Social Networking Communities and E-Dating Services:
Concepts and Implications

Celia Romm-Livermore
Wayne State University, USA

Kristina Setzekorn
Smith Barney Ltd., USA

Information Science REFERENCE

INFORMATION SCIENCE REFERENCE

Hershey · New York

Director of Editorial Content: Kristin Klinger
Senior Managing Editor: Jennifer Neidig
Managing Editor: Jamie Snavely
Managing Development Editor: Kristin M. Roth
Assistant Managing Editor: Carole Coulson
Assistant Development Editor: Deborah Yahnke
Typesetter: Chris Hrobak
Copy Editor: Ashley Fails
Editorial Assistant: Rebecca Beistline
Cover Design: Lisa Tosheff
Printed at: Yurchak Printing Inc.

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue, Suite 200
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com

and in the United Kingdom by
Information Science Reference (an imprint of IGI Global)
3 Henrietta Street
Covent Garden
London WC2E 8LU
Tel: 44 20 7240 0856
Fax: 44 20 7379 0609
Web site: http://www.eurospanbookstore.com

Library of Congress Cataloging-in-Publication Data

Social networking communities and e-dating services : concepts and implications / Celia Romm and Kristina Setzekom, editors.

p. cm.

Includes bibliographical references and index.

Summary: “This book provides an overview of the major questions that researchers and practitioners in this area are addressing at this time and by outlining the possible future directions for theory development and empirical research on social networking and eDating”--Provided by publisher.

ISBN 978-1-60566-104-9 (hardcover) -- ISBN 978-1-60566-105-6 (ebook)

1. Online social networks. 2. Social networks. 3. Online dating. 4. Dating services. 5. Internet--Social aspects. I. Romm, Celia T., 1954- II. Setzekom, Kristina.

HM742b.S63 2009

306.730285’4678--dc22

2008022552

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

Chapter V
Collective Solitude and Social Networks in World of Warcraft*

Nicolas Ducheneaut
Palo Alto Research Center, USA

Nicholas Yee
Palo Alto Research Center, USA

ABSTRACT

This chapter investigates the nature and structure of social networks formed between the players of massively multiplayer online games (MMOGs), an incredibly popular form of Internet-based entertainment attracting millions of subscribers. To do so, we use data collected about the behavior of more than 300,000 characters in World of Warcraft (the most popular MMOG in America). We show that these social networks are often sparse and that most players spend time in the game experiencing a form of "collective solitude": they play surrounded by, but not necessarily with, other players. We also show that the most successful player groups are analogous to the organic, team-based forms of organization that are prevalent in today's workplace. Based on these findings, we discuss the relationship between online social networks and "real-world" behavior in organizations in more depth.

INTRODUCTION

Online gaming has become a phenomenon of growing social, cultural, and economic importance. From the pioneering, text-only MUDs of the 1990s (Curtis, 1992; Cuciz, 2001) to today's rich, graphical 3-D environments, the market has grown to more than 13 million players (Woodcock, 2005) and generated revenues of more than 5 billion dollars in 2007. Growth is still considerable and estimated at about 25% per year for the foreseeable future (Olausson, 2007).

Figure 1. A night elf priest riding his mount

One behemoth stands out among all these lucrative massively multiplayer online games (MMOGs): World of Warcraft (WoW). As of today, more than 8 millions subscribers worldwide (Blizzard, 2007) are interacting, competing, and collaborating in WoW's online world. WoW was designed around a template broadly similar to other games in the same genre, itself inspired by the more traditional pen-and-paper role-playing games like Dungeons and Dragons (Fine, 1983). Like its predecessors, the game takes place in a persistent universe where there is no clear beginning and end and no set schedule. To enter the game players first create one or several "avatars" from a set of classes (e.g., magician, warrior) and races (e.g., night elves, orcs) as digital representations of themselves. Once this character is created, players can begin questing in a medieval-fantasy world broadly inspired from the works of authors such as J.R.R. Tolkien.

Azeroth (the world of WoW) is an extremely vast and richly detailed 3-D environment (see Figure 1). Players can fight dangerous creatures (which may include other players) and explore the game's two continents alone or in the company of others while undertaking quests. This allows them to earn "experience points" and reach progressively higher "levels" (60 was the maximum at the time of our analyses[1]), improving the abilities of their character and acquiring powerful items along the way.

Like its predecessors in the same genre, WoW is highly collaborative by design (Taylor, 2006): players often have to band together to accomplish the game's objectives, and trading items and information is essential to a player's advancement (Nardi & Harris, 2006). While some player groups can be short-lived (e.g., ad-hoc "pick up groups" formed by strangers to accomplish a difficult quest, and disbanded afterwards), many crystallize into more stable social networks of various size and complexity. The need for repeated collaboration in online games therefore translates into formal, persistent groups that are supported out-of-the box by nearly all MMOGs: guilds (Figure 2).

Guilds are essential elements in the social life of online gaming communities. They frame a player's experience (Seay, Jerome, Lee, & Kraut, 2004) by providing a stable social backdrop to many game activities, and their members tend to group with others more often and play longer than non-affiliated players (Ducheneaut, Yee, Nickell, & Moore, 2006a). At the "endgame" (when players have reached level 60 and cannot

Figure 2. A guild about to attack a powerful dragon

earn experience points—and levels—anymore), guilds even become indispensable. Indeed, the game's objectives change significantly at this stage. Since players cannot earn points to progress, the only way for them to increase their power is to gain access to powerful items (weapons, sets of armor) guarded by dangerous monsters in complex dungeons ("instances" in WoW's parlance). By design, these instances require a "raid" party of 10, 20, or sometimes up to 40 players at a time. Quite obviously it is almost impossible to assemble a pick-up group of this size—some formal coordination mechanisms are required, and the guilds provide such an environment. Being a member of an "elite" or "uber" guild, renowned for its ability to tackle the hardest challenges, is therefore a badge of honor and essential to progress at the endgame. Admission to these prestigious social groups often requires going through a "trial period," as well as being sponsored by one of the members (Taylor, 2006).

Interestingly, the game's software often provides only very limited tools to support these important player associations: members most commonly have access to an in-game roster showing who is currently logged on and a private chat channel to broadcast messages to them. Guilds, therefore, rely also on an array of important Web-based resources such as forums, Web sites, calendaring tools, and so forth, to organize their activities.

All the elements mentioned above demonstrate that, by design, MMOGs are essentially social engineering experiments. While it would be easy to dismiss them because of their deceivingly simplistic objectives (a comment we often hear: "It's just a game where you kill monsters, right?"), they are in fact social network engines: by casting strangers into an exciting environment filled with complexity and uncertainty, MMOGs offer conditions where players will naturally adopt different roles and responsibilities in order to get things done collaboratively. As such, MMOGs can be fascinating laboratories to observe group dynamics online. Observing the nature and structure of interactions between players in the game world could help us understand some fundamental properties of Internet-based social networks, which could in turn have practical implications for the creation and management of teams in other digital spaces.

In this chapter, we use data we collected over two years about the behavior of more than 300,000 characters in WoW to map the structure and evolution of social networks in this multiplayer game. Using automated "bots" constantly connected to WoW's game servers, we were able to estimate how often and how long players interact with each other in a variety of circumstances. This data lets us easily construct social network graphs representative of these connections, which we can then use to compute various metrics reflecting their most salient properties (e.g., a network's density, that is, how tightly interconnected people are; or a network's number of disconnected subgroups, indicative of fragmentation, etc.). Coupled with other data gathered by our bots (e.g., a character's class, its rate of advancement in the game, etc.), this also lets us assess how one's social relations affect (or are affected by) one's status in the game.

Our findings and analyses focus on two main areas. First, looking at the average structure of social networks across the entire game world, we discuss the reasons behind a surprisingly low level of network density in guilds. Indeed, it looks as if most players spend time in the game experiencing a form of "collective solitude" (Malaby, 2003): they play surrounded by, but not necessarily with, other players and guild members. Second, we examine the structural social network variables reflecting how organized guilds can be. Looking at these variables over time, we can see which properties of a guild's organization can help the group survive (or not). It turns out the most successful guilds are analogous to the organic, team-based forms of organization that are prevalent in today's workplace. We discuss this relationship between online social networks and "real- world" behavior in organizations in more depth.

To better understand how we were able to reach these conclusions, we begin below by presenting some additional background information about WoW and games research more generally, as well as describing our methods in more detail.

BACKGROUND AND METHODS

The Need for New Approaches to Online Gaming Research

Due to their increasing popularity and visibility in the mainstream media, online games have become a topic of active research in recent years. A great deal of work has been concerned with the social and cultural dimensions of these games: authors such as Yee (2001; 2002), Castranova (2003), Jakobson and Taylor (2003), and Bartle (2004) have all contributed early insights about the social dynamics of these entertainment communities. However, most of this research tends to be based on self-reports obtained from the players using interviews (Yee, 2001), surveys (Seay, Jerome, Lee, & Kraut, 2004), or ethnographic observations (Taylor, 2003; B. Brown & Bell, 2004). Except for the project we are about to describe in this chapter, until now no studies were based on data obtained directly from the game's software.

To address this limitation, we therefore decided to study social activities in MMOGs based on longitudinal data collected directly from games. We use this data to compute "social accounting" (Bernheim Brush, Wang, Combs Turner, & Smith, 2005) metrics allowing us to assess, for instance, how often players group with each other and how this affects their progress in the game. This provides us with a solid empirical foundation to better understand these complex social worlds. Of course, these metrics would be of little value if we did not have direct experience with the game world to put them into context. Our research is therefore complemented by hundreds of hours of playtime: all the contributors to this project have created characters on several different servers, joined guilds, big and small, successful and doomed to failure, since the launch of the game in November 2004. This deep, personal experience with the game's environment frames our analyses and allows us to make sense of our numbers in a contextualized manner.

Our current approach was influenced in great part by an interesting design choice made by Blizzard Entertainment, producers of WoW. Indeed, WoW was built such that its client-side user interface is open to extension and modification by the user community. Thanks to this open interface, we have been able to develop custom applications to collect data directly from the game. In particular, we rely on WoW's "/who" command, which lists the characters currently being played on a given server[2]. We created a "robot" software to periodically issue "/who" requests and take a census of the entire game world every 5 to 15 minutes, depending on server load. Each time a character is observed our software stores an entry of the form:

Alpha,2005/03/4,Crandall,56,Ni,id,y,Felwood,AntKillers.

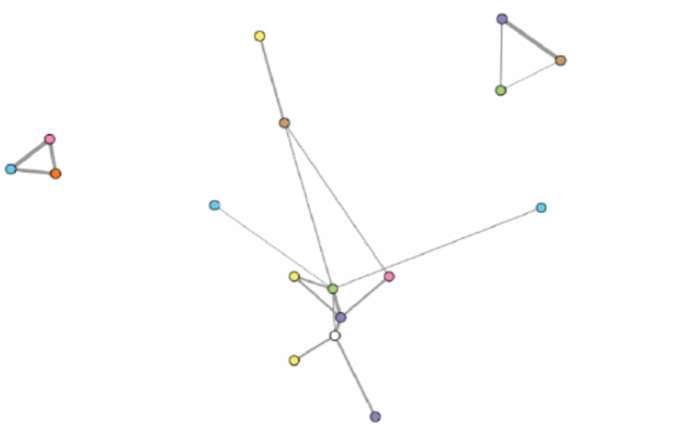
The above represents a level 56 Night Elf Druid on the server Alpha, currently in the Felwood zone, grouped ("y"), and part of the Ant Killers guild. Using this application we have been collecting data continuously since June 2005 on five different servers: PvE(High) and PvE(Low), respectively high- and low-load player-versus-environment servers; PvP(High) and PvP(Low), their player-versus-player equivalents; and finally RP, a role-playing server. Overall, we have observed more than 300,000 unique characters to date. We then used the accumulated data to compute a variety of metrics reflecting these characters' activities (Ducheneaut, Yee, Nickell, & Moore, 2006a) and, in particular, the structure of their social networks.

To do so, we rely on three variables: the "zone" information, the "grouped" flag, and finally the "guild" data. We assume that characters that are grouped in the same zone are highly likely to be playing together. If so, we create a tie between them, where the strength of the tie is proportional to the cumulative time these characters have spent together. This lets us assess social networks in the game irrespective of formal group membership. To take the latter into account, we simply enable connections between players only if they belong to the same guild, giving us a picture of social relations in these more formal groups (Figure 3). We then use the accumulated data to compute a variety of social network analysis metrics for each character and each guild, such as their density and fragmentation (Wasserman & Faust, 1994).

The Limitations of Automated Data Collection

Before going any further, it is important to mention some inherent limitations of our data and methods. First, note that we are collecting information about characters, not players. Players often create several characters or "alts" (some actively played, some acting as "mules" for storage and trading). We believe, however, that this does not affect the validity of our analyses for two reasons: 1) our observations show that all the "alts" of a player are generally members of the same guild; 2) except for a few "altoholics," players tend to focus on developing one character exclusively

Figure 3. Social network for a typical small guild. Note the core group and the two isolated triads, as well as the varying strengths of the ties connecting the players. Player nodes are colored based on their class (mages in blue, hunters in green, etc.)



for a reasonably long stretch of time instead of constantly switching between many, simply because WoW's design makes the latter very unproductive—players cannot keep up with the "grind" required to advance and fall behind the rest of their guild. Considering that our sample periods are quite short (one month or less; see next section), it is therefore highly probable that each sample contains on average data limited to a player's current "main," their mule, and perhaps an additional "alt" leveled at the same time. Since we are looking at aggregate, group-level structural measures, not individual patterns of behavior, this relatively uniform spread of the number of characters played at any given time should therefore not skew our analyses too much.

We also rely heavily on a character's location to construct our social networks, which is not immune to distortion. For instance, characters are often left "AFK" (away from keyboard) in the game's main cities before or at the end of a play session—their physical proximity there does not necessarily reflect any kind of joint activity. We therefore exclude cities from our sample when computing social networks. It is also entirely possible for characters from the same guild to be in the same zone and not playing together—they could each be grouped with strangers. While this can be a common occurrence in the "entry level" zones of the games that are densely populated, our experience shows this clearly tapers off as characters gain in level. We therefore believe that while our social networking data might be a bit noisy and possibly creates more (or stronger) ties between guild members than really exist, this effect is not overwhelming.

Finally, while we believe the statistical treatment of large populations of characters yields interesting insights into their collective behavior, it also entirely ignores differences between the individuals controlling each character (Yee, 2006a). It is reasonable to assume, for instance, that players from different demographic segments of the population behave differently in the game (gender seems like an obvious factor). But since this data was not publicly visible at the game's interface level, we had no choice but to proceed without it. Only a game publisher would be able to correlate demographic factors to in-game behaviors on a large scale since they collect the former as part of their sign-up process. We hope companies in this industry will one day be willing to share such data with the research community.

With this background in mind, we now turn to the analysis of our data.

SOCIAL NETWORKS IN WORLD OF WARCRAFT

Grouping Patterns: A Look at the Prevalence of Social Activities

For many MMOG players "it's the people that are addictive, not the game" (Lazzaro, 2004). Indeed, most of the activities they offer (e.g., developing a character, fighting monsters) are already present in single player games. What makes a difference for many is apparently the shared experience, the collaborative nature of most activities and, most importantly, the reward of being socialized into a community of gamers and acquiring a reputation within it (Yee, 2002; Jakobson & Taylor, 2003). In response to this perceived player need, game developers have therefore designed multiplayer games such that opportunities for interacting with others abound.

WoW encourages players to form groups using two classic mechanisms that were refined in EverQuest, the first widely successful MMOG in the U.S. (EverQuest's game mechanics were inspired in turn by tabletop, pen-and-paper role-playing games such as Dungeons and Dragons (Fine, 1983)). First, character classes have specific abilities that complement each other (e.g., priests are the best healers, warriors the best melee fighters, etc.). As such, grouping with players of a different class should increase efficiency. Second,

Figure 4. Average time spent in a group, by class (color added to facilitate comparison with Figure 5)

Figure 5. Percentage of the total population playing each class

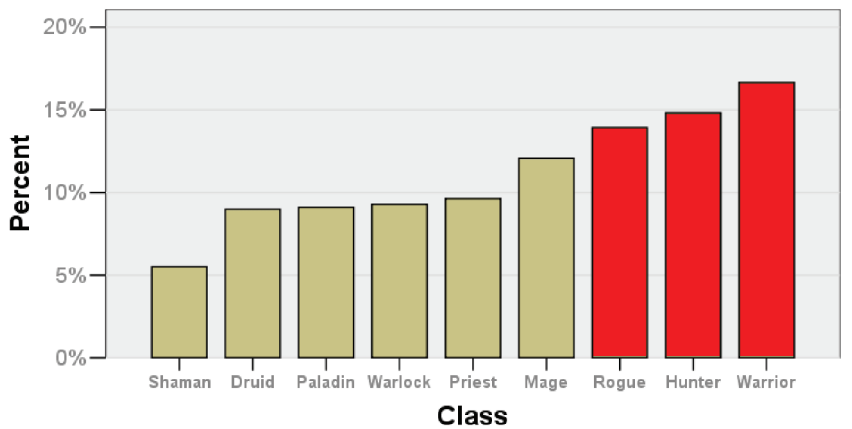
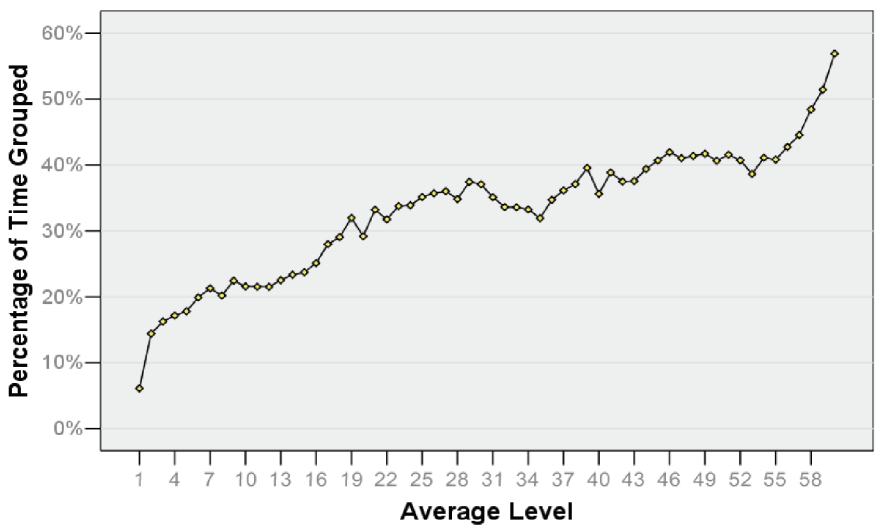


Figure 6. Fraction of time spent in groups, by level



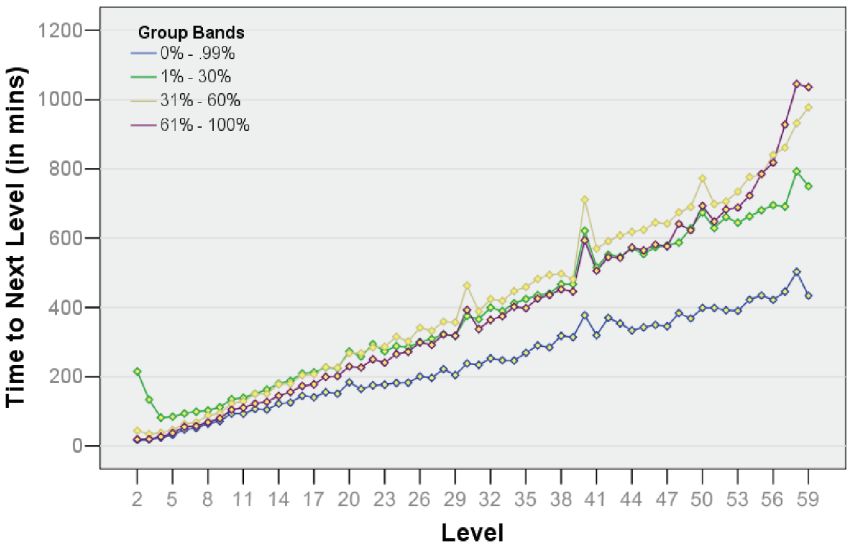
many quests and dungeons in the game are simply too difficult to be tackled alone. Players have to form either a party (5 players maximum) or even a raid (40 players maximum) to have a chance to win the powerful items available in these difficult locations. As players gain levels, an increasing amount of game content requires such groups, up to the "endgame" (level 60) where no dungeons are accessible without a strong party of at least 5 players (and often more).

Despite the complementarity of classes however, some stand a better chance of survival alone than others. For instance, Hunters are accompanied by a powerful pet, effectively allowing a single player to control a two-character unit. In the words of the players we talked to, this makes hunters a more "soloable" class. We computed the average time spent in a group for each class and the numbers clearly reflect their "soloability" (or lack thereof)—see Figure 4. The differences are significant, $F(8,129372) = 152.99$, $p < .001$, with the most soloable class (warlocks) spending about 30% of their time grouped versus the 40% spent by priests at the other end of the distribution. Interestingly, the more "soloable" classes tend to be the most popular. When we computed the class distribution over the entire population, the three most-played classes (warrior, hunter, and rogue) were among those spending the least time in groups (less than 32%; see Figure 5).

We wondered, however, if grouping behavior changed as characters gained in level. It appears time spent in groups increases about linearly with levels to stabilize at around 40%. There is then a strong increase in grouping starting after level 55 and, starting at level 59, more than half of play time is spent in a group (Figure 6). This reflects the increasing difficulty in fighting the "mobs" (monsters) encountered in high-end dungeons: while soloable classes have an advantage in the early stages of the game where individual quests abound, the progressive emphasis on group tasks mitigates it somewhat later on.

Another interesting aspect to consider is the impact of grouping on progress in the game. We split characters into four bands of grouping ratio (e.g., characters in the 0-1% band were almost never observed to be in a group) and then plotted the average time it took them to complete a level across all the levels. As Figure 7 shows, characters that are never in a group consistently level faster than characters that group at any

Figure 7. Impact of grouping on leveling time



frequency. In fact, the former are about twice as efficient in leveling as the latter. This can probably be explained by the "overhead" induced by grouping: party members have to be recruited and assembled; responsibilities have to be discussed and assigned, and so forth. This significantly cuts into the "productive" time that can be spent killing monsters and earning the experience points needed to progress. For achievement-oriented players (Bartle, 1996; Yee, 2005), this grouping overhead is simply a nuisance and they simply dispense with it, completing most of the early game tasks alone instead. But as we mentioned above, groups cannot be ignored forever and players will have to form parties if they want to enjoy the endgame's content.

This data paints a more nuanced picture of the social nature of MMOGs than was previously available. Grouping is apparently an inefficient way to progress in the beginning stages of the game and many players are not observed to be in a group until they are past level 55. Players prefer "soloable" classes and it is only in the very late stages of the game, where dungeons are simply too difficult to enter alone, that the grouping rate rises. Therefore, WoW seems like a game where the endgame is social, not the game as a whole. One player summarized this situation nicely by saying that, during their first few months in the game world, WoW's subscribers tend to be "alone together": they play *surrounded by* others instead of *playing with* them—a phenomenon we explore in more depth below with the help of social network data.

Collective Solitude: Social Networks in Guilds

The grouping behaviors we just reported indicate that players spend, on average, little time in groups when they first enter WoW, but the metrics we used also tell only one part of the story. Indeed, a player can group with others in a variety of contexts: from pick-up groups quickly formed on the spot to tackle a tough monster and rapidly disbanded afterwards, to permanent player associations like the guilds we described earlier in this chapter. We wanted to see whether collaborative play was more prevalent in these formal, persistent player groups than in others.

To evaluate the kind of social environment provided by a guild, we built social networks connecting the players in our sample using two different methods: one to assess the guild's *potential for sociability* and the other to quantify *joint activities*. With the first approach, players are connected to each other if they are observed online at the same time, irrespective of their game location (the strength of the tie is proportional to the time two characters overlap). The resulting network reflects the range of opportunities for social interaction in a guild. Indeed, it connects players who have the opportunity to chat using the "guild" channel and who are listed in the "guild members" window each time a player logs on. In other words, it lists the range of guildmates known (but not necessarily talked to or played with) by each player. In social networking terms, these connections could be called weak (Granovetter, 1973) or "bridging" (Putnam, 2000) ties.

