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ABSTRACT

Most previous literature on virtual communities has taken a macro perspective viewing the virtual community as a whole instead of looking into the actions of individuals. This study offers a different perspective as it looks into a virtual community from the point of view of the individual. In so doing, we propose a social mechanism that concentrates on the actions of individuals leading up to and including their membership in a specific type of virtual community associated with the file sharing technology Bittorrent. A further analysis is then presented of a macro process which views the membership process as a whole and suggests there that outside forces of technology/community growth, ISP and CSP involvement, and diminishing experience with traditional media commerce further impact community membership.

Keywords

Bittorrent, community membership, file sharing, social mechanism, virtual community.

INTRODUCTION

As the Internet has grown in strength and complexity, its role in interpersonal communication has grown as well. Today, sites like Facebook (www.facebook.com), MySpace (www.myspace.com) and Twitter (www.twitter.com) are just a few examples of the type of technology based networking that is taking place. Other examples of community based technologies include message boards, blogs, virtual reality domains, and newsgroups. The collective users of any one of these technologies form a 'virtual community' with its own inherent characteristics and actions.

A search through the extant literature on IS was hard pressed to find a definition for 'virtual community'. While there was no clearly stated definition, there seems to be an inferred definition which assumes the extension of the term 'community' to a group which interacts via computer based technologies as opposed to interacting face-to-face. A dictionary definition states "a group of people who interact via Internet Web sites, chat rooms, newsgroups, email, discussion boards or forums; also called [online community]" (dictionary.com). The authors of this paper suggest that the interaction taking place amongst peers in peer-to-peer (p2p) filesharing applications fits with these definitions. While interactions in filesharing applications may not be considered as rich as chat conversations or email text, the premise behind these 'networks' is that if there were not two way actions by active participants, the network would cease to exist. At the very least, a file sharing network would have little value for anyone and thus little participation if it were one sided. While there are 'freeloaders' on these networks, or those who connect simply to download content and then disconnect, they could not achieve such ends without those that support the network by uploading content. Additionally, the file sharing process is one in which multiple individuals are

working together to achieve an end (complete, downloaded files). This interaction is only possible while there are multiple connected peers, both uploading and downloading, such that individuals coordinate efforts through their clients. While this effort leaves much of the communication required to the software client, the interaction involves rules and etiquette that will be discussed later in this paper. Adherence to these rules suggests a community presence rather than simply technical machinations.

Virtual communities have become of special interest because of their popularity and novelty (i.e. virtual worlds) as well as their impacts with sites like the aforementioned Facebook and MySpace. A community of interest in this study is that which forms around the Bittorrent technology. Bittorrent is a file sharing application (and also the name of the protocol which enables this application) currently being used to download primarily multimedia files (i.e. music, movies, books). This application rests on the shoulders of Napster, a product which started a controversy in the music industry in the late 1990s (www.Napster.com). While Napster is something different now, it started as a way of matching clients looking for a particular electronic file up with providers of that file. Napster was shut down by federal legislation that was interpreted to uphold Napster with enabling copyright infringement. Napster worked by maintaining a directory of file locations so that those searching for a specific file, usually recorded music, would be matched up with its location and subsequently be able to download the file. Bittorrent, by contrast, employs peer to peer (P2P) technologies. Unlike Napster, P2P technology is comprised of many clients working together without direction from a central source. The peers are autonomous in their actions.

Bittorrent makes use of peers communicating together in a technical, social environment to take advantage of file sharing (similar to Napster). However, the sharing is reliant on the peers communicating (through the Bittorrent protocol) and carrying out the file sharing activity with each other rather than through a third party management tool which governs the transaction.

While Bittorrent's underlying technology is different, issues which emerged with Napster are relevant in the Bittorrent environment as well. However, this is not a study on the ethical, economic or legal issues that have emerged with Bittorrent; rather the study focuses on formation of the community which is a necessary component for Bittorrent technology to work. More specifically, the aim of this study is to propose a social mechanism that explains membership. In other words, we want to answer the question: what are the necessary conditions and what are the processes for an individual to become member of a Bittorrent community? In addition, we are interested in seeing how individual activities are related to macro social processes, such as the effect that these communities may have in values and culture, namely the indifference that Bittorrent members may show towards the buying of digital music.

From an academic viewpoint this study is important in that it will propose a model, a social mechanism that can be the basis of further confirmatory studies of Bittorrent, other p2p technologies or completely different contexts.

Business managers and owners interested in bolstering communities of practice in their organizations may find this study valuable in that it can explain behaviors of individuals as well as groups. Specifically, current business models typically do not include the use of P2P networks and may even consider them a nuisance or worse. A better understanding of this type of technology could support the adoption of updated business models which incorporate the technology or at least make allowance for its existence.

VIRTUAL COMMUNITY LITERATURE

This is the study of a community based on a specific type of IT. As such, this study fits in with other research to date on virtual communities. However, as suggested above, we offer a fresh perspective as it presents the process of becoming a member from the point of view of individuals. The extant literature was reviewed for contributions which covered community development, characteristics and actions. As will be seen, models, theories and tests are offered which address the virtual community as a whole but little was done from the perspective of the individual.

Proposed models suggest there are important concerns to be addressed when designing a virtual community. It is desirable for the community to exhibit certain characteristics by which its success may be measured like population growth or at least stability, and sustainability over time. Such concerns suggest consideration of factors like relationship types, and user involvement as elements to be accounted for in design (Jones, Ravid and Rafaeli, 2004; Moore and Weigland, 2004). From another view point, studies have looked at the interaction among members of a community and suggested there are mechanisms which may optimize elements of the interaction such as level of communication, richness of content and understanding. (Silva, Goel and Mousavidin, 2008; Lin, 2008).

While some research concentrated on traits important to community design there were other studies which concentrated on the sustainability of the community. Models were presented taking a resource based approach (Butler, 2001) or in one case a biology model was applied to make recommendations on the sustainability of a community as if it were a biological colony (Porra and Parks, 2005).

