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Developing Metrics to Characterise Flickr Groups

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Abstract

Flickr, the large-scale online photo sharing website, is often viewed as one of the ‘classic’ examples of Web2.0 applications. Flickr is becoming the “eyes on the world” by capturing and recording a visual archive of contemporary life on a diverse and extensive range of subjects. Through sites, such as Flickr, researchers are able to observe the social behaviour of online communities and extract, process and analyse content and metadata for a range of purposes. One of the main features of the online photo storing and sharing web site, Flickr, is groups. They provide a means to organise, share and discuss photos of potential interest to group members. This paper explores the scale of group creation on Flickr and proposes a novel scheme for characterising groups in Flickr. It suggests a set of metrics derived partly from previous studies, looking at aspects of membership, communication activity and communication structure. These metrics could be applied more generally than Flickr to capture characteristics of various online groups or communities. To provide the data to examine these metrics we first gathered a population of as many groups as possible, from which we randomly sampled 1,000 groups. Data about the groups sampled were collected using a variety of approaches and analysed with respect to the proposed set of metrics. The results of our analysis provide new insights into group behaviour in Flickr. We find that, in addition to very large groups in terms of members and photos, the data analysis uncovered a large number of small groups with low activity. Most groups, especially large ones, were not dominated by a few individuals as expected. The contributions of this paper include (1) a novel set of metrics for characterising online groups that extend existing schemes; (2) an approach for sampling Flickr to estimate the population of groups based on a form of dictionary-lookup; (3) new insights into Flickr groups based on results from analysing detailed information of 1,000 randomly selected groups; and (4) reflections on our experiences with using publicly accessible data to characterise groups in Flickr and to measure their “groupness’.

1. Introduction

Large Web2.0 sites and other "megawebsites" like Flickr are difficult to grasp because of their sheer scale. In October 2009 Flickr claimed to have 4 billion photos[1], having passed the 3 billion mark just 6 months earlier. The site may produce many rich personal experiences, but it is hard to get a feel for what the whole site is like. Individual impressions can be quite different because it is more like a place where many communities grow than itself a community (Perez 2007).

One of the most studied features of the Internet as a phenomenon is the active involvement of users in creating online or virtual communities. Usenet, Listservs and Web forums, such as Yahoo! Groups have supported the emergence of vibrant collectivities. Web2.0 sites, such as Flickr and Facebook, however, seem to be based primarily on a more social network model. Thus Flickr would be understood via individual users uploading and organising personal collections of photos, making social contacts through browsing profiles and responding to comments. Yet Flickr does have a group function too. To what extent should this be understood through the online community model? Is part of the success of Flickr its combination of ego-centred activity with the online community concept?

Flickr is a large site based on user generated photos and often cited as a 'classic' example of Web2.0 (Cox et al. 2008, Cox 2008, Miller and Edwards 2007, van House et al 2005). Flickr itself and content derived from the site has been studied from and used for a variety of purposes, such as providing recommendations for tagging photos (Sigurbjörnsson & van Zwol, 2008), investigating users motivations for publishing and tagging on Flickr (Nov et al., 2008; Angus & Thelwall, 2010) and automatic automatically assigning geographic coordinates to Flickr photos (Van Laere et al., 2010). Flickr groups[2] have a pool of photos, discussion space and a list of members. Anyone can set up a group, choosing a name, defining some simple functions and

[1] http://blog.flickr.net/2009/10/12/4000000000/
[2] FAQ for Flickr groups: http://www.flickr.com/help/groups/

becoming “Admin”. There are private and public groups. Generally users can join a group just by clicking on a button. They can then choose to surface one of their photos in the group pool. Several different types of group seem to have emerged on Flickr (Davies 2006, Malinen 2010). Some are a place to collect together photos around a particular topic, theme or photographic technique, be this very specific, such as pictures of a type of tree, or something very broad, such as black and white photos. Given that tagging only partly solves the problem of organising the vast collection of photos on Flickr, adding photos to groups is a form of emergent topical classification. Other groups are organised to hold competitions or make awards, effectively highlighting good photos. These groups can be themselves thematic or very broad in scope. How the awards are made varies, but often the group Admin and helpers choose who to reward. The existence of this type of group is linked to the desire to identify good photos, again in an emergent way. Flickr’s own way of calculating how good a photo is, is an interestingness algorithm, which uses evidence such as number of time a photo has been viewed, commented or favourited to priorities photos in searches. The award groups are another bottom up approach to organizing photos by quality, which allows many different criteria of goodness to be coexisting on Flickr. A third type of Flickr group has quite a strong geographical basis, collecting photos of a particular town or village, and these seem to be the most likely to organize meet-ups and develop into social groups.

On a superficial level this resembles the organisation of something like Yahoo! groups. In fact, a comparison of the organisation of Flickr and Yahoo! groups is instructive. Whereas Yahoo! groups are relatively clearly bounded and can be browsed as separate entities, because of the rich navigation paths it is very easy within Flickr to navigate out of any Flickr group, e.g. from a photo in the pool to the “photostream” of its author or from the membership list to the profile of individual members, their photos, favourite or contacts. There is no function to browse Flickr groups. Actually Flickr is far less organised around groups, rather it is focussed on individuals, their uploading and organising of their own photos, monitoring traffic on these photos and managing their own navigation of the site by recording photos, people and groups they like (via favourites, contacts and group memberships). Data based on reciprocal commenting would be the most direct way to explore this social network (Recuero 2007, Prieur et al 2008). However, the groups exist and clearly play some function within this very successful and engaging site. Given the scale of Flickr, it is useful to try and use some quantitative approaches to understanding the role of groups. This paper provides the foundations for such an approach by the following research objectives. Firstly, to establish the scale of group creation on the site. Secondly, to develop a set of metrics that use publicly accessible data to characterise. groups in Flickr. And thirdly, using these metrics to characterise the extent of the "groupness" of Flickr groups.

2. Related Work

Although some fascinating Flickr group related tools have been designed, such as Group trackr[3], there has been relatively little academic research on Flickr groups as such. A notable exception is the work of Negoescu and Gatica-Perez (2008). They looked at group behaviour from a collection of the 500 most recent photos from 22,414 recently active users. They found that only around a half of the sample had ever surfaced a photo in a group pool. Paying members of Flickr ("pros") put more photos in groups than non-paying members, perhaps partly as a function of their having more photos. About a quarter had "shared" photos in over 50 groups; 10% in over 200 groups. 15% of the people who had put a photo in a group had shared all the photos they had shared with just one group; 45% had shared at least one photo with more than 20 groups. Thus, on the whole where people do surface photos in groups they tend to use multiple groups. But the authors found that users tended not to share lots of photos with a particular group; "loyalty" was low. 85% of users had an average of less than 15 photos in any particular group. On the other hand, the same photo is not put in lots of groups - there is not much "photo recycling" - the average is about 3.1 groups per photo, implying that most users do not try and promote a photo on lots of groups, even

[3] http://dev.nitens.org/flickr/group_trackr.php

though, as Sigurbjörnsson and van Zwol (2008:5) found, there is a correlation between the number of times a photo is viewed and the number of groups it is in.

The measures that Negoescu & Gatica-Perez (2008) investigate tell us something broadly about the average sort of behaviour in groups, but they do not tell us very much about the character of groups themselves. To develop a fuller range of descriptive metrics for Flickr groups a useful starting point is Butler's (1999) working paper on Listservs (see also Cummings, Butler & Kraut 2002). Here he is considering whether Listservs should be best understood as analogous to small groups or voluntary associations, and he proposes sets of measures under the headings of membership, communication activity and participation structure to explore this. His metrics are summarised in Table 1.

Table 1: Descriptive metrics for online collectives (Butler 1999)

A. Membership
Size
Growth / Loss / Change
B. Communication activity
Average number of messages per day
Percentage of all groups with zero activity
C. Participation structure
Average thread length
Proportion of messages receiving no reply
Interactive or episodic pattern of messaging
Participation ratio - proportion of members who contribute at least one message
Gini coefficient for the distribution of participation among active participants
Proportion of all messages sent by two top participants

These metrics are well chosen to capture the basic scale and turnover of membership; the raw level of communication; and the character of participation, whether it seems to reflect reciprocation and what proportion of the membership are involved in discussion. With some modification the metrics also seem relevant to measuring the "groupness" of Flickr groups. The membership measures are relevant, although it might be hypothesised that because the effort involved in being a member of a listserv is greater than joining a Flickr group - one has to do something with incoming emails - Flickr groups might be expected to be larger and more stable because there is little incentive to leave a group on Flickr. Listservs function through the circulation of text messages; on Flickr normally the key group activity is surfacing photos in the pool. Thus the equivalent to the average number of messages would be the rate of posting of photos. In addition to photo related activity, discussions on the Flickr group forum could also be considered in a way more obviously analogous to Butler's metric. Participation structure is slightly more difficult to translate for Flickr. The obvious analogous measure for Butler's first three structural measures which are about interaction, would be in terms of responses from surfacing a photo in terms of viewing, favouriting and commenting. This is much more difficult to estimate in Flickr, partly because a photo may be found through a number of routes and so the level of viewing may not be linked to it being placed in a group pool. Thread length etc can be found for the group forum. The second three measures are more about levels of participation and the distribution of activity across the whole group or a small core of users. This is possible in theory to calculate for Flickr, eg what proportion of all pool photos were posted by the most frequently posting members.

Butler's (1999) work provides an excellent starting point for understanding appropriate group metrics, but surprisingly we can find few subsequent studies that extend these metrics for discussion forums or other types of site. Similar types of metric have been proposed for communities of practice (Castro 2006) and for marketing communities (Cothrel 2000). Schoberth, Preece & Heizel (2003) look at some of the same measures in relation to longitudinal group activity and Smith and colleagues have produced many metrics and visualisations for usenet in the Netscan project (e.g. Smith, 2002). Another interesting approach is offered by Backstrom et al's (2008) study of Yahoo! groups. Some of their metrics are summarised in Table 2.

Table 2 Yahoo! groups metrics Backstrom et al. (2008)

Base line traffic - 2 messages in every monthly interval
Base line users - 10 distinct users post in a year
Dense period - 2 month period which in every 7 day period there are 10 + posts
A membership core, based on replies to and replies from numbers of distinct other users

Whereas Butler is trying to characterise the communicative character of online collectives, Backstrom et al (2008) are seeking to identify segments of the groups that are active, so they propose critical levels of membership or activity that indicate the strength of the group. On this basis they segment Yahoo! groups with active small/private groups and less active, very large public groups. While this does not add to Butler's measures it does suggest an approach to how to use the figures, i.e. to segment the whole population.

Whereas the quantitative study of online community has not been very fully developed, there have been many qualitative studies of online communities. Many of these have been motivated by a desire to explain what features of these groups make users feel them to be communities. As part of an attempt to operationalise these parameters for content or linguistic analysis, Herring (2004) usefully summarises some of the key features of online groups that have been identified as indicating community. These are summarised by her in the quotation below:

> 1) Active, self-sustaining participation: a core of regular participants
>
> 2) Shared history, purpose, culture, norms and values
>
> 3) Solidarity, support, reciprocity
>
> 4) Criticism, conflict, means of conflict resolution
>
> 5) Self-awareness of group as an entity distinct from other groups
>
> 6) Emergence of rules, hierarchