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Let's Bail!: The evolution of individual-group affiliation in an online gaming community

Jingyi Sun *, Dmitri Williams, Yiqi Li

Annenberg School for Communication and Journalism, University of Southern California, USA

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ABSTRACT

Compared to interpersonal social interaction in online communities, the dynamics between individuals and groups has received much less attention. This study seeks to address this gap by examining how ecological factors drive the dissolution of individual-group ties. Guided by the ecology theory, the logic of "jack of all trades", which argues diversification lowers success, can be applied to understand how individuals access group resources and how group boundaries are collectively constructed. Moreover, interpersonal networks, including within-group and cross-group ties, also affect individual-group interaction. Within the research context of an online gaming community, this study examines the relational dynamics of 8631 persistently active players and their affiliated 2292 groups over thirty-two months. The results show that ecological factors including individual niche width, group category contrast, interpersonal networks, tie age and group age affect the individual-group tie decay hazard.

1. Introduction

As virtual places for social activities, online communities have attracted increasing research attention (Kraut & Resnick, 2012; Lu et al., 2014; Shen et al., 2020). Scholars proposed two major types of social interaction: the bond-based attachment among individual members, and the identity-based attachment reflected as individuals' sense of belonging to a group as a whole (Chung et al., 2016; Kavanaugh et al., 2005; Ren et al., 2007). The bond among individuals has been theorized in terms of the formation and dissolution of interpersonal social networks (Pennington, 2020; Shen et al., 2014), and the attachment between individuals and groups is examined through predicting group membership by social ties and attribute homophily (Ahmad et al., 2011; Alvari et al., 2014). However, there's little attention to the dissolution of individual-group ties. Nevertheless, group turnover in online communities is of great theoretical importance because it affects group performance, facilitates the information flow across sub-communities, and forms bridging social capital (Howard & Jones, 2004; Meng et al., 2015).

This paper seeks to address this gap by evaluating the dissolution of individual-group affiliation by following the ecology theory. Ecology theory focuses on how entities respond to their environment by occupying different resource positions, or niches, for survival and growth (Aldrich & Ruef, 2006; Hannan & Freeman, 1984). A niche can be synonymous with a social category in some contexts, as we will see below. Recent developments in ecology theory take into account the tradeoff between breadth and depth in niche occupation; that is, some entities occupy a diverse range of niche categories, but this resource allocation pattern reduces their capability to engage well in any of them (Hannan et al., 2007; Hsu, 2006). Collectively, if many members of a niche category also occupy other niches, the category itself would have a "fuzzy" boundary and a less clear collective identity (Negro et al., 2010).

This paper argues that such breadth-depth tradeoff can be applied to understand the individual-group attachment. Individuals could join and get to know a number of groups and choose to stay or quit. At the individual level, if one chooses to join a broad variety of groups, it indicates the person's low likelihood to develop a deep attachment with any one group. At the group level, the more membership overlap one group has with other groups, the fuzzier the boundary of the group and the less meaningful to be a member of that group, which may potentially lower group members' attachment. Furthermore, group attachment and interpersonal bond are closely connected. By building social relations within a group, one's attachment with the group can be enhanced; reversely, such group attachment might be lowered if one develops many social relations outside the group (Alvari et al., 2014; Ducheneaut et al., 2006; Shen et al., 2014). Following this logic, this paper shows that within-group and cross-group interpersonal network ties influence

* Corresponding author.
E-mail addresses: jingyisu@usc.edu (J. Sun), dcwillia@usc.edu (D. Williams), yiqili@usc.edu (Y. Li).

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individual-group tie dissolution differently.

The research context is a massively multiplayer online game (MMOG) called *World of Tanks (WoT)*. Online gaming communities can be viewed as ecosystems, where in-game groups compete or collaborate for resources, and so do players (Chen et al., 2008). Resembling many other online gaming communities, clans in *WoT* are semi-permanent organizations with unique identities, rules, requirements, leadership styles, and organizational cultures (Vesa et al., 2017). Players usually join groups that align with their interests, mindsets and ways of playing the game, which is important for both individuals and clans because players have diverse motivations for game playing (Kahn et al., 2015). Meanwhile, players also expand their interpersonal social networks which enable them to collaborate and ultimately perform better in-game (Meng et al., 2015; Shen et al., 2014). The dual social channels to access resources make this gaming community an ideal context to inform group dynamics and its connection with interpersonal networks (Ducheneaut, 2009). Moreover, reliable longitudinal data on group membership at a large scale has often been difficult to acquire (Ahmad et al., 2011), and this limitation is eliminated in this paper through a large, long-term set of data pulled directly from a game publisher's data warehouse.