Our second type of social network connects players who are observed to be in the same zones of the game, excluding the major cities. Such a network highlights players who are spending time together, grouping with guildmates to run quests and visit dungeons. These are stronger, "bonding" (Putnam, 2000) ties based on mutual interest in the same game activities.

We computed each guild's social network degree density (Table 1) (Wasserman & Faust, 1994). We limited this analysis to guilds having six members or more (densities in small networks can often be unreliable (Wasserman & Faust, 1994)). On average, it seems that players know at most 1 out of 4 members of their guilds, and play only with 1 out of 10 (Table 1, row 1). Guilds are therefore sparsely knit networks—a surprising finding, considering the effects they have

Table 1. Social network densities

Guild size		Co-Presence	Co-Location
All > 6	N	4205	4205
	Mean	0.27	0.09
	Median	0.23	0.06
6 – 15	N	1779	1779
	Mean	0.31	0.12
	Median	0.29	0.08
16 – 30	N	889	889
	Mean	0.27	0.08
	Median	0.25	0.07
31 – 60	N	618	618
	Mean	0.22	0.05
	Median	0.20	0.04
61 – 120	N	367	367
	Mean	0.18	0.03
	Median	0.17	0.02
> 120	N	244	244
	Mean	0.17	0.04
	Median	0.14	0.01

on play patterns. Moreover, density is inversely correlated with size (-.15): as guilds grow, it becomes more difficult to know and play with most of the members.

Since guilds tend to be sparsely knit, we then tried to identify cohesive sub-groups within them. We performed a k-core decomposition (Wasserman & Faust, 1994) for each guild in our five size categories, using the co-location networks. Each k-core is a sub-graph where each player is adjacent to at least *k* others. The main core (the k-core with the largest *k*) gives the size of the most cohesive subgroup (Table 2).

The ratio of main core size to guild size is inversely correlated with size (-.17), decreasing from 37% to 12%. In other words, growing a guild has diminishing returns as far as forming tight play groups is concerned: a smaller and smaller fraction of the additional recruits will join the core. Still, our data illustrates why having a large guild can remain beneficial. Note that, for guilds with 16 to 60 members, the average main core is between 6 and 9. Considering that the basic quest party size in WoW is 5, this probably means that the core players in these guilds can form at least one, sometimes two stable quest groups. Guilds with 61 to 120 members probably have three such groups. And finally, guilds with more than 120 members have a large enough core (about 22) to form a credible raid group in order to tackle the toughest dungeons at the endgame.

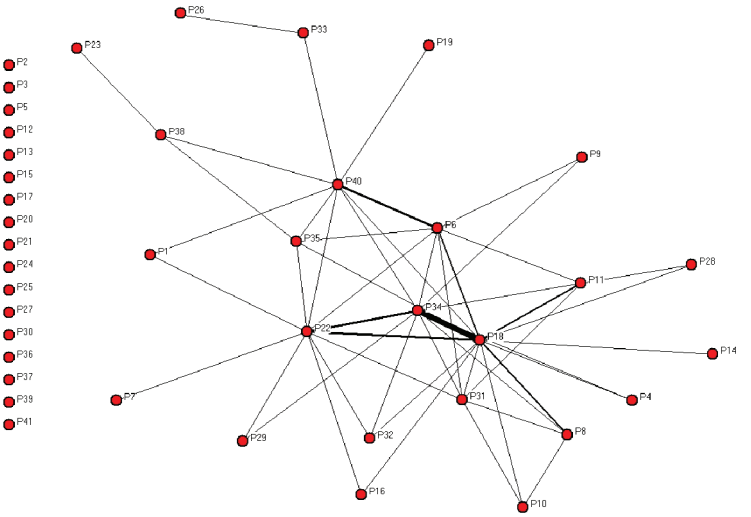
We also observed that players belonging to the core of a guild do not simply play with many guildmates, they play with them longer. We computed that, on average, any two members in a guild spend 22.8 minutes playing together over a 30-day period, while for core members the average is 154 minutes. Guild cores are "tight" sub-groups. Finally, our data shows that a large majority (65%) of guilds have a single core group. A few guilds (13%) have two cores, and fewer still (4%) have three.

Figure 8 illustrates the co-location network for a typical, medium-sized guild. Out of the 41 members, 17 were never observed in the same zone as another guildmate. Among the 24 remaining there is a main core of eight players actively playing together, with a really active central trio (their thick ties show they spend a lot of time together). The other 13 players are only peripherally connected and play with two or fewer guildmates.

Table 2. Main core size for the five guild categories

sizeband	N	Minimum	Maximum	Mean	Std. Deviation
6 - 15	1779	0	11	3.59	2.232
16 - 30	889	0	17	6.40	3.042
31 - 60	619	0	39	8.64	4.424
61 - 120	367	1	54	12.14	8.050
> 120	244	1	68	21.78	16.489

Figure 8. Co-location network in a medium-sized guild



Grouping for Fun and for Profit: Effects of Social Networks on Group Dynamics

In the previous section, we described how social activities in WoW are less prevalent than we might have imagined. In particular, while the endgame is more intensely social, the early stages of the game tend to favor "solo play." This translates into fairly sparse social networks for the game's most central player associations, the guilds.

But while this paints an interesting overview of social life across the entire game population, it is also important to recognize that guilds are incredibly diverse. Some are small groups with pre-existing ties in the physical world and no interest in complex collaborative activities. Others are very large, made up mostly of strangers governed by a command-and-control structure reminiscent of the military. In previous work, we have explored the range of possibilities between these two extremes and documented the motivations that lead players to guilds of one type or the other (Williams et al., 2006). Across all types, one trend was particularly clear: guilds are fragile social groups, and many do not survive very long (see also Ducheneaut, Yee, Nickell, & Moore, 2006a).

This fragility is almost certainly due to a broad combination of factors. Leadership style, for instance, is often cited by players (Williams et al., 2006). Game design is another contributor: players "burn out" due to the intense "grind" required to advance in MMOGs (Yee, 2006b) and leave the game, abandoning their guild at the same time. "Drama" (public conflict between two or more guild members) and internal politics (e.g., arguments over who gets access to the most powerful "loot" dropped by monsters) have also been the demise of many guilds. But it could also be possible that a guild's social network influences the group's eventual fate. Indeed, it seems reasonable to hypothesize that some aspects of the structure of a guild contribute to its eventual success, just like the structure of any organization plays a role in its efficiency (Mintzberg, 1978). The data we gathered about the structure of social networks in guilds gives us an opportunity to answer this question and explore how social relationships formed online affect the eventual survival of a group.

Our data collection software gave us access to the following social network variables:

- **Size:** Number of characters bearing a given guild tag during the sampling period. We

hypothesized that size could have a positive impact on a guild's evolution since "the rich get richer" on many WoW servers—that is, a few very large guilds tend to dominate and attract the most dedicated players as a server matures (Ducheneaut, Yee, Nickell, & Moore, 2007).

- **Density:** Connections between guild members can be mapped out as a matrix. The density of a guild is the percentage of matrix cells that are filled in. As we saw earlier and in Ducheneaut, Yee, Nickell, and Moore (2006a), guild social networks in WoW tend to be sparse. Density allows us to explore whether or not guilds benefit from higher social connectivity.
- **Maximum sub-graph size:** Largest interconnected cluster of members in a guild's social network. This measure gives a rough sense of how large sub-groups can get within a guild. Larger groups often experience more coordination issues and overhead, which could impact survivability and performance.
- **Mass count:** The number of sub-graphs larger than three in a guild's social network, that is, how many independent sub-units there are. Fragmentation of the membership might create more manageable and more successful groups within a guild, or it could impede information sharing and be detrimental.

We also had access to some simple game-specific metrics reflecting the role and performance of each player in a guild:

- **Level (average, median, and standard deviation) and number of level 60 characters:** Indicators of how experienced the guild members are. A large number of level 60 players knowing a lot about WoW could presumably help a guild in the long run. And overall guilds of higher level might fare better than lower ones.
- **Average time spent together:** A measure of schedule compatibility—the higher the value, the more members are online at the same time (we normalize this value using each guild's size to be able to compare them). Schedule incompatibilities are often mentioned by players as an important reason for leaving a guild (Williams et al., 2006).
- **Average time spent in "instances" (dungeons):** An indicator of the importance of planned group activities in a guild, as opposed to ad hoc quest parties and individual quests.
- **Class balance:** A good playgroup in WoW often has representatives of different classes, since they are highly complementary by design. We use a chi-square score to measure overall balance or imbalance. The chi-square score calculates the deviation of each class count from the expected count for a given size (e.g., there being eight classes for each faction, a perfectly balanced guild of 80 members would have ten members of each class). Bigger scores mean bigger imbalances (we normalize the result using each guild's size).

Having computed the above for each guild in our sample, we then tried to assess their impact on two success indicators for a guild: its survival, and the rate of advancement of its members.

To study guild survival, we took two month-long samples, one from July 2006 and the other from December 2006, and extracted all unique guilds in both. If a guild seen in the early sample was not observed in the later one, we marked it as "dead." Otherwise, we marked it as "survived." Using this method, we had 3,537 unique guilds in our July sample. Of those, 1,917 (or 54%) were not seen again in December and marked as "dead."

We then ran a logistic regression with survival as the dependent variable and all the metrics mentioned earlier as predictors. The Cox & Snell R-Square for the resulting model was .200 (Table

Table 3. Guild survival model summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	4088.392	.200	.268

Table 4. Classification table for the survival model

			Predicted		
			12_Survival		Percentage
	Observed		.00	1.00	Correct
Step 1	12_Survival	.00	1467	450	76.5
		1.00	570	1050	64.8
	Overall Percentage				71.2

Table 5. Regression coefficients for the survival model

	B	S.E.	Wald	df	Sig.	Exp(B)
@07_guildsize	.054	.011	24.481	1	.000	1.055
@07_max_subgraph_size	-.048	.012	15.845	1	.000	.953
@07_mass_count	.077	.109	.502	1	.479	1.081
@07_total_count	-.080	.072	1.237	1	.266	.923
@07_density	3.586	.916	15.339	1	.000	36.081
@07_centrality	-1.527	.889	2.948	1	.086	.217
@07_LvlAvg	.021	.006	13.935	1	.000	1.021
@07_LvlMedian	-.002	.003	.389	1	.533	.998
@07_LvlSD	.046	.010	23.283	1	.000	1.048
@07_Count60	-.022	.008	7.143	1	.008	.978
@07_AvgTogether	.090	.074	1.466	1	.226	1.094
@07TogetherRatio	-1.243	.377	10.887	1	.001	.288
@07_InstanceTimeRatio	7.011	1.782	15.481	1	.000	1109.076
@07_ClassBalance	.003	.005	.423	1	.515	1.003
@07_BalanceRatio	-.288	.054	28.135	1	.000	.750
Constant	-1.541	.195	62.413	1	.000	.214

3)—a number that may initially seem low but is in fact well within the accepted norms for similar social science research (Cohen, 1988)[3]. And again, we openly acknowledge that our model cannot be entirely accurate since we can only collect a limited number of variables.

Using a strict cut-off, the model provided by the logistic regression was accurate in 76.5% of the "death" cases and 64.8% of the "survival" cases (Table 4)—better than chance alone. The predictive values of each variable we used are listed in Table 5.

For a measure of player advancement, we computed a standardized character advancement score. A character's raw advancement is simply the number of levels the character has advanced over one month (for the analyses below, from July to August 2006). In this case, we subtracted the starting level from the ending level. Because a 10- level advancement by a level 1 character is

Table 6. Guild advancement model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.313[a]	.098	.094	1.31596

Table 7. Regression co-efficients for the advancement model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.574	.101		-5.681	.000
	@08_guildsize	-.016	.005	-.505	-3.296	.001
	@08_max_subgraph_size	.018	.006	.470	3.043	.002
	@08_mass_count	.250	.065	.107	3.876	.000
	@08_total_count	.033	.039	.021	.839	.402
	@08_density	-.134	.431	-.010	-.312	.755
	@08_centrality	.898	.424	.078	2.117	.034
	@08_LvlAvg	.001	.003	.008	.328	.743
	@08_LvlMedian	.002	.002	.025	1.244	.213
	@08_LvlSD	.014	.005	.056	2.711	.007
	@08_AvgTogether	.139	.034	.226	4.044	.000
	@08TogetherRatio	.574	.186	.071	3.078	.002
	@08_InstanceTimeRatio	-2.092	1.069	-.035	-1.957	.050
	@08_ClassBalance	.007	.002	.056	2.890	.004
	@08_BalanceRatio	-.018	.024	-.019	-.762	.446

much less significant than a 10-level advancement by a level 50 character (the later stages of the game require much more time and effort to progress), we standardized character advancement by calculating the average (and standard deviation) of advancement for every starting level. In other words, we compared each character only with others who also started at the same level at the same time. This was done by calculating the z-score of advancement for every character. Characters who were already level 60 at the beginning of the sampling period were excluded.

We then computed a standardized guild advancement score—simply the average of the standardized advancement scores of every member in that guild. This guild score was thus a reflection of how much the guild as a whole advanced during the sampling period. Again, characters that were already level 60 at the beginning of the sampling period were excluded.

Using the same predictors as before, we ran a multiple regression with guild advancement as the dependent variable. The R-Square for the resulting model was .098 (Table 6)—smaller than before but still within acceptable limits. The predictors of character advancement are listed in Table 7.

Both models identified six significant predictors of survival and advancement (Table 5 and Table 7) that we discuss in more detail below. Before examining each of them, it is worth noting that four of these predictors are identical in each model (guild size, class balance, level standard deviation, and maximum sub-graph size), a good indication that these variables have an important impact on both the survival and efficiency of a group—but two of them also had opposite effects

in each model, revealing an interesting tension between survival and efficiency.

Looking at the four predictors identified by both models in more detail we find:

- Class balance (co-efficient B for model 1 (M1): .003; standardized co-efficient for model 2 (M2): .056): more balanced guilds survive better than others, and they also allow their members to progress more quickly in the game. This seems logical when considering the game's design: classes have complementary skills and therefore, balanced groups are more enjoyable to play with and perform better.
  The importance of class balance becomes more interesting when we consider that the distribution of classes over the entire population is very imbalanced (Ducheneaut, Yee, Nickell, & Moore, 2006a; 2006b)—priests (a crucial healing class), for instance, are in notoriously short supply. And therefore, their presence in one balanced guild means class imbalance (and probably limited longevity and performance) in another. The quest for a well-balanced roster leads to churn, as players from the needed classes are recruited away from one guild to another. Pro-active recruitment of needed classes is therefore important for the success of a guild: letting social networks form purely at random is not an efficient strategy.
- Guild size (M1: .054; M2: -.505): intuitively it is reasonable to believe that there is strength in numbers and therefore that large groups should have better odds of surviving—a hypothesis confirmed by our first model. But in an interesting contrast, model 2 reveals that a large guild size is actually an impediment to rapid progress in the game for its members. Perhaps the smaller groups offer a more "intimate" environment where players help each other move forward in the game, whereas larger groups have the strength required to tackle the toughest dungeons and therefore constantly attract players in search of high-end items, which contributes to their long-term survival.
  A pattern such as this illustrates that players look for different social networks over their tenure in the game. Small groups may be more appealing in the early stages, when progress is important, while bigger and more "anonymous" structures become necessary to access the endgame's content. This need for larger groups of very dedicated ("hardcore") players at the endgame is often cited as a major reason for quitting the game after level 60 has been reached (Williams et al., 2006): this kind of social experience is quite obviously not appealing to all players.
- Level standard deviation (M1: .046; M2: 0.056): a wider level spread contributes positively to both survival and advancement. Our hypothesis that a concentration of high-level characters would increase the guild's knowledge pool, and therefore its survival, does not seem to hold here. But an alternative explanation could be that a wide-level spread is indicative of fresh recruits joining the ranks, replacing natural attrition through burnout and transfers to competing guilds. A wider level spread is also advantageous for leveling: it ensures that there will always be someone in the guild with a level close enough to play with—and this is whether each player advances faster or slower than the guild's norm.
- Maximum sub-graph size (M1: -.048; M2: 0.470): in a fashion similar to size, this variable has opposite effects in each model. Controlling for guild size, guilds with smaller sub-groups are more likely to survive, perhaps because they avoid coordination issues, as we hypothesized. But the larger the sub-groups in a guild, the faster players advance. The issue here seems to revolve around forming groups that are large

enough to be efficient but also small enough to be enjoyable to play with.

