napster and gnutella – implement these steps in the value chain in a different ways.

MP3.com considers itself an online repository of the users' music files to facilitate access to that music from everywhere on the Internet (source: www.mp3.com). Users are allowed to upload pieces of music up to a certain extend and rent further storage capacity if necessary – or identify themselves in the so-called beamer services as owners of a carrier (CD) for some piece of music. Each user has an account that allows access the pieces of music online. Access to music is granted via Internet technology and general browsers of all kind. MP3 gives unknown artists the opportunity to release a CD online and offers to produce, ship, and offer CDs on demand. The artist sets the price and receives up to 50% of the revenues.

MP3 offers a matching or recommendation service that points out artists and music to match an individual's profile. In addition, MP3 offers various services of community interaction, since the architecture is client-server based. The client has files, registry and, because of the community services of recommendations and interaction, all information about the consumers and the artists.

In terms of the value chain, the consumers, service, and artists contribute mp3 files. The service of MP3.com contributes the storage space for content and some means to structure and organize access to content, for example search engines and directories. The consumers is also doing some kind of marketing through reviews and a recommendation service for peer groups (but of course the main parts of marketing are still done by the music industry). MP3.com structures and organizes those contributions. They play an essential role for the distribution part of the value chain. MP3.com again just organizes this.

Thus, MP3 implements three steps in the value chain in a different way: the production of contents, the marketing, and the distribution. In all three cases, the consumers assume some role for production for content – Mp3.com provides the means for structuring and organizing and allows for some interrelationship between community and contents. However, only the step of marketing follows a community architecture. Only at this step of the value chain, do the community members interact following a community model – the implementation of the other "novel" implementation follows patterns that are more similar to the original model of the value chain.

Napster.com considers itself "the world leading file sharing community" (source napster.com). The server Napster.com offers a directory of lists of files to be shared and software to participate in the community. Each Napster client offers mp3 files in a dedicated folder on the hard-disk to be shared with the community and allows registration of those files in the central directory. To search a file, the Napster client accesses the server and its directory of files at napster.com. Swapping of files takes place following a peer-to-peer architecture. Napster.com offers interaction services and a recommendation service.

Napster.com has all the information necessary for community management. Every member of the community contributes content, storage facilities for files, and digitized profiles. The Napster clients are, in turn, servers for the swapping of files.

In terms of the value chain depicted in Figure 6 the service itself is involved in the marketing, copying, and distribution of the titles. The decision of a consumer to download (buy) a mp3 file influences the marketing implemented in a recommendation service. This dependency is represented as backwards arrows in Figure 6. Note that consumers themselves provide the resources for copying and distribution and trigger copying and distribution. This is also depicted as backwards arrows. When compared to the traditional model, Napster implements four steps of the value chain in a novel way: production of contents, marketing, distribution, and copying. More steps of the value chain follow a community model – it is the community which contributes as peers to marketing, copying, distribution, and contents and each step follows a community architecture. Moreover, Napster has features such as buddy lists and allows for blocking of certain users – such that the social aspects of a community and the content management within this community are more interrelated. Thus, the architecture of this value chain is more peer-to-peer and the social function of community spills over to content management.

Gnutella is a file-sharing application. It is widely used to swap any kind of file. Gnutella clients form a self-organizing net of peers. To join the net, a client has to know at least one single gnutella client. Searching for files and swapping of files are exercised in a peer-to-peer architecture. A gnutella client is client and server for files. It offers all files in a dedicated directory to be shared on the net; and each client-server swaps files, searches for and requests files. There is *no* central service.

Gnutella clients do not offer any community building services, as e.g., communication or recommendation services, i.e. there is no marketing step in gnutella's value chain. The value chain of gnutella shows that – apart from marketing – all steps in the value chain of the music industry have been taken over by the consumers. They contribute the content, replication and distribution (by their decisions to upload and download music). The service just facilitates all these interactions by the consumers.

Concerning the business models, the position of MP3 seems to be perfect. The server has to be accessed to get files. Community building can rely on data that are known from the individual. However, since community organizing seems to be the main source for revenues, the architecture of Napster appears to be much more efficient. The system architecture ensures that Napster receives all relevant information about the user and their preferences (at least when files are swapped). Community services encourage interaction via Napster (e.g., on the chat). However, gnutella ensures that files can be swapped without having a single point where all information is gathered. Neither the software nor information of the community can generate revenues – the protocols make gnutella a self-organizing system (similar to Usenet). Therefore, there is hardly any ground left for generating revenues.

5.4. Developments in Community Architectures

The three major applications depicted in this chapter illustrate that communities may take over a number of roles within business models - adequate organization precluded. We observe two major trends in those architectures. First, traditional business models and system architecture merge with the novel peer-to-peer architectures. Second, we observe that the peer-to-peer architectures dispose of transaction functionalities. Such infrastructure has the potential to leverage the community interaction from "organized peer-to-peer exchange of information" to "organized peer-to-peer transactions".

Let us briefly discuss the limits of such peer-to-peer architectures and of the interaction design that they enable. First, a clear common understanding of the business is necessary - as long as the community is agent-oriented, requiring active participation. The benchmark is probably the Open Source communities. Communities design and code software - but in the case e.g. of LINUX, the Apache Web-Server there has been a very good common understanding of the goal and the structure of the problem - based on existing systems. Novel ideas, as e.g. gnutella or Napster, are typically not implemented within an open community. Second, despite the fact that an infrastructure enables all members of a community to contribute - there are asymmetries in contributions and asymmetries in the influence people have on the communities. On gnutella and Napster, only very few people contribute files (Almost 70% of Gnutella users share no files, and nearly 50% of all responses are returned by the top 1% of sharing hosts. (Adar and Huberman, 2000)). On rating or expert markets some people establish themselves as opinion leaders. (cf. expert.com - where the highest ranked expert has typically more the double the rating than the second). One can observe that technology provides the infrastructure, that diligent design of the services may organize a community adequately, but that a communication design, organization and management are necessary to establish a community on a medium - and that technology can only provide the design options for this. This relation closes the circle to the sociological perspective that we discussed previously - technology can provide the infrastructure, but the communication design has to follow the requirements discussed in the sociological perspective.

6. DISCUSSION AND CONCLUDING REMARKS

Various authors have studied the phenomena of communities - most of them the social aspects of communities (Rheingold, 1993). Hagel and Armstrong (Hagel III and Armstrong, 1997) made the idea of communities as business models popular and many authors discuss the environment a community provides as a prerequisite for transactions (Hagel III and Armstrong, 1997; Schubert, 1999; Jones, 2000). Only recently, system architectures that reflect the community paradigm, e.g. in peer-to-peer computing, have become popular. The novel architectures support much more than just "communication and information" - they are the basis for transaction, organizing the community to take over a number of functions. Technology drives this development and the socio-economic business model "community" gains a new relevance in various application fields.

The music sector, and in particular the alliance of Napster and Bertelsmann and all the legal approaches to stop the developments, illustrate that originally technology driven designs may change a value chain and even a whole industry sector. In this paper we show that technology provides novel options for the design of value chains in almost any field of business.

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