This paper is organized as follows. Ecology theory, with particular attention on network evolution, niche categories, network embeddedness and age dependence, are reviewed to derive hypotheses. The literature on MMOGs with a particular focus on individual-group and interpersonal interaction is reviewed to provide contextual information. This paper then gives a detailed account of the big data method and tests the hypotheses with event history modeling following Burt's (2000) tie decay function. Implications of the findings and future avenues of research are discussed.

2. Literature review

2.1. Organization ecology and network evolution

From a sociological perspective, ecology theory argues that organizational changes are subject to the mechanisms of variation, selection and retention (V–S-R) (Aldrich & Ruef, 2006). Variations are departures from routines. Those variations conducive to environmental fitness are more likely to be selected. Selected variations are thus retained, preserved or reproduced (Aldrich & Ruef, 2006). As channels for accessing resources, network transformation is also subject to the mechanisms of V–S-R, where exploring potential partners entails variation, and links with high fitness are selected and retained (Monge et al., 2008). In particular, linkage fitness could be evaluated in multiple dimensions, i.e. the capacity to provide important resources and the efforts needed to sustain the link (Monge et al., 2008). The V–S-R process of network evolution has been applied to understand the evolution of interpersonal networks (Shen et al., 2014) and inter-organizational networks (Powell et al., 2005).

This paper argues that the V–S-R process provides a useful perspective to understand the evolution of individual-group attachment. In the current research context, individuals might initially try to join a group and go through a probationary period to see if it is a fit for them. After some experimentation, they may choose to remain in or quit the group, or the group might remove them as well. If an individual wants to be further socialized within a group and obtain more resources from this group, he or she has to make efforts to maintain the affiliation by following the group's requirements and contributing to it. The more socialized an individual is within a group, the higher the stakes of switching and starting all over again. When deciding to dissolve or sustain a tie with a group, individuals are also likely to consider whether the group is a source of potential benefits and worthy of the effort to maintain the tie, and whether they have close friends within and outside the group. The above logic is explained with relevant ecological concepts below.

2.2. Individual-level niche width

In ecology theory, the concept of "niche width" originally refers to the abundance or scarcity of resources in a niche that entities (i.e. organization or individual) rely on for survival and growth (Hannan & Freeman, 1977). The recent development of ecology theory incorporates the fuzzy set theory, such that an entity's membership in a niche category can be partial and weighted, ranging from 0 to 1, thus it is called the grade of membership (GoM) (Hannan et al., 2007). As GoM in a category approaches 1, this entity is more likely to be a typical or full-fledged member of this category. Niche width in fuzzy space is measured by the unevenness of the distribution of GoM across categories. Thus, a narrow niche width means concentrating GoM in one or a few categories, and a large niche width means spreading GoM more evenly in many categories. This concept implies a tradeoff between niche width and fitness (or success). In other words, having a large niche width reduces an entity's capability to perform well in categories to which they claim membership. This accords with the logic of "jack of all trades, master of none" (Hsu, 2006).

The tradeoff between niche width and fitness is due to two factors. On one hand, having a broad niche width reduces the chance of skill specialization and harms the capacity to engage with target audiences in any niche category; on the other hand, a broad niche width creates an ambiguous and confusing identity (Hsu et al., 2009; Negro et al., 2010). For instance, films with a large niche width of genres attracted more viewers but had lower ratings from film aficionados on the film rating website IMDB (Hsu, 2006). EBay sellers who listed items with large niche width in e-commerce categories had fewer bids and sales (Hsu et al., 2009). A wine's appeal to critics declined with the niche width of the producer because a large niche width prevented the producer from being an expert in one category (Negro et al., 2010). Wikipedia articles on coarse-grained subjects in its hierarchical categorization system attracted large numbers of contributors but received lower ratings because of the difficulty in reaching consensus on the content quality of more general topics (Lerner & Lomi, 2018).

The current paper argues that the tradeoff between breadth and depth can also be applied to the individual-group attachment. As a special type of social category, group categories are defined by a complex series of factors including gender, ethnicity, skills, interests, values or choices (Postmes & Spears, 2000). Meyrowitz (1986) argued that it is the information flow or access to social information that enables or constrains social behaviors in a group. Shared codes hold a group together, form a group's identity, makes individuals identify with a group, and separates members from non-members. The more socialized a member is to a group, the more "backstage" information this member has access to (Meyrowitz, 1986).

Given the limit of one's cognitive capacity, the more attention and effort one devotes to a group, the higher the grade of membership in that group. Thus, the niche width of an individual in terms of group membership measures whether this individual chooses to access focused/deep or broad/shallow group resources. A narrow niche width is indicative of the ability to concentrate resource allocation to better engage with some groups but not all, and it also shows the ability to quickly make the decision to quit if a group doesn't align with one's interest or expectation. A narrow niche width is an exhibition of commitment, which is likely to make fellow members more willing to socialize with this individual. It should be noticed that individuals' niche width does not necessarily correspond with the number of groups they have joined. It is possible that individuals who evenly distribute their grade of membership in groups have a larger niche width than those who concentrate in some of the groups even the former might have joined fewer groups. A comparable example in real life is how employment experience affects organization turnover. For instance, employee A has evenly allocated working experience in three jobs with a GoM vector {0.33, 0.33, 0.33}, and employee B has unevenly allocated working experience in four jobs with a GoM vector {0.7, 0.1, 0.1, 0.1}.

The diversification of resource allocation for employee A (0.67) is larger than employee B (0.48) even though the former has fewer jobs. Thus, employee A is less likely to deeply engage with any of the three jobs and employee A's colleagues are also less likely to socialize with this individual due to the lack of commitment shown in their past working experience. Following this logic, we propose that:

H1. Individual-level niche width positively correlates with the likelihood of individual-group affiliation decay.

2.3. Group-level category contrast

Individuals' group membership mobility facilitates information flow across groups and erodes boundaries among them. The extent to which niche categories have sharp boundaries is measured by the concept of "category contrast" (Negro et al., 2010, p. 1398). Low contrast means fuzzy boundaries. When a category has high fuzziness, it means many members of this category have low grade of membership, and subsequently there's little consensus on the attributes that define the membership to this category (Negro et al., 2010). When contrast is low, it is not easy to differentiate this category from others, and therefore membership does not have much meaning (Kovács & Hannan, 2010). In other words, low contrast harms the collective identity of members, such that even committed members claiming this category would not derive much benefit from it (Negro et al., 2010). Thus, the negative impact of spanning categories of high contrast would be higher than spanning categories of low contrast (Kovács & Hannan, 2015), whereas high fuzziness of categories even incentivizes members to span categories because there's little downside (Hsu et al., 2012).

Applied to individual-group attachment, groups with low contrast have fewer full-fledged members and many members have allocated attention to other groups. Therefore, groups with low contrast have less distinctive collective identities that differentiate them from other alternative groups. Although newcomers bring fresh information, groups made up of members with low devotion are unable to collectively create critical resources unique to them. For better performance, groups need to establish effective governance and decision-making structures (Vesa et al., 2017), build social relations as team social capital to handle challenges (Oh et al., 2004), and establish trust and emotional support to enhance group cohesiveness (Williams, 2006). Groups with only marginal members are unlikely to effectively create such critical resources. From the perspective of members, in such groups with fuzzy boundaries, even members with large grade of membership couldn't gain expected resources, e.g. improving skills, seeking advice, making friends. Individuals may view a group with low contrast as a fluid rather than cohesive community, which makes it difficult for individuals to identify with the group and develop a strong attachment. Hence, we propose that:

H2. Group-level category contrast negatively correlates with the likelihood of individual-group affiliation decay.

2.4. Individuals' within-/cross-group networks

The social perspective of categorization posits that both actors and categories are embedded in a larger system such that actors' categorization behaviors are affected by social relations and comparison among actors (Wry & Castor, 2017). This perspective naturally speaks to the interconnectedness between individual-group attachment and interpersonal bond (Ren et al., 2012). Research has shown that members affiliated to the same group are more likely to team up and play longer than non-members (Ducheneaut et al., 2006), social ties between individuals belonging to the same group are less likely to decay (Shen et al., 2014), and interpersonal toxic behaviors are less likely for game battles based on existing groups (Shen et al., 2020). On the flip side, knowing influential members through interpersonal networks positively predicts group membership (Alvari et al., 2014). Following this logic, individuals' social embeddedness is likely to affect individual-group attachment.