Other significant predictors not shared between the two models included:

- Time in instances (M1: 7.011): interestingly, guilds that focus on the most complex game areas survive better. Since these dungeons usually require more planning and coordination than simply "roaming the world," it could be a reflection of a more organized guild (as opposed to one limited to ad hoc quest groups).
- Density (M1: 3.586): better-connected guilds apparently survive more often than others. Anthropologists like Dunbar (1993) have proposed that a certain amount of "social grooming" is necessary to hold a group together. A larger number of ties might be indicative of higher cohesion and more peer pressure to participate in guild activities, increasing its odds of success.
- Schedule compatibility ("Together ratio") (M2: 0.186): perhaps unsurprisingly, guilds with members whose time online overlaps significantly have a positive impact on advancement—they make finding partners for joint play sessions easier.
- Mass count (M2: .107): a guild fragmented into many cohesive subunits is more beneficial to its members' advancement. This fits well with WoW's design: most "quests" are designed to be challenging enough for small groups of up to five players. Guilds where players can repeatedly team with up to four other members of approximately the same level should therefore facilitate advancement.

Taken as a whole, the metrics we just presented form a fairly coherent picture of the ingredients required for a group to survive in an online game, and it looks as if some forms of social networks are more beneficial than others. First, the data suggests that random associations between strangers should be avoided. Guilds that pro-actively recruit members to balance their roster fare better in the long run, a lesson many players learn during their first few months in the game. It is quite common for newcomers to join their first guild based on a "random invite" in the main cities, but this guild is rarely the one they will ultimately stay in. At the "endgame" (when players reach 60), a much more formal recruitment process is usually in place, with the guild leader and his officers vetting any addition to their group after careful consideration. In other words, you cannot be friends with anybody: social networks will stabilize around characters that "fit" together.

Second, managing growth and size appears to be another important set of issues. Small groups seem to be best in the early life of a guild, while larger entities perform and survive better as players gain in experience. And while groups must resist the urge to grow their network too quickly, they must also pay attention to renewing their ranks frequently enough: a wide range of member's experience, from newcomer to seasoned veteran, is beneficial to the performance and survival of the group. The issue of size is also important for the internal organization of the guild. Social networks broken down into fairly small and dense sub-units focused on well-defined tasks have higher odds of success than more amorphous and sprawling structures.

Many of the trends we identified above and in the previous section might sound "obvious" to long-term WoW players, and indeed, they fit our own intuition about successful strategies in the game fairly well. But our data allows us to substantiate such intuitions and focus on areas that could prove important for the design of future online communities, gaming-related or not. We now discuss the implications of our findings in more depth.

DISCUSSION

A "Looser" Form of Social Networks and Sociability

Computer games have often been reviled as the source of many social ills, in particular, a supposed (but not convincingly proven) link between gaming and violent behavior (Anderson & Bushman, 2001). The arrival of MMOGs provided a refreshing contrast: at last, gamers could point to an environment where collaboration between strangers was the norm and sociability the end goal. Convincing analyses have been written comparing MMOGs to a kind of "third place" (Steinkuehler & Williams, 2006) taking over the role of fast-disappearing social hangouts of the physical world, like the local corner pub or bowling alley (Putnam, 2000). In this context, how can we make sense of the data we presented showing that, on average, social networks in WoW tend to be fairly sparse? Does it mean that MMOGs have failed in promoting the sociability that so many thought was their main claim to fame?

We do not believe this to be the case. Instead, we would like to argue that the structure of social networks in WoW is illustrative of a broader set of changing expectations about sociability online, particularly from young Internet users. Indeed, the mention of sociability tends to evoke images of mythical old villages where everybody knows everybody (Bender, 1978). Idealized social networks are based on tight links, closest in spirit to the bonds seen in a family or kinship group. There is a tendency to associate "social" environments with such characteristics and dismiss anything less as "asocial" or "failed" social spaces. But this mythical conception has not kept pace with the changes introduced by technology in the past decade. The ubiquity of electronic communication means (from IM to cell phones, or even IM on cell phones) has enabled an entire generation of users to pay "continuous partial attention" (Friedman, 2001) to a larger and looser social circle than was previously possible. For instance, teenagers using SMS are used to a form of constant, low involvement social connectivity with their friends (Palen, 2002). They exchange frequent but short SMS "pings" simply to check on each other's status and "keep their network alive," so to speak. Users of social networking sites collect friends like others do with coins (Boyd, 2006): there is satisfaction and pleasure in being surrounded by lots of acquaintances online. And even in the physical world, what we could call the "Starbucks phenomenon" also illustrates a similar trend: many customers go there to work on their laptop, an activity they could do perfectly well elsewhere if it were not for a crucial missing ingredient: being surrounded by other people. Again, the goal here is not to interact with the other patrons. It is simply to enjoy the feeling of being in a place populated by other human beings. In this it does not exactly fit Oldenburg's definition of a third place (Oldenburg, 1989), which emphasizes direct interactions between visitors as a key feature. It is perhaps closer in spirit to a European street café where people watching, not necessarily conversation, is the main activity.

The "collective solitude" (Malaby, 2003) we see in WoW now makes more sense in light of these parallel trends. During the early stages of their tenure in the game, players will log in and set off on a quest on their own. There is no request and often no need for a group: the objectives can be accomplished more quickly alone. And yet, this solitary activity is far from asocial. As players moves through the world they are in constant contact with their guild, monitoring the background chatter in the guild's chat channel. They see other player avatars engaged in various activities in the world. They have the feeling of being in an inhabited space where the presence of others is constantly visible. There can be satisfaction in this looser form of social connectivity and, as our data illustrates, this is apparently the right mix for a large fraction of WoW's 8 million players. Later on, as group tasks take center stage

and progress depends much more on collective action, players will form tighter and more structured networks in the form of high-end "raiding guilds" (more on this in the next section below). Not all players, however, are willing to transition to his more "hardcore" social experience (Williams et al., 2006). Blizzard recognized this after the game was released: they progressively added more high-level content that can be accessed alone (e.g., quests where players earn "reputation" with one of the game's factions, allowing them to purchase gear equivalent to the one obtained from raiding instances). This trend is particularly visible in the "Burning Crusade" expansion they released early in 2007.

Social networks in WoW might therefore reflect a transition in the kind of sociability people are looking for online, with a movement towards interactions that are simultaneously looser and shorter, but also more frequent and more massive. In other words, people are very much looking for the company of others but they might not necessarily want to interact at length with them. WoW provides an ideal environment where this need can be satisfied, a point substantiated by evidence from other MMOGs that failed to attract as many players. In previous games, grouping was much more emphasized in the early phases of the game, leading to denser social networks (Jakobson & Taylor, 2003) but also obviously limiting these games' appeal (Everquest, WoW's closest competitor in the U.S., peaked at a population of 0.5 million). So while WoW might not be exactly the kind of third place envisioned by others (Steinkuehler & Williams, 2006), it still plays a valuable social role by offering the kind of "on-demand," non-constraining social environment sought after by most of the new media generation.

It is also interesting to note that social networking services (e.g., Friendster, Facebook) serve a similar purpose: while creating links to other individuals is easy and only requires a simple "invite," these links are not necessarily the source of extended social interactions. Boyd (in press) has documented extensively the practices surrounding the use of these sites by teenagers and the parallels with the behaviors we observed in WoW are striking. In particular, Boyd shows how social networking sites let teenagers "write a digital body into being" through their carefully crafted profiles. WoW makes this metaphor more tangible by providing players with an actual body through their avatar. WoW players pay significant attention to the image projected by this avatar: wearing a rare and powerful set of armor, for instance, is a mark of accomplishment. In fact, it is frequent for players to leave avatars such as this standing in the middle of a crowded public space in the main cities, simply for other players to admire! As such, WoW is as much about constructing a digital identity as it is about killing monsters. But this game of identity construction only makes sense if there are "networked publics" and "invisible audiences" (Boyd, in press) to witness it. WoW therefore supports the same kind of "social voyeurism" (Boyd, in press) one sees on MySpace and elsewhere: it is often more about "hanging out" than active social interactions, more about observing and acting in a public space than forming tight relationships. This makes gaming communities look like a natural extension of other online social networking sites, a space where the same practices are at play instead of a separate domain protected by a "magic circle" (Huizinga, 1949) transforming social relationships between the players.