Specific characteristics associated with virtual communities have been identified and their relevance to behaviors or actions has been suggested. One study suggests there is a 'sense of virtual community', an extension of a sense of community, which develops within virtual community environments (Blanchard and Markus, 2004). The formation of norms has been discussed from a standpoint of relevancy to productivity (Postmes, Spears and Lea, 2000). Studies have suggested the environment the community is in plays a role in determining participation and involvement. For example, the intereaction within a community of practice associated with professional organizations looks very different from that of online message boards discussing politics or hobbies (Malhotra, Gosain and Hars, 1997; Ward, 1999). Others simply looked at virtual communities and their composition based on special circumstances like crisis or conflict (Pliskin and Romm, 1997; Mowbray, 2001).

Knowledge sharing has been viewed as one of the main purposes for the existence of a virtual community. To this end research has suggested that there is importance in the study of barriers and facilitators of knowledge sharing both cognitive and environmental (Ardichvili, Page and Wentling, 2003; Wasko, Faraj and Teigland, 2004; Chiu, Hsu and Wang, 2006; Yu and Chu, 2007). Other models suggest a longitudinal approach which develops optimization of contributions over time (Beiber, Englebart, Furuta, Hiltz, Noll, Preece, Stohr, Turoff and Van De Walle, 2002; Ma and Agarwal, 2007).

Trust has been an element that has been singled out as being wholly important to the function of a virtual community. As such several papers discussed the antecedents and formation processes leading to trust in virtual communities (Jarvenpaa, Knoll and Leidner, 1998; Leimeister, Ebner and Krcmar, 2005; Porter and Dunthu, 2008).

A pragmatic approach has produced suggestions for virtual community management contributing to the sustainability or contribution maximization depending on the community's intended purpose (Oh and Jeon, 2007; O'Mahony and Ferraro, 2007).

In some cases virtual communities were evaluated in terms of their specific application. One study looked at the use of a virtual community for software development (Holstrom and Fitzgerald, 2006). Another suggested an application of blogs for the reinforcement of good business practices (Ip and Wagner, 2008).

The extant literature reveals much investigation into the makeup and working of virtual communities. Models for construction and optimization of interactions have been constructed. Environmental factors, intended purposes and strategies for management have been presented and characteristics of community makeup have been discussed. It is the intention of this study to fill a gap in the literature by addressing the processes an individual goes through to attain membership in a virtual community. By proposing such a mechanism, this study fits within the domain of virtual community research while providing explanation around a phenomenon which to date has not been researched.

METHODOLOGY

Data was gathered through 'auto-observation' (Adler & Adler, 1994). The use of this observational technique allows for complete immersion of the researcher into the reality of the study environment. Such immersion was done by performing the information gathering and action steps necessary for one to become aware of the Bittorrent technological environment and utilize the technology to download digital content. As will be seen, iteration of these steps leads to the individual's membership in the Bittorrent community.

Information was gathered from more than 30 web logs (blogs) and general information websites including those published by businesses that develop software using the Bittorrent protocol or host web sites which provide some necessary files for the Bittorrent communities to function (i.e. tracker files). This data was collected over a period of approximately 3 months in mid 2008.

The actions taken were documented in a 'thick description' (Geertz, 1979). This is a detailed, step by step account of the observer's activities as well as insights gained throughout the process. This thick description was developed by one researcher working with the Bittorrent client for a few hours at a time several days a week spread out over a 3 month period. Between activity periods with the client or when additional information was needed, research on blogs or web pages was performed. Because the process of using the Bittorrent client involves seeking information as well as trial and error, updates were made as iterations revealed new insights or provided additional data. In this way a hermeneutic circle was formed between the use of the tool and collection and interpretation of data found in blogs and on web pages. The thick description

is presented in the first person because this is how the data was captured and we considered it of value to leave the description unaltered.

A set of social mechanism diagrams was developed based on the interpretation of the data (see figures 2 & 3). Social mechanisms can be useful in providing an explanatory model by which qualitative data can be evaluated (Mayntz, 2004; Steel, 2005). They serve as tools for representing 'causal reconstruction of social macro-phenomena' (Mayntz, 2004). This is helpful when deriving explanation from data which is difficult or impossible to quantify in terms of specific, measurable variables. The derivation of a social mechanism gives us the ability not only to describe the phenomenon in terms of a causal representation, but to afford us a tool for predicting behaviors thus making it possible for our study to generalize to other contexts. The outcome of the causal chain in the mechanism is the explanandum, that is, the phenomenon under study. In our case the explanandum is 'becoming a member of Bittorrent'. As such, it is reasonable to anticipate that a mechanism derived from observation might be used to represent a causal chain of actions that other individuals would follow leading to the posed explanandum; i.e. how and under which circumstances an individual may become a member of Bittorrent.

As indicated above, for this study, the explanandum is posed as 'how is membership in a Bittorrent community achieved?' The proposed social mechanism consists of the actions leading to becoming a member of a Bittorrent community. The mechanism diagram shows three different elements: standing conditions, mechanism, and explanandum. The standing conditions are those necessary for the actions/behaviors to take place. The mechanism is then represented by the causal path of actions which lead to our explanandum. There were two diagrams developed as a result of this study, a macro and a micro. The purpose of the two level approach was to accommodate the different levels of data represented in the observations. It becomes clear that while there is a micro mechanism which exemplifies actions within the causal chain of BT community membership, there is also a macro view which exemplifies conditions outside of the micro mechanism that have an impact. The mechanism diagrams will be addressed further in the discussion portion of this paper.

THE THICK DESCRIPTION

What is Bit Torrent

Bit torrent (BT) refers to both a protocol and an application. Bram Cohen has been credited with engineering the protocol in Early 2001. Since that time he has pioneered the organization Bittorrent.com for design and use of the protocol. The Bittorrent site offers a free download of its client for general use. The client uses the BT protocol to participate in the file download process. Following in Bram's footsteps there have been numerous others, numbering in the hundreds, which have since come up with their own clients using the standardized protocol.