The concept of embeddedness can be attributed to Granovetter (1985), who argued for a middle ground between under- and over-socialized perspectives, such that actors' behaviors are influenced by their networks. Relational embeddedness generally indicates strong ties, network closure and stability, which reduces the chance of tie decay (Burt, 2000). At the individual level, structural embeddedness has a non-linear relationship with performance, because embeddedness initially brings benefits like coordination and trust but excessive embeddedness results in constraint like information redundancy (Uzzi, 1996). Similarly, at the group level, research has also found that within-group network density has an inverted-U-shaped relationship with group effectiveness, and that group members' external ties with leaders from other groups increase their group's effectiveness (Hsu et al., 2012).

Within-group and cross-group social ties influence individual-group attachment in different ways. Strong ties with ingroup members are likely to strengthen in-group identity, while strong ties with outgroup members had the opposite effect (Rao et al., 2000). Similarly, strong intra-organizational network ties would reduce employees' turnover intention, while a strong external social network marginally increases it (Moynihan & Pandey, 2008). Specific to gaming communities, Hsiao and Chiou (2012) found that players' within-group network centrality positively correlated with access to within-group resources but not directly affected enjoyment, whereas social ties outside their groups negatively influenced access to within-group resources but positively associated with enjoyment. Taken together, we propose that within-group ties strengthen group affiliation and cross-group ties weaken group affiliation.

H3a. Individuals' within-group network ties negatively correlate with the likelihood of the individual-group affiliation decay.

H3b. Individuals' cross-group network ties positively correlate with the likelihood of the individual-group affiliation decay.

2.5. Age dependence of ties and groups

New organizations usually suffer from a higher mortality rate due to lack of resources and legitimacy, which is called the liability of newness in ecology theory (Hannan & Freeman, 1984; Stinchcombe, 1965). When applied to network evolution, the liability of newness means that newer relationships are less likely to be sustained (Burt, 2000; Pennington, 2020). The rationale is that the maintenance of ties needs investment, and network stability usually associates with reliability, trust and norms (Walker et al., 1997). In organizational turnover studies, researchers found that employees' tenure in positions negatively correlated with turnover (Iverson & Currivan, 2003). This finding is echoed in the dissolution of interpersonal networks in gaming contexts, where new players are more likely to develop a large number of weak ties as part of the initial "trial-and-error" learning process, and the hazard of tie decay decreases with time (Shen et al., 2014).

H4a. Individuals' tenure within groups negatively correlates with the likelihood of individual-group affiliation decay.

The liability of oldness, also known as structural inertia, predicts less change within older organizations (Amburgey et al., 1990). Inertia increases with age, because older organizations have more restrictions from formalized structures, standardized routines, institutionalized power distributions, dependencies and commitments (Baum, 2002). Internal selection encourages standardization and accountability of roles and limits experimentation (Aldrich & Ruef, 2006). Members of older organizations favor familiar structures and oppose alterations (Le Mens et al., 2015). In the current context, we propose that older groups have more rigid and cohesive structures, and members are less likely to quit. Older groups are usually characterized by stronger and denser

within-group networks and more established social hierarchy. As a result, older organizations could provide more trust, emotional support and stronger identification for members, but also entail more constraints to members and exclusion of newcomers.

H4b. The group age negatively correlates with the likelihood of individual-group affiliation decay.

2.6. The social architecture of WoT

The current research context, *WoT*, is a MMOG featuring mid-20th century tanks and team-based battles in which each player maneuvers a type of tank. It's an appropriate research context for the examination of individual-group attachment and its connectedness with interpersonal bond attachment, because there are in-game organizations to organize social activities for players, and meanwhile players build social networks to improve team-based performance. Clans in *WoT* are formal organizations with distinctive identities, including names, profiles, and military-like leadership structures (Shen et al., 2020). A clan can have a maximum of one hundred members, and players are only allowed to join one clan at a time. Clans usually have specific recruitment requirements in terms of skill levels and participation, and they assign special recruiters to screen membership applications. To ensure effective governance, clans assign members with roles like commander, executive officer, personnel officer, combat officer, recruitment officer, junior officer, etc. Clans also have within-clan chat channels to discuss and coordinate training, recruitment and battle plans. Thus, the social organizing of clans adds another layer of rules to the program-code embedded rules of virtual worlds (Vesa et al., 2017).

A number of studies have examined a similar type of in-game organization called guilds in *World of Warcraft* to understand individual-group dynamics. Guilds with different purposes and sizes have distinctive formal structures, which greatly affect individuals' behaviors, attitudes and social interaction (Williams et al., 2006). Players join guilds for multiple reasons, including access to information and knowledge, improving skills, socializing and making friends (Williams et al., 2006). Apart from providing resources, guilds also play an important role in forming players' social identities (Guegan et al., 2015). Like other types of organizations, the evolution of guilds follows life cycles (Chen et al., 2008). For guild performance, scholars have found that guild features like size, members' skill levels, within-guild social network structures, and recruitment strategies are influential factors (Ducheneaut, 2009). For the formation of guilds, homophily and skill diversity are important driving forces (Ahmad et al., 2011).