Organizing Successful Social Networks Online

While MMOGs appear from the outside to be entirely about fun and play, the reality of participating in the game can sometimes be surprisingly different. For instance, acquiring some powerful items requires hours of tedious "grinding," that is, repeatedly killing the same monsters again and again until they drop the requisite amount of material. And as players approach the endgame,

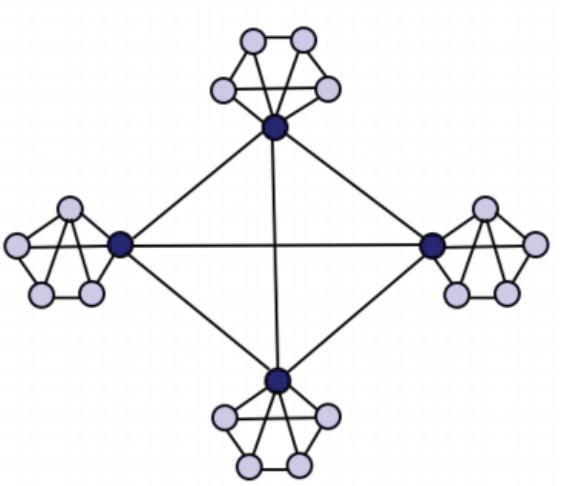
entering the toughest dungeons requires the concerted efforts of "raids" of up to 40 players. These can be a real logistical nightmare: raid leaders have to coordinate the schedules of these 40 players (and have backup available in case of no-shows), assign responsibilities and form subgroups, define tactics, establish the rules for sharing the bounty from the event, make sure that all players come with the equipment required, and so forth. There is therefore a curious blurring of the boundaries between work and play in MMOGs (Yee, 2006b), and in fact some of the game's activities are so close to what would be required in a corporate environment that some suggested an experience as a guild leader would make a worthwhile addition to a resume (J. Brown & Thomas, 2006). Others have argued that the "video game generation" is acquiring valuable knowledge from games that will help them transform the workplace (Beck & Wade, 2004), and this even though MMOGs were not originally designed with the teaching of specific skills in mind.

But what exactly are players learning in these games that could be valuable in the workplace? Our data about the structure of social networks in successful guilds sheds some light on this question. Indeed, it looks as if very specific forms of organization ultimately prevail in WoW. A successful and long-lasting endgame guild must be both large and broken down into small, dense sub-units of about five players using characters with diverse skills (that is, diverse classes) and well-defined roles. To stay alive and perform well the group will also need to adopt a pro-active recruitment strategy, bringing in a constant influx of players at varying levels of expertise. The ideal-type (Weber, 1949) of a successful guild therefore looks like Figure 9 below.

The figure above looks surprisingly similar to the organic, team-based structures that are prevalent in many corporations nowadays. It therefore looks as if WoW familiarizes its players with organizational forms that they will have a high chance of encountering in the physical world (if they are not already employed and part of a similar structure). Because of the game's design, players are also given clear roles (their class) that naturally steer them into specific positions in their guild's social network. This may later affect the way these players behave in the workplace (for instance, WoW players might prefer working in small teams with clearly defined individual responsibilities).

This similarity between workplace organization and guild structure blurs the distinction between play and work even further: after a long day at the office, a player joining his guild for a raid online will join a group that is in many ways similar to what he just left! The fact that he or she does the latter much more willingly than going to work in the morning is an interesting puzzle, indicating that modeling a workplace's organization after a game guild to make it more enjoyable might not be very successful: they are organized in basically the same way. The root of the pleasure offered by MMOGs must therefore be found in places other than the form of social networks they support—a question that game theorists have been grappling with for a long time (Huizinga, 1949; Koster, 2005) and that is beyond the scope of this chapter.

Figure 9. Ideal-type social network for a successful guild



Beyond the perspective of individual participants, our data also has implications for the structuring and management of organizations, most clearly illustrated by Figure 9. In particular, it seems to indicate that diverse, organic structures stand a better chance of success than others. While a single organizational form is not always the best (Mintzberg, 1978), past research has argued that efficiency and survival depend in great part on the organization's environment (Hannan & Freeman, 1984; Winter, 1990), resulting in inertia and a pressure towards uniformity. However, these theories were difficult to test empirically due to the chaotic nature of business environment everywhere. But note that WoW offers an essentially uniform environment for organizations to emerge: by design guilds all have similar objectives (progressing through the game's toughest instances), players are equipped with a well-defined and limited set of skills (based on their class), the level of uncertainty is constant (encounters with "mobs" and "bosses" are scripted by a computer program and therefore predicable), and so forth. WoW is a structured environment that submits organizations to the same set of constraints. It is therefore interesting to see that under these controlled conditions, organizations with similar structures (schematized in Figure 9) will survive and thrive. This seems to give support to ecological theories of organizational change (Hannan & Freeman, 1984; Winter, 1990) emphasizing the role of the environment in an organization's success. The particular form achieved (team-based, organic) is not necessarily the best in all contexts but it clearly seems to be the most resilient in WoW's environment.

CONCLUSION

Online games can be fascinating laboratories to observe the dynamics of groups online. In particular, the ease of collecting large-scale interaction data makes them ideally suited to analyzing the formation and evolution of social networks in player groups. In this chapter, we have used such a data set to reach conclusions pointing at some important evolutions in the nature of sociability online, as well as the potential of online collaborative spaces to impact activities in the physical world.

Regarding the former, our observations show that while MMOGs are clearly social environments, the extent and nature of the players' social activities differ significantly from previous accounts. In particular, joint activities are not very prevalent, especially in the early stages of the game. WoW's subscribers, instead of playing with other people, rely on them as an audience for their in-game performances, as an entertaining spectacle, and as a diffuse and easily accessible source of information and chitchat. For most, playing the game is therefore like being "alone together"—surrounded by others, but not necessarily actively interacting with them. As we argued, this seems analogous to trends observed in other environments (electronic or otherwise) and points at a possible "loosening" of sociability. We do not mean to imply that this is in any way damaging (or improving) on the diverse ways humans have interacted in society over the ages. Indeed, there is no evidence from WoW that players feel their social experience is impoverished—it is in fact quite the opposite. We simply want to point out that, based on WoW's success, this suggests alternative design strategies for online games (and online spaces more generally) where encouraging and supporting direct interactions might be less important than designing for the "spectator experience" and a sense of social presence (Reeves, Benford, O'Malley, & Fraser, 2005).

We have also been able to show that social structures in WoW tend to crystallize around a common template. The design of the game certainly influences this pattern: for instance the emphasis on small quest parties with complementary, well-defined roles, translates directly into guild structures made of small sub-units loosely

interconnected with each other. Our data also indicates that online social networks are more resilient when they are actively planned and managed. A constant influx of new blood coupled with a growth management plan will help a guild thrive without collapsing under its own weight. Overall, these interaction patterns steer players towards certain forms of teamwork that might transfer to group activities outside of games. Such data is particularly relevant in light of current debates about the educational value of MMOGs and their possible impact on the workplace.

Finally, WoW also illustrates how, under controlled conditions, organizations tend to converge on a similar form maximizing their efficiency and survivability. This gives credence to ecological theories of organizational change that, until now, had been difficult to test empirically for lack of a controlled experimental environment. Moreover, this more generally illustrates how online games could represent an ideal platform to empirically test social-scientific problems in a variety of domains where replicability and control over the environment are important (Castranova, 2006). We believe such use of games for research purposes is a promising avenue for future work.

REFERENCES

Anderson, C., & Bushman, B. (2001). Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and pro-social behavior: A meta-analytic review of the scientific literature. *Psychological Science, 12,* 353-359.

Bartle, R. (1996). Players who suit MUDs. *Journal of MUD research, 1*(1).

Bartle, R. (2004). *Designing virtual worlds.* Indianapolis, IN: New Riders Publishing.