BT as a protocol is used to take advantage of peer-to-peer networking technology for the purpose of downloading large amounts of electronic data. The traditional approach to file downloads utilizes a network server which serves as both a home for the file to be downloaded and a manager of the download process. Requests are sent to this server and the server initiates a connection with the requestor, over which the file is then downloaded. As files become popular targets for download this process becomes a bottleneck for those trying to download the file. BT utilizes the peers (individual clients) who simultaneously request the download of a particular file to alleviate this bottleneck. The server in a BT transaction purely acts as a starting point to link together peers and start them sharing. Once the sharing process has started the server no longer plays a role; the download process is divided up amongst the peers. In this way, bandwidth of the network is shared and processing of the download is facilitated.

The server in this process houses only the 'torrent' files. These files, with a .torrent extension, are simply the markers for setting up the BT transaction. There is no content to be distributed by the server; the server plays the role of a 'tracker' setting up the connections among peers in order for the transaction to take place. The key to this process is the interaction among the individual clients involved in the transaction as a result of the technology.

The community is called a 'swarm' and the roles are those of uploaders (seeds) and downloaders (peers or leechers). As a seeder you are the user with a complete copy of the file being requested. As a peer you desire a complete copy of the file. When the swarm is set up, an active seed in the swarm breaks up the file and distributes it to the different peers who are active. The peers are then able to communicate and share the pieces with each other until everyone has a complete copy of the file. It is expected that peers who receive a complete copy of the file keep their client connected to the swarm until others are done. If they shut down their client prior to other members getting any unique part of the file they may have had, others in the swarm may not get a complete copy of the file. When this happens the swarm must wait until it has been re-seeded by

someone who does posses a complete copy. The more seeds there are in the group, the more accessibility by the peers and the faster the download speeds will be.

The behavior of those who do not conform to this proper rule of etiquette is called 'leeching'. Those that download but do not uphold their responsibility to upload are called 'leeches' or 'leechers' (although in some cases this may refer to peers who simply don't have anything to upload yet). For the protocol to be successful it is important that the peers understand they should leave their client up and participating in the swarm even though they've received their complete copy of the file. In spite of no emphasis on this by the client programs, the process is highly successful which indicates that this norm is being observed to a great extent. Investigation into the use of the Bittorrent tool produces many blogs or web pages describing proper etiquette when participating. As becomes evident, there is a goal behind creating a high ratio of upload to download. Higher ratios are observed by some tracker sites as a requirement for participation. Even without the motivation of participation in 'exclusive' tracker sites, blogs will carry discussions of 'good' behavior with comments inferring the more respected members of the Bittorrent community are those which contribute as well as take and that those contributions are measured in terms of these ratios.

Some other important terms for discussing torrents are:

- *Availability ratio*: This is a number which designates how many complete copies of the file are available in the swarm. Unless this number is at least 1 no peers will receive a complete file.
- *Share ratio*: This is an indicator of how much your client uploads in proportion to downloads. Good ratios are close to or over 1.
- *Choking*: Client activity which incorporates intentional withholding of data while evaluating connection status between peers or in order to uphold acceptable download performance.

Using Bittorrent to Download

Using the BT protocol requires the use of a client which must be installed on the user's computer. Using a search engine on the Internet and the words 'Bittorrent client' produces thousands of hits. While investigating the realm of clients to use, I encountered blogs and general information web sites with various view points on the 'best' client to use. After reading through several of these and weighing the possible pros and cons of the use of different clients I decided to take the lead of what appeared to be majority opinion at the time and I downloaded and installed the client from Bittorrent.com – imaginatively named 'Bittorrent 6.0.3'(as opposed to some more imaginative names like Azareus or Bitlocker). The marketing from the makers of this client includes an allusion to the fact that the head of this organization is credited as the creator of the Bit Torrent protocol (Bram Cohen) and suggests expertise in this area as a result. It was enough to sway my opinion on the integrity of the download and the reliability of the product.

The client download went as a typical download from a website does. Upon selecting the link to the file download for the client I was asked if I wanted to open it or save it to my computer's hard drive (ironically, the download of the client cannot utilize the bit torrent protocol, luckily these are not large files). I chose the latter and ran the installation from the downloaded file after the file download had completed. The installation started an installation wizard which stepped me through verifying the installation start, the file install location, the icon groupings, and prompted for a read through of an extensive license agreement. The install was very quick and simple with no unexpected issues.

Once the install had completed I was immediately directed to the Bittorrent.com download pages. The client had appeared to install some software which enabled an ability to see streaming video on the website which was not active prior to the installation. I was viewing content as a sample of what I could download through one of the posted links in the directory of torrent files stored on their server.

Interestingly, the directory of download links does not appear to be accessible through the same path that I followed to download the client. It was only once the client was downloaded that I was directed to the torrent file directory. When I went back to the Bittorrent.com home page, I could find no way to access the directory, however, the installed client has a command within it ('Get Stuff') which takes me directly to the torrent file directory. This directory represents the type seen on many servers known as 'tracker' servers. These are the servers which host the torrent files which help set up the P2P communications and subsequently the download process.

The client displays much of the information relevant to the activities taking place during the torrent process including: seeds (both number in the swarm and number connected), peers (both number in the swarm and number connected), upload and download speeds, amount uploaded, share ratio, and availability number. When a file to be downloaded is located in the directory, the link to start the download can be selected. Selecting the link prompts the user to either save the .torrent file to

their hard drive or 'open' the file which starts the download process. The latter of these automatically starts up the Bittorrent client and initiates the download process.

The directory for this download site was typical of what may be seen on many of the torrent 'tracker' sites. Files are categorized into major headings. The most common headings across different tracker sites are movies, music, books, and games. For each entry in the directory there are indicators of the 'health' of the swarm associated with a particular file. Health appears to be a measure based on the number of seeds and the number of peers in that particular community. Additionally some other information may be taken into account like connection speeds and amount of time peers and seeds have been connected. On the site I was using there was color coding ranging through red, orange, yellow, and green indicating poor to good health respectively. After looking through the directory for a few minutes I chose to go with a download of a popular game which had a health condition indicator of good or healthy (green). This was a 1.4GB file which showed 14 seeds and 9 peers connected to the swarm (see figure 1 for an example of a Bittorrent client).

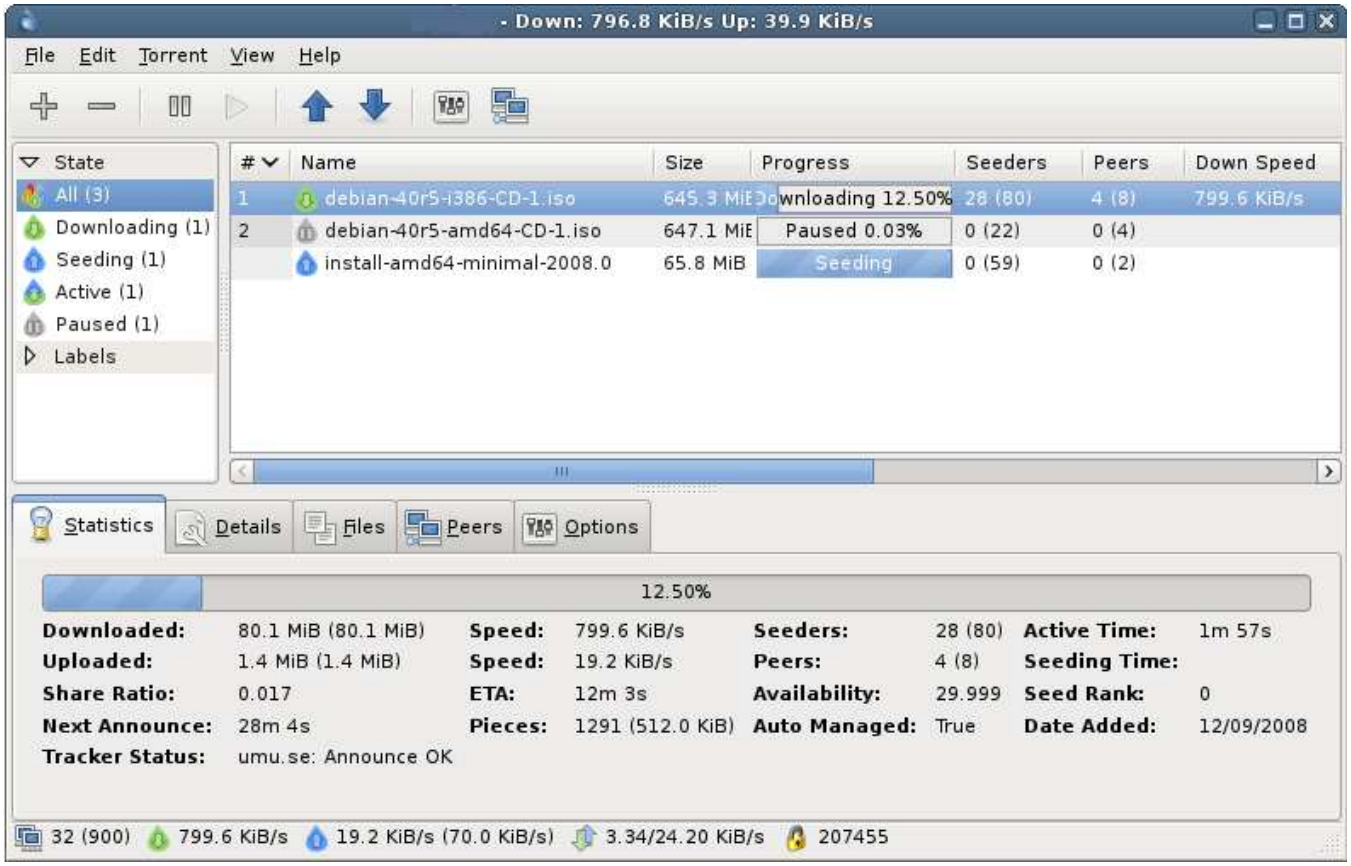

Figure 1. Example of a Bittorrent client application

Upon selecting the file download link the Bittorrent client is opened and the download process is initiated. This particular file took approximately 2 ½ hours to download. At startup the relevant statistics start showing in the client. Seeds and peers for the file start out as numbers close to those displayed in the directory on the server, but as time goes on these numbers change as members of the swarm enter or leave. My share ratio number started fairly low (.187) and went even lower (.127) toward the end of the download. The availability number also decreased over time, starting at 11.972 and decreasing to 9.931. These numbers make sense when you look at the behavior of those participating. The share ratio is indicative of how much I am uploading in relation to downloading. Since this was the only file I had any community connection to, my ratio stayed small since I was receiving more than I was uploading. Additionally, as time went by, members of the swarm would logically drop out as they finished downloading the file, thus rendering the total number of complete files available to the swarm lower. Note this latter behavior goes against good etiquette or social norms of a torrent community. According to acceptable behaviors, swarm members should leave their clients running to allow others to connect and retrieve pieces of a complete file. However, since this number did not drop to zero rapidly and stayed at around 10 for quite some time, it is evident that many subscribe to the norms of the culture. In fact, the loss of some may be justified in that those leaving the swarm may have been participating for some time after their download was complete. A normal, 'acceptable' attrition may have been what was observed here. In attempt to be a good member of the swarm I left my client up after my download was complete for several hours. In doing this the file status changed from downloading to seeding and I could observe connections being made to the swarm and upload speeds being displayed as my client now served exclusively as a seed member.