Meanwhile, players also directly establish interpersonal interaction because battles must be completed in collaboration with other players, thus co-play networks among players constitute important forms of social capital in gaming communities (Meng et al., 2015; Shen & Chen, 2015). In *WoT*, co-play relation is defined as playing together in non-random battles to indicate a purposeful collaboration. As team-based battles require each player to complete a different task, coordination and teamwork are key to success (Shen et al., 2020). For instance, scouting is carried out by light tanks to spot enemy tanks. With scouts lighting up targets, heavy tanks carrying bigger guns will get into the enemy base and try to hit priority targets. Frontline tanks equipped with the heaviest armor are directly positioned in the fire line. A player gets credit for not only damaging targets in the opponent team but also assisting team members to complete tasks. Having more familiar and trusted collaborators is essential for in-game performance because coordination, risk-taking and selflessness are required.

3. Method

3.1. The data

With the cooperation of the game's publisher, Wargaming, we retrieved all data from the *World of Tanks* PC data warehouse for the North American server spanning thirty-two consecutive months from September 2016 to April 2019. The complete dataset includes monthly aggregated data of 9,851,011 observations for 1,689,346 players, monthly aggregated co-playing relations among these players, and 1,417,454 observations for 45,648 clans. Data were aggregated monthly to achieve a balance between a general picture and specific details. All data were anonymized. Wargaming created a unique key for each player, so that different behaviors of the same player could be properly merged.

We began by identifying the players central to our research. First, a player needed to be a member of a clan for at least one month throughout the observation period of thirty-two months. Second, a player needed to be active for the observation period. The reason for focusing on persistently active players is that we need to differentiate between ceasing to interact with clans and leaving the game. Thirdly, it is common for users of online communities to have multiple accounts, and duplicate accounts could harm the accuracy of results. After removing those child accounts affiliated with parent accounts with the assistance of the publisher, the sample consisted of 18,496 persistent players interacting with 5751 clans.

Further considerations are required to make our empirical analysis valid. First, among 5751 clans, 2301 clans had complete observations because some were not active for the entire observation period. It is necessary to rule out the possibility that affiliation dissolution is due to the non-existence of clans. Second, since this study only examines how committed players interacted with clans, some clans might have only one persistently active player. Inclusion of these clans could not well capture the fuzziness of group boundary. Thus, we selected clans which had complete observations and had more than one persistent player. The final dataset consisted of 2292 clans and 8631 players who only interacted with these clans.

3.2. Measures

3.2.1. Dependent variable

Although a player cannot be a member of two clans at the same time, it is possible to have more than one clan in the monthly aggregated data because they might switch clans mid-month. To simplify the problem, for all the players, we obtained the clan in which a player spent most of the time for each month. After sorting each player's panel data in time order, we created the dependent variable of event occurrence to indicate a player leaving a clan.

3.2.2. Tie age

A player can quit clans several times within the observation period, so this is a multiple-states process, where the same type of event occurs more than once and each time period between two events is called a spell. A time duration variable was created to count the time elapsed for each time point within a spell. This is also the measure for individual-group affiliation tie age, or group membership tenure.

3.2.3. Individual niche width

Niche width at the player level was measured on the basis of players' clan memberships. Each player's grade of membership vector at each time point was an indication of the clan affiliation history weighted on tenure, which included a list of clans that this player had been a member of up to that point, and the degree of membership to each clan weighted by their tenure in that clan. Given the grade of membership vector $\mu(z, x, t)$, where $z \in Z$ (groups), the niche width of individual x at time t, as defined by Hannan et al. (2007), is given by:

$$Width\{\mu(z, x, t)\} = 1 - \sum_{z \in Z} \mu^2(z, x, t)$$

3.2.4. Group category contrast

Category contrast is defined as the average grade of membership of all members in that category (Negro et al., 2010). We defined co-membership to clans for each month as spending the most of their days of that month in the same clan. Based on such affiliation, members belonging to the same clans at the same time point were grouped together to measure the clan's category contrast at that time point.