Beck, J., & Wade, M. (2004). *Got game: How the gamer generation is reshaping business forever.* Boston, MA: Harvard Business School Press.

Bender, T. (1978). *Community and social change in America*. Baltimore, MD: The John Hopkins University Press.

Bernheim Brush, A., Wang, X., Combs Turner, T., & Smith, M. (2005). Assessing differential usage of Usenet social accounting meta-data. *Proceedings of CHI 2005* (pp. 889-898). New York, NY: ACM.

Blizzard. (2007). January 11, 2007 press release. Retrieved from http://www.blizzard.com/press/070111.shtml.

Boyd, D. (2006). Friends, Friendsters, and Top 8: Writing community into being on social network sites. *FirstMonday, 11*(12).

Boyd, D. (in press). Why youth (heart) social network sites: The role of networked publics in teenage social life. In: D. Buckingham (Ed.), *McArthur Foundation series on digital learning*. Cambridge, MA: MIT Press

Brown, B., & Bell, M. (2004). CSCW at play: 'There' as a collaborative virtual environment. *Proceedings of CSCW'04* (pp. 350-359). New York, NY: ACM.

Brown, J., & Thomas, D. (2006). You play World of Warcraft? You're hired!. *Wired, 14*(4).

Castranova, E. (2003). On virtual economies. *Game Studies, 3*(2).

Castranova, E. (2006). On the research value of large games. *Games and Culture, 1*(2), 163-186.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.)*. Hillsdalle, NJ: Lawrence Erlbaum Associates.

Cuciz, D. (2001). The history of MUDs. Retrieved October 7, 2003, from http://www.gamespy.com/articles/january01/muds1/index4.shtm.

Curtis, P. (1992). Mudding: Social phenomena in text-based virtual realities. *Proceedings of Directions and Implications of Advanced Computing (DIAC'92) Symposium*. Berkeley, CA.

Ducheneaut, N., Yee, N., Nickell, E., & Moore, R. (2006a). "Alone together?" Exploring the social dynamics of massively multiplayer online games. *Proceedings of CHI 2006* (pp. 407-416). New York, NY: ACM.

Ducheneaut, N., Yee, N., Nickell, E., & Moore, R. (2006b). Building a MMO with mass appeal: A look at gameplay in World of Warcraft. *Games and Culture, 1*(4), 1-38.

Ducheneaut, N., Yee, N., Nickell, E., & Moore, R. (2007). The life and death of online gaming communities: A look at guilds in World of Warcraft. *Proceedings of CHI 2007* (pp. 839-848). New York, NY: ACM.

Dunbar, R. (1993). Co-evolution of neocortical size, group size and language in humans. *Behavioral and brain sciences, 16*(4), 681-735.

Fine, G. (1983). *Shared fantasy: Role-playing games as social worlds*. Chicago, IL: The University of Chicago Press.

Friedman, T. (2001). Cyber-Serfdom. *The New York Times*.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology, 78,* 1360-1380.

Hannan, M., & Freeman, J. (1984). Structural inertia and organizational change. *American Sociological Review, 49,* 149-164.

Huizinga, J. (1949). *Homo ludens, a study of the play element in culture*. London: Routledge and Kegan Paul.

Jakobson, M., & Taylor, T. (2003). The Sopranos meets EverQuest: Social networking in massively multiplayer online games. *Proceedings of DAC 2003* (pp. 81-90). Melbourne, Australia.

Koster, R. (2005). *A theory of fun for game design*. Scottsdale, AZ: Paraglyph Press.

Lazzaro, N. (2004). *Why we play games: Four keys to emotion without story*. Oakland, CA: Xeodesign.

Malaby, T. (2003). *Gambling life: Dealing in contingency in a Greek city*. Chicago, IL: University of Illinois press.

Mintzberg, H. (1978). *The structuring of organizations*. Englewood Cliffs, NJ: Prentice Hall.

Nardi, B., & Harris, J. (2006). Strangers and friends: Collaborative play in World of Warcraft. *Proceedings of CSCW 2006*. New York, NY: ACM.

Olausson, M. (2007). Games industry transformed as one-third of games software revenues will be generated online by 2011. http://www.strategyanalytics.net/default.aspx?mod=PressReleaseViewer&a0=3569.

Oldenburg, R. (1989). *The great good place*. New York, NY: Marlowe & Company.

Palen, L. (2002). Mobile telephony in a connected life. *Communication of the ACM, 45*(3), 78-82.

Putnam, R. (2000). *Bowling alone: The collapse and revival of American community*. New York, NY: Simon & Schuster.

Reeves, S., Benford, S., O'Malley, C., & Fraser, M. (2005). Designing the spectator experience. *Proceedings of the conference on human factors in computing systems (CHI 2005)*. New York, NY: ACM.

Seay, A., Jerome, W., Lee, K., & Kraut, R. (2004). Project massive: A study of online gaming communities. *Proceedings of CHI 2004* (pp. 1421-1424). New York, NY: ACM.

Steinkuehler, C., & Williams, D. (2006). Where everybody knows your (screen) name: Online games as "third places". *Journal of Computer-Mediated Communication, 11*(4).

Taylor, T. (2003). Power gamers just want to have fun?: Instrumental play in a MMOG. *Proceedings of the 1st Digra conference: Level up*. The University of Utrecht, The Netherlands.

Taylor, T. (2006). *Play between worlds*. Cambridge, MA: The MIT Press.

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. Cambridge, UK: Cambridge University Press.

Weber, M. (1949). *The methodology of the social sciences* (E. Schills & H. Finch, Trans.). New York, NY: The Free Press.

Williams, D., Ducheneaut, N., Xiong, L., Zhang, Y., Yee, N., & Nickell, E. (2006). From treehouse to barracks: The social life of guilds in World of Warcraft. *Games and Culture, 1*(4), 338-361.

Winter, S. (1990). Survival, selection and inheritance in evolutionary theories of organization. In: J. Sing (Ed.), *Organizational evolution: new directions* (pp. 269-297). Thousand Oaks, CA: Sage Publications.

Woodcock, B. (2005). *An analysis of MMOG subscription growth – Version 21.0.* Retrieved July 12, 2005, from http://pw1.netcom.com/~sirbruce/Subscriptions.html.

Yee, N. (2001). The Norrathian scrolls: A study of EverQuest (Version 2.5). Retrieved October 7, 2003, from http://www.nickyee.com/eqt/report.html.

Yee, N. (2002). Ariadne - Understanding MMORPG addiction. http://www.nickyee.com/hub/addiction/home.html.

Yee, N. (2005). Facets: 5 motivation factors for why people play MMORPGs. Retrieved August 16, 2005, from http://www.nickyee.com/facets/home.html.

Yee, N. (2006a). The demographics, motivations and derived experiences of users of massively-multiuser online graphical environments. *PRESENCE: Teleoperators and Virtual Environments*. Cambridge, MA: MIT Press.

Yee, N. (2006b). The labor of fun: How video games blur the boundaries of work and play. *Games and Culture, 1,* 68-71.

ENDNOTES

* This work is based on two earlier publications: *Alone together? Exploring the social dynamics of massively multiplayer games*, in Proceedings of CHI 2006, © ACM, 2006. http://doi.acm.org/10.1145/1124772.1124834 *The life and death of online gaming communities: a look at guilds in World of Warcraft*, in Proceedings of CHI 2007, © ACM, 2007. http://doi.acm.org/10.1145/1240624.124075

1 An expansion pack was released in early 2007, opening up new zones to explore and increasing the maximum level to 70.

2 In order to break down the game's large subscriber base into more manageable units, players must choose a specific server to play on. Each server can host a community of about 20,000 players (there are more than 150 servers available in the U.S.). Three server types are available. The most common is PvE (player versus environment) where players cannot kill other players by default, unlike PvP (player-versus-player) servers. The third server type is RP (role-playing) for players who prefer to "stay in character" during the game. We observed behaviors in at least one exemplar of each to make sure play style did not affect our metrics.

3 Cohen states that an R of .37 would be considered "large" (with a corresponding R-Square value of .14), for data collected during highly-controlled experimental conditions. Considering that our analysis was conducted on a large naturalistic sample with a great deal of extraneous noise, an R-Square of .200 is therefore quite high.