The first attempt at downloading a file went smoothly, without issue. Upon completion I went to the download directory of my hard drive and checked the file for functionality. The file was complete. It is an install file of the application and by clicking on it an installation wizard is initiated which installs the gaming application.

With this first successful test under my belt, I decided to try again with a music file. In this case I used an internet search engine to find another tracker server. The top entry in my search engine pointed me to the site www.torrentreactor.net. This site had subtle differences from the Bittorrent site but similar information was available in terms of categorization of files and health of the swarms associated with each file in the directory. A few minutes worth of search in the music category produced an entry to a popular TV show soundtrack. This file had an indicator of good health. I viewed the detailed information entered for this file which gave a detailed description of the contents of the file as well as some statistics about its popularity and a rehash of the swarm health associated with this particular file. I then selected the download link. For this first try at this a few minutes of an attempt was made to initiate the file (indicated by the browser busy icon in my web browser) and then an error page was displayed stating the file was unavailable and to try back later. I immediately made a second attempt with the same result a few minutes later. Finally after a third attempt, as before the Bittorrent client started automatically and the download process was initiated. Now I had both this new file in a download/upload process that is part of the bit torrent protocol and my first file downloaded previously in exclusively an upload status. As would be expected, this bolstered my share ratio number making it closer to 1. The availability number for this file increased to almost 4 during the download but shrank back to near its original value (1.5) by the time the download was complete 30 minutes later. The size of this file, being only 124MB in comparison, can account for the shorter time to complete the download. As exemplary of expected behavior for a swarm the availability number of this file rose as members were downloading (for the duration of my download) and had decreased again by the time mine was completed. This would indicate those with a higher awareness and conformity to the norms would stay while those without such awareness or sense of obligation left the swarm as they completed their download.

With 2 success stories as a foundation I decided to explore an entry which did not have a good health indication. A further search through the music files of this same sight produced an entry for a music album in low health state (colored orange, one step away from lowest, red). This health state suggests there are not an optimum number of seeders and leechers and as such I might expect a lengthy or incomplete download. Selecting the download link for this file came back with an error for the first two attempts. For the third attempt my computer went into an endless searching state. I stopped the process after 30 minutes concluding that the low health indicator for this torrent must have been accurate and I was not going to get a download.

To get a better feel for the health indicator I attempted to download a different music file with a similar poor health indication. This file however started the download process immediately. It appears as though there may be some luck involved in the timing or configuration of the swarm which goes beyond the health statistics from the directory of the tracker server. While these two files were in a similar state, the second connected immediately indicating there were clients in the swarm willing to negotiate with me as a member (viewed my bandwidth conditions and sharing ratio as acceptable) whereas a similar swarm configuration for another file produced no such relationship. There is a dynamic here that may be indicative of varying levels of connection capabilities among members as well as the integrated norms of good torrent behavior which if

observed should lead to a high share ration and thus better performance and acceptance. It could be that my connection speeds to clients in the latter swarm were higher than those to the first of these two attempts. However, it could also be that the limited upload/download activity my client had been producing was acceptable to the clients in the latter swarm whereas higher standards were required for the former.

Subsequent attempts to use the Bittorrent client to download files were all met with success. Times to download were extremely variable. In one case it took 30 minutes to download a 124mb file whereas in another for a 123mb file it took almost 1 ½ hours. Indications of the health of the swarm did not necessarily match up with success of downloads. Your ratio remains from the last time the client was up and further adjusts as activity continues. In this way, you don't just develop a good ratio 'per session' but this can take into account total sharing over a long period of time.

The Files Being Downloaded

By looking at several different torrent directory sites I was able to see strong similarities among them. All had general categories for organizing the content of the files for download. As mentioned above, the most popular categories were of movies, games, music, anime, and books. Other categories were less specific or 'catch-all' type categories like 'other' or 'special interest'. These latter categories encompass a large variety of content from podcasts of AM radio shows to scanned images of instruction manuals for household products. It seems clear that the networked computer user community has an awareness of the usability and power of the bit torrent protocol and is making use of it.

An area of concern by parties with vested interests in the content of these files is the potential for illegal distribution and use of the content. This is most prominent in the case of movies and music files, however, it was eye-opening the number of published books widely available through these sites. In the case of movies, there were several offerings of downloads for movies which had just hit the theaters in recent weeks. These movies would not be available for purchase in DVD or similar format for several more weeks, if not months.

Similar findings were evident for music in the form of songs or albums that had not yet been released but far less so than the movies. More prevalent in the music files were 'bootleg' copies of concert audio or video or both. While 'bootleg' recordings were quite popular some 20 years prior to this paper, I hadn't heard as much of them in recent years. The BT distribution capability may be a facilitator of their resurgence.

As mentioned, published works, especially college text books seemed to be a popular choice across the directories. Certainly the lure of a $150 text book at a cost of $0 must be a temptation. This or other motives certainly keep the sharing communities active in this domain as there were hundreds of entries for books to choose from.

Electronic Content Rights Protection

Perhaps one of the main reasons for the popularity of the BT protocol is the corresponding anonymity it integrates with its functionality. Since the protocol works by collaborative effort among peers, encrypted packets of information can be exchanged making tracking to a specific user difficult if not impossible. Websites hosting the directories for torrent files are only housing the .torrent files which contain no illegal content, only the information needed to start up a community of sharers. Thus, legal action against the torrent websites has proven difficult. Illegal activity has to be traced back to the protocol and the participating peers. This harkens back to the days of Napster and the first burst of sharing mp3 music files. Napster had the same argument, that it was not hosting any content, only facilitating sharing amongst members. However, Napster hosted directory information on their server which tied the server directly to the resources providing the illegal content. Napster lost its legal battle and was held accountable for its role in facilitation of illegal sharing of content.

Similar action has manifested against some of the bigger tracker sites for torrent files. In December of 2004 a Finnish site (Finnreactor) was raided and involved parties charged while software and media companies seek more than $5 million in damages. Other sites like Supernova.org and Lokitorrent were forced to shut down under pressure from the Motion Picture Association of America (MPAA). In 2005 Elitetorrents.org was shut down by the FBI on charges relating to copyright infringement. The list goes on as from the year 2004 to the time of this writing the most popular sites gained exposure and thus scrutiny by governing bodies. At this time tracker sites are starting to promote 'legal' sections of their directories and emphasize their use. One of the sites used in this research (Bittorrent.com) integrates capabilities to bill for downloads. Usually these downloads differentiate themselves as 'high definition' or high quality in some respect that would not typically come from an at large sharing community.

The popular sites that stay up and running seem to be involved in some sort of negotiations with the governing bodies like the MPAA or specific production studios which require diligence in removing links which foster illegal activity and establishing legal alternatives.

As an interesting note, tracker web sites tend to not 'advertise'. You must find them through web searches or by referral. As mentioned earlier, the Bittorrent.com tracker list is not accessible from their homepage; you get to it through the client. Other sites disguise their intent by making tracker listings look like plain text (seedpeer.com) or through unusual formatting of the page (zoozle.org). One site just closed down production on March 24th of 2008 stating their concern that their attempts to provide quality and reliability to their user community were being compromised by outside pressures (torrentspy.com). More and more, tracker sites that are visible to the general public are scrutinized by the producers of the media being shared or their representatives as well as legal bodies.

The Bandwidth Controversy

Time Warner has had a dual interest in the introduction and popularity of BT. First, their pursuit of those serving as tracker websites for content had led them to an agreement with Bittorrent.com in 2006 to share legalized versions of their films (and other production studios' content) with built-in digital rights management. This would provide a mechanism for billing those who downloaded the file for its use. Second, Time Warner had an interest in the technical workings of the BT protocol. As an internet service provider, Time Warner states its obligation to provide all its customers with a fair amount of bandwidth for their connections with which they contend the BT protocol interferes.

The claim against BT is that its use requires large amounts of network bandwidth. If the BT protocol were allowed to run unchecked on the Time Warner networks, the organization claims it could not uphold its end of a bargain with its customers to provide them with an agreed upon amount of network bandwidth. In keeping with this argument, Time Warner utilizes network appliances which scan the network traffic for packets it identifies as generated with the BT protocol. The perception by users of the protocol (and organizations that host tracker services) is that when these are discovered they are either rendered unusable or identification of the routes over which these packets are travelling are throttled down to very low upload and download speeds. This, in essence, renders the BT functionality unusable as well as other services which may have been using that connection on that specific host.

Users of the BT protocol that subscribe to Time Warner services have become increasingly agitated by this move and numerous blogs or news postings have been made regarding the controversy. Users claim they have a right to use their promised bandwidth for whatever purposes they desire and that no limitations are justified. The position is that Time Warner should be investing in more and faster equipment if there are bandwidth issues and not putting restrictions on the customers. As of the time of this writing Time Warner (more recently bought out by Comcast) responses have been noncommittal. Official statements of the restrictive activity could not be found, yet customers of the service are adamant that they are observing this activity. Even network peers that are outside of Time Warner networks suggest that when they connect to a swarm with members that are a part of the Time Warner networks, they observe the bandwidth throttling on their swarm activity. The user community has posted work-arounds and procedures for attempting to counter the throttling attempts with additional encryption or procedural changes to bit torrent clients. No formal resolution had been documented.

DISCUSSION

The purpose of this study was to undertake an auto-observational technique for collecting data regarding the social mechanism(s) involved in becoming a member of a file sharing community called Bittorrent. Social mechanism diagrams were developed as a result of the data observed and presented on both a micro and macro level. Further discussion on how these mechanisms relate to the data will be presented here.

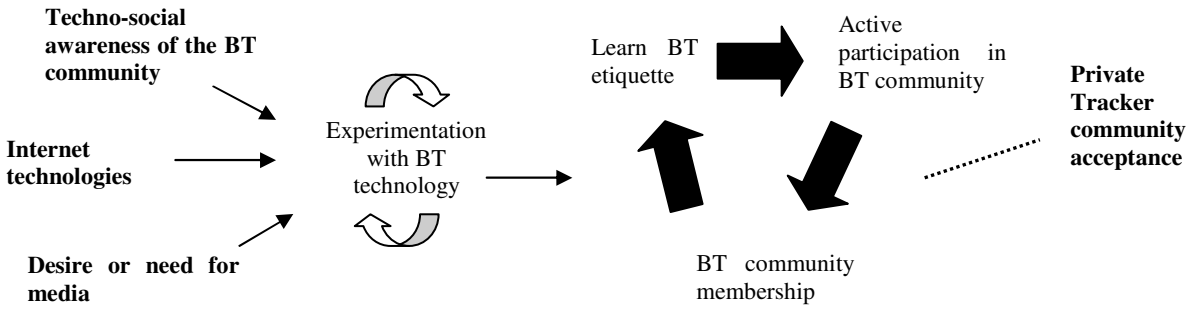

Figure 2. Micro View: Mechanism of Bittorrent Community Membership

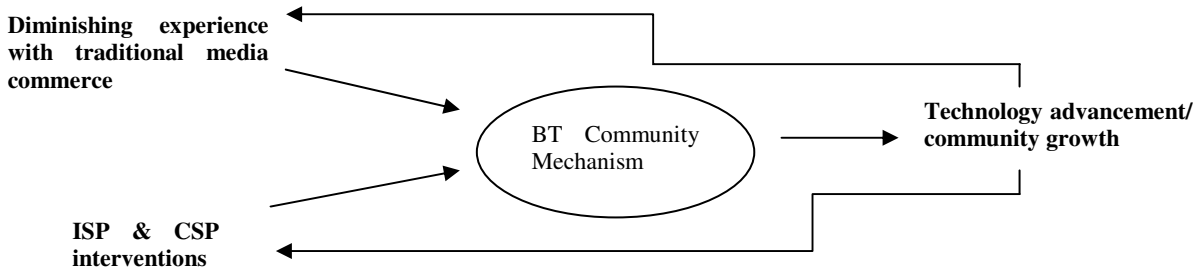

Figure 3. Macro View: Purposeful Adaptation Mechanism of Bittorrent Community

The Explanandum

The first interesting detail of the resulting mechanism concerns the explanandum. That is the phenomenon that we aim at explaining, in this case is Bittorrent membership. We found that community membership is closely tied to learning and practicing the accepted etiquette deemed by the community and active participation within those boundaries. The thick description describes the task of the researcher as various clients are evaluated and one is eventually selected. Upon selection