3.2.5. Individual network degree centrality

Players' structural embeddedness was measured by network degree centrality in the co-play networks. We first built co-play networks for all players with tie weights indicative of the number of times two players played together for each month. We then dichotomized the networks on the median of tie weights, which was two for all time points, to get rid of weak ties. In order to measure within-clan degree centrality and cross-clan degree centrality, we distinguished ties between members belonging to the same clans and members of different clans. We built two-mode networks using player-clan affiliation for each month, and projected into a one-mode co-membership network for that month. This network was used to differentiate between within-clan ties and cross-clan ties.

3.2.6. Group age

Clan age was measured as the number of active months of clans up to each month in the observation period.

3.2.7. Control variables

The individual-level control variables included the numbers of battles won and in-game ratings as an indication of time commitment, performance and skill. The group-level control variables included the number of clan members and win rate, as an indication of group size and performance. Descriptive statistics are shown in Table 1.

4. Results

To model repeated events clustered in individuals and groups, multilevel discrete-time event history models, or frailty models, were built to test the hypotheses. Because individuals switched among groups, repeated measures of individuals were not exactly clustered in groups. Thus, random effects for individuals and groups were taken into account separately. Five discrete-time event history models were built to test the hypotheses (Table 2). Tie age was included in every model because time was an integral part of event history models. Hypotheses were tested separately to avoid multicollinearity.

H1 hypothesizes that individual-level niche width positively correlates with the hazard of individual-group affiliation decay. The results show that this parameter is positively significant in model 2, $B = 6.002$, $SE = 0.115$, $p < .001$. That is to say, the more diversified a player allocates attention and resources, the more likely this player will quit a clan. This result offers support to H1.

H2 hypothesizes that group-level category contrast negatively correlates with the hazard of individual-group affiliation decay. The results show that this variable negatively associates with the tie decay hazard in model 4, $B = -6.042$, $SE = 0.128$, $p < .001$. The more distinctive boundary a clan has, the less likely a member will quit that clan. This hypothesis is further explained by the positive correlation between group contrast and group win rate, $r = 0.16$, $p < .001$. Since groups with fuzzy boundaries are less likely to perform well, players are less motivated to stay. H2 is supported.

H3 hypothesizes that within-group and cross-group co-play network ties affect individual-group tie decay hazard differently. Model 3 shows that within-group network degree centrality slows individual-group affiliation decay, $B = -.016$, $SE = 0.005$, $p < .001$, and cross-group network degree centrality positively affects individual-group affiliation decay, $B = .003$, $SE = 0.000$, $p < .001$. H3a and H3b are supported.

H4a hypothesizes that the longer the tenure of an individual in a group, the less likely the individual-group affiliation decay. This is supported throughout Model 1, 3 and 4, with $B = -0.022$, $SE = 0.003$, $p < .001$ in model 1. H4b hypothesizes that older clans have stronger inertia forces such that members are less likely to quit. Clan age is negatively significant in model 5, $B = -0.518$, $SE = 0.075$, $p < .001$. H4a and H4b are supported.

Moreover, control covariates also reveal some interesting findings. For instance, players who had won more battles were more likely to quit, probably because such star players had plenty of alternatives. Clans with more members were better at retaining members, probably because such clans had more abundant resources, particularly the critical mass to regularly field a full team in battles.

5. Discussion

This study explores the ecological factors that affect the individual-group affiliation tie dissolution. Compared to abundant studies on tie formation, tie decay is under-theorized (Pennington, 2020; Shen et al., 2014). Guided by the ecology theory, this study focuses on factors including resource allocation, group boundaries, within- and cross-group social ties, group membership tenure, and group age. With all the hypotheses supported by empirical analysis, this study shows the explanatory power of ecology theory for understanding individual-group dynamics in online communities.

5.1. The ecology of individual-group dynamics

This study makes several theoretical contributions to the ecology theory. First, it applies the principle of breadth-depth tradeoff to understand how individuals' group membership experience indicates the pattern of accessing group resources, which in turn affects individual-group attachment. In gaming communities, groups compete with each other for higher rankings. To guard against free riders, staged socialization is necessary, where players need to follow the group requirements and make contributions (Vesa et al., 2017). Individuals are able to access broad and diverse group resources through joining multiple groups with

Table 1
Descriptive statistics for multilevel discrete-time event history models of individual-group affiliation decay.

	Mean	*SD*	*Range*	1	2	3	4	5	6	7	8	9
1. Tie age	14.90	9.22	32									
2. Individual niche width	.03	.12	.81	-.21								
3. Individual within-group network degree	2.72	5.51	47	-.15	.19							
4. Individual cross-group network degree	13.23	37.37	893	-.13	.14	.64						
5. Group category contrast	.91	.14	.95	-.03	-.45	-.40	-.27					
6. Group age	1403.87	602.94	2970	.43	.00	-.05	-.05	-.01				
7. Individual battles won	187.01	155.69	2280	-.21	.04	.28	.29	-.07	-.15			
8. Individual rating	4853.16	1574.7	10417	.04	.09	.17	.14	-.18	.20	.12		
9. Group member count	59.61	30.39	99	-.14	.17	.37	.25	-.41	.07	.13	.12	
10. Group win rate	49.67	3.57	100	-.11	.07	.16	.16	-.12	.03	.12	.51	.14

Note: 1. All correlations are statistically significant.

Table 2
Parameters for multilevel discrete-time event history models of individual-group affiliation decay.

	Model 1	Model 2	Model 3	Model 4	Model 5
Tie age (H4a)	-.022***	.003	-.022***	-.052***	-.006
	(.003)	(.003)	(.003)	(.003)	(.004)
Individual niche width (H1)		6.002***			
		(.115)			
Individual within-group			-.016***		
network degree (H3a)			(.005)		
Individual cross-group			.003***		
network degree (H3b)			(.000)		
Group category contrast (H2)				−6.042***	
				(.128)	
Group age*10^{-3} (H4b)					-.518***
					(.075)
Individual battles win count*10^{-2}	.180***	.194***	.171***	.184***	.175***
	(.014)	(.013)	(.015)	(.013)	(.014)
Individual rating*10^{-4}	.293	-.306	.303	-.610 **	.530 *
	(.236)	(.201)	(.236)	(.210)	(.247)
Group win rate*10^{-1}	-.010	.157	.210***	.090***	.216***
	(.115)	(.012)	(.015)	(.012)	(.015)
Group member count*10^{-1}	.208***	.107***	-.022	.102	-.048
	(.015)	(.093)	(.115)	(.094)	(.117)
Intercept	−6.888***	−7.583***	−6.832***	-.590	−6.418 ***
	(.554)	(.432)	(.553)	(.442)	(.567)
No. of observations	240527	240527	240527	240527	240527
No. of individuals	8631	8631	8631	8631	8631
No. of groups	2292	2292	2292	2292	2292
Random effects SD for individuals	.928	.000	.931	.559	1.048
Random effects SD for groups	1.070	.386	1.068	.320	1.085
AIC	20341	18058	20315	18576	20300
Log likelihood	−10163	−9020	−10148	−9279	−10141
Δ LR χ 2		2285	30	1767	43

Note: 1. Standard errors are included in parentheses.
2. Δ LR *chi*-squares are compared to Model 1.
3. *$p < .05$. **$p < .01$. ***$p < .001$.

evenly distributed tenure, at the cost of specializing and deeply socializing with some groups. A broad niche also indicates a lack of commitment, which is likely to prevent fellow group members from investing in relationship building with a focal individual. Consistent with the theoretical prediction, the results show that the player-level niche width increases the individual-group affiliation decay.

Furthermore, following the concept of category contrast, this study proposes that the individual-group attachment is not only a function of the resource access pattern at the individual level, but also category boundary at the group level, because socialization in groups is a two-way interaction. When category contrast is low, the category boundary is fuzzy, and members bearing the category label are mostly marginal members with low grade of membership, thus there is no coherent collective identity that differentiates this category from others (Kovács & Hannan, 2010; Negro et al., 2010). Applying this logic to individual-group dynamics, since marginal members who have distractions are unlikely to devote to group activities such as coordinating battles, training, and teamwork building, a group consisting of mostly marginal members is unlikely to perform well. Individuals are unlikely to make tie retention efforts with groups of little foreseeable benefit. Even if an individual is willing to commit to such a group, the marginal members that make the bulk of the group are also unlikely to be patient enough to socialize with this individual. Consistent with this prediction, the results show that groups with fuzzy boundaries are more likely to experience individual-group tie decay.

Third, this paper connects individual-group interaction with interpersonal interaction. Within-group networks are likely to increase individuals' identification with groups and their intention to maintain the affiliation, and within-group networks are also likely to strengthen the collective identity and group boundary. By comparison, cross-group networks are likely to expose individuals to additional resources and new information, and cross-group networks also promote information flow across groups and erode boundaries. Unlike the inverted-U shaped relation between network embeddedness and performance found in previous studies (Uzzi, 1996), the empirical results in the current study did not support a non-linear relationship, possibly due to the fact that network degree has its limitation in representing the complex structural embeddedness.

5.2. Practical implication for organization turnover

Individual-group interaction in virtual communities is worthy of research attention in its own right because of the tension between two forces, that is, digital relations are transient and social boundaries seem to be much more blurred than in real life, whereas the efficiency and longevity of online groups still depend on collective boundary just like any kind of human organizing. Individuals in online communities are bounded by the social norm of organizing, and when it comes to developing relations, they ultimately have to balance quantity and quality. For managers of online organizations, although there's little contractual enforcement of commitment, they could still strategically create the group identity and manage members' social networks to strengthen cohesiveness and sense of belonging.

Furthermore, scholars are increasingly aware of how social dynamics in virtual communities follow the same social rules and norms as offline world and thus provide valuable parallels to offline human organizing (Lu et al., 2014; Vesa et al., 2017). Studies have shown that digital group dynamics parallels real-life team-based organizing structures so that it is often generalizable to wider contexts (Ducheneaut, 2009; Johnson et al., 2009). In the current context, although military and fighting elements are unique game features, the common element is a competitive environment. Most clans are driven to succeed as their reason for being.

Thus, the competitive team-based dynamics map well on to a wide range of groups that must collaborate to win something. As such, a comparable context in real life is organization turnover, which has attracted abundant interest in organization research (Griffeth et al., 2000; Hausknecht & Trevor, 2011). However, a noticeable shortcoming in this body of literature is that it is almost entirely based on a micro-perspective that focuses on attitudes and perceptions of group attachment. Neglecting ecological factors prevents the theory building from acknowledging that individuals and human organizations respond to their environment. Online communities, especially large MMOGs, however, offer abundant behavioral traces to study this problem that researchers cannot afford to ignore.

5.3. Limitations and future directions

This study has several limitations. First, we only focused on the most committed players, because for players who are not persistently active it is difficult to differentiate between leaving a clan and quitting the game. This choice created several problems. These persistent players were presumably more committed to in-game organizations compared to fluid players, who might have different patterns of engagement with clans. Second, it became difficult to accurately measure the category contrast of groups because not every member was included, and thus the sample size was streamlined to avoid high correlation between individual-level measures and group-level measures. Moreover, as mentioned earlier, it is also difficult to explore more complex structural measures of within-group and cross-group networks. This study used network degree centrality to measure a focal individual's co-play resource within and across a group, but if the complete within-group network could be obtained, a better operationalization could be nestedness, which measures the depth of being embedded in a hierarchy of cohesive groups (Moody & White, 2003). Thus, considering how committed and fluid players together contribute to the performance of groups and examining their networks would be a promising area for future work.

Another limitation is that players' motivations to join clans were unknown as surveys at such a large scale would be difficult. Previous studies show that players join clans for either improving knowledge and skills or making friends (Williams et al., 2006), and different motivations might affect how players interact with groups and other fellow players. For instance, for players aiming at competing, whether a clan can provide the critical resources to help them gain better performance and higher rankings would be the top consideration. Thus, this type of players might not hesitate to quit clans once they have gained the knowledge and skills they expect. On the contrary, players mainly interested in socialization may choose to stay in a clan for a long time as long as they have made good friends in that clan, that is, the effect of within-group network ties on preventing clan quitting would be stronger for this type of players. Future studies could take individual motivation into consideration when assessing individual-group attachment and interpersonal bond.

Finally, although this study seeks to explore the ecological factors that drive the dissolution of individual-group ties, we acknowledge the limitations of the current behavioral data. The fact that players leave their clans could be due to many in-game but nonecological factors, e.g., interpersonal disputes, change of interests and motivations, change of game architecture. It could also be due to many non-game reasons, including issues in real life that prevent them from committing to clan activities. Future studies could provide complementary qualitative or survey-base measures to provide insights into the other reasons for quitting.

6. Conclusion

This study examined the ecological factors that drove the dissolution of individual-group affiliation ties in a large online gaming community. For individuals, their resource allocation patterns in groups and within-group/cross-group interpersonal ties would affect their attachment with groups. For groups, their boundary fuzziness and their age would affect the extent to which they could retain members. As the digital traces of online communities are increasingly available, it deserves more future research attention to examine how participants of online communities utilize and allocate environmental resources and how that relates to their social interaction.

Credit author statement

Jingyi Sun: Conceptualization, Methodology, Software, Formal analysis, Writing – original draft. Dmitri Williams: Supervision, Resources, Data curation, Writing- Reviewing and Editing. Yiqi Li: Writing-Reviewing and Editing.

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