of a client, experimentation with the process of finding and downloading files is observed and subsequently, success or failure and performance or lack of performance is associated within different scenarios. The research learns the appropriate etiquette for the community and begins to follow these rules. Once the rules of etiquette are understood by the researcher, he is then able to interpret performance and degrees of success or failure more appropriately. This reinforces the researchers behaviors as further attempts to download are made. This process is then cyclical as etiquette is refined or updated and the process reinforces itself. The explanandum was originally posed as BT community membership but we found it is better understood as this iterative process incorporating active participation and learning etiquette. If a member falls out of keeping with the current etiquette or discontinues practice in the community, there is a question of their membership. Indeed, membership for the individual is not solely questioned, but the existence of the community in general can become questionable if individual members do not understand the importance of both uploading and downloading files.

This cycle is seen in the thick description as a learning process (pulling information from blogs), application (applying action and etiquette to the practice of performing a download), and subsequent involvement in the community in an ongoing manner. Further reinforcement is exemplified by acceptance to 'private tracker sites'. It was found that tracker sites available to the general public become targets to investigation for illegal activity. To avoid such scrutiny, 'private' sites are hosted which can be accessed by invitation only. Invitation to these sites typically comes by referral, i.e. one individual suggests that he knows of a Bittorrent user that behaves well based on accepted etiquette and thus would make a valuable contribution to the community. This user is then extended an invitation to participate in the community via a tracker site which requires special credentials to use. The researcher was not involved deeply enough to become a member of a private tracker community, however, numerous blogs could be found which hosted discussions about private site invitations. On some forums invitations were offered up in exchange for invites to other private sites. These blogs would reiterate the rules of etiquette focusing on share ratios and 'clean' or uncorrupted content and stress the importance of good behavior for those who accept these invitations as the individual offering would pay a price should the recipient not fulfill their obligations (usually through the removal of both parties from the private sharing community).

Standing Conditions

There were three conditions necessary for the community membership mechanism. These are conditions needed for the membership process to occur. The first is a desire or need for media. This is fairly straight forward. The community of interest in this study is the Bittorrent community or a specific type of file sharing community. By nature community membership dictates that you are participating in the file sharing process and thus, choose to upload and download files; it also means acceptance and recognition by other members. Specific to this study it was found that to maintain good standing in a Bittorrent community; one does not assume the role of a downloader exclusively. This might further suggest that a necessary condition is not only a desire or need but also ownership of media with value to other potential community members that will eventually be shared. The thick description details the researchers actions as he goes through the download process. Because this was academic research, the need may be described as coming from a very different motivation, however, the purpose was the same. The researcher was mimicking an actual user with desire for music and software files. The need drove the search on tracker sites and subsequent selection of files. As the researcher acquired content, the files were then used as media available for upload. It was in this fashion that the first of these conditions could be met and further steps could be taken.

A second condition pertains to the availability of the internet technologies required to perform the actions necessary to function within a community. These are the Bittorrent clients of which there are many. At the time of initial observations there were over 60 easily accessible clients available for download. While some of these may no longer be available, it appears there are others that continue to take their place. The text describes a selection process followed by the researcher to evaluate and eventually install a particular client. The only difficult portion of this task was the evaluation of so many different clients with little prior background suggesting there is no lack of available technology at the time. As observed in the text and represented in the macro mechanism diagram, there are constant pressures on the community to seek methods for preventing intrusion by internet service providers or content providers. These providers seek to disrupt or shut down the activities of the community in the name of copyright laws. While the ethical implications of such activities are not discussed in this study, the applicability is in terms of technologies which are incorporated into updated or new Bittorrent clients which circumvent those technologies seeking to disrupt the community. This leads to a continuous population of new or updated Bittorrent client programs necessary for the community to continue. At the time of this writing, the researcher observed among the many available clients, both older and newer clients. The newer clients were sometimes new versions of previously developed clients and some were advertised as completely new and different. Many times the distinguishing factors revolved around performance increases and security updates. In the case of a client, the security updates were designed to deal with protocol blocking, ip tracking, and virus or corrupt file intrusion.

The third condition precludes an awareness of the Bittorrent technology. It seems logical that to utilize a technology one must first know of its existence, however, this is something more in that there must be a connection to social circles whose origins lie in technology. Take for example web logs or blogs, chat rooms, and discussion boards. Going back to the thick description, an awareness of the capabilities and requirements of the technology were gained through discussions on blogs, web sites, and discussion boards. While the initial awareness of Bittorrent may come from a less technical communication (i.e. conversation over lunch), a deeper awareness of functionality and meaning come from information about the technology itself. Indeed, the researcher found that a fair amount of reading was necessary to gain a basic understanding of the technology for both purpose and function. In some cases, the most practical information could be had by talking with students around the university to get their experiences. While the Bittorrent technology is in fact well developed and wide spread, it is not 'advertised' or purchased in software stores. This is most likely due to the controversial nature of its use. But the side effect is that of slight anonymity (of the product). In order to gain awareness of the technology a user must be in tune with the web 2.0 community in general.

Experimentation with BT Technology

The experimentation portion of the mechanism diagram is depicted by circulating arrows. This was done to suggest that this is not confined to a single action but is in itself an iteration of actions. Experimentation in the thick description is detailed as a series of attempts to download content and the resulting consequences. As these accumulate a knowledge and experience base is built upon which further steps can be taken toward participation in a BT community. Additionally, the share ratio is initiated and if proper etiquette is observed, a strong ratio is accumulated which is an indication of a good member of the community.

The Macro View

The mechanism discussed so far is descriptive of the processes an individual goes through in acquiring membership in a Bittorrent community. In order to more fully develop explanation from the observations presented, a broader view is necessary; that is a view of the macro social processes. This broader view leads to the development of a second mechanism diagram viewed from a macro perspective.

The macro perspective suggests there are conditions which exist completely outside of the micro mechanism that have an impact. As figure 3 shows, this impact comes from three conditions.

Diminishing experience with traditional media commerce exemplifies a characteristic which may be associated with age. This can be seen best in the example of music downloads. There are generations starting that will never know life without the Internet. Some individuals using file sharing technologies like Bittorrent right now have never set foot inside a 'record store' to buy music. Their first experiences of purchasing music came in the form of downloads to their phone or other portable music playing device. As the distribution of music via the internet continues to grow, it follows that more traditional forms of purchase will have a lessened impression especially on those who had little or no experience with them to begin with. As such, file sharing communities will benefit as they become more of a mainstream target of use rather than an alternative.

The text describes a conflict between an internet service provider (ISP) and its clients. In this case the ISP is throttling bandwidth on connections that are identified as using the Bittorrent protocol. Customers of the ISP are protesting the action on the grounds that they are paying for bandwidth to the internet and should not be censored based on their type of usage. Other concerns were noted where recording industry representatives and other organizations that provide content to the public (CSPs) seek legal action against some of the tracker sites which host the torrent files necessary to start the interaction in a Bittorrent community. While these parties implement technologies to support their causes (i.e. the bandwidth throttling) the Bittorrent communities respond with their own behavioral or technological advancements. Behaviorally, the user community protests against the ISP for their right to use uncensored bandwidth. Technologically, Bittorrent clients become 'smarter' in that they can disguise their protocol to look like something other than that which the ISPs are looking for when throttling bandwidth. As an outside condition, as long as the ISPs and CSPs continue to apply measures to enforce their perceived rights, the membership community mechanism will respond with updated technologies and amendments to the rules of etiquette.

Through advancements and continued success thwarting the efforts of outside forces, the community continues to thrive and grow. As the community thrives and grows, we see a feedback to both prior conditions. Experience with traditional media commerce diminishes as experiences with file sharing technologies take its place. Additionally, as the community succeeds, ISP and CSP efforts to circumvent its success continue and even intensify until existing conflicts are resolved.

CONCLUSION

The intention of this study was to seek understanding of the actions and behaviors which lead to membership in a file sharing community based on the Bittorrent technology. Data was gathered using an auto-observation technique and social mechanism diagrams were constructed to represent a causal reconstruction of the phenomenon. It was found that the phenomenon was best described at two levels leading to micro and macro social processes. As is part of the intent of social mechanisms, it is anticipated that the mechanism identified in this study may be used to understand and even predict actions and behaviors of others in similar contexts. From an academic perspective, this can be a contribution to understanding as well as a framework for further investigation. It seems logical that while this study's focus was on a file sharing community, this mechanism might apply beyond this particular context as well. Examples of communities which may find explanation in this interpretation include virtual reality, online chat rooms, discussion boards, and technologies for social communication like Facebook and MySpace.

From a business perspective, this mechanism approach can yield insight into the behaviors which appear to be perplexing industries which haven't been able to keep up with the shift from traditional business models to the e-commerce environment. Discussed in this study particularly were the music and movie industries, but it is reasonable to see how this may expand to any media which can be created in digital format, especially if it can be compressed or otherwise modified to facilitate electronic transfer. Business managers and owners might be able to use such insight to better understand new distribution techniques or the need for differing business models altogether. In addition, as the mechanisms proposed suggest how membership to a community is achieved, manages interested in creating communities of practice in their organizations may use them as guidelines.

Another opportunity comes in the form of pursuing this mechanism in the broader context suggested above. Can this mechanism work in predicting other community memberships like gaming worlds and online social gathering spots? While this study focused on Bittorrent, other technologies should be investigated in the interest of supporting a wider application of the mechanism.

The auto-observation technique has some limitations inherent to it which may in fact pertain to this study. While a researcher is constantly striving to be impartial, the complete immersion in the environment of study may make it difficult to perceive of one's actions or insights as being wholly objective. As such, it cannot be ruled out that the actions taken by the researcher are typical of actions that another individual with other motivations may take. In this shortcoming there is opportunity for further studies to follow up with observation or other methods of data collection that may represent other perspectives. Along these same lines, the perspective observed here was singular in that it represents only the user. Perspectives from other interested parties (i.e. ISPs and CSPs) could provide additional insight or contrast those developed here.

An additional item of mention in this study comes from the definition of 'virtual community' presented in the introduction of this paper. While the interaction normally associated with social networking sites like MySpace and Twitter is quite rich in comparison with the interaction taking place in p2p filesharing technologies like Bittorrent, the intent of this paper was to suggest that virtual communities interact as a means to an end. Social networking sites are purposed to exchange information. P2p filesharing mechanisms achieve the same results. It may be argued that the communication aspect of the filesharing network is handled by the software client; however, this does not happen without the awareness of the user that they are coordinating effort with others. The rules of etiquette associated with filesharing behaviors are observed by more than a few. The proliferation of 'private' tracker sites and similar facilities in other technologies suggests that desirable behaviors are indeed recognized and rewarded. Comparisons of Bittorrent technology to social networking were not intended to be direct comparisons, but rather to attend to our point that the study of the mechanisms presented in this paper do fit into the realms of virtual community and socio-technical literature. As the mechanisms suggest, there is something important to be identified here which describes behaviors that lend insight to the use of such technologies. Such insight may be used by management to better understand their client community. As well, such insight may prove important to the further study of virtual community related phenomena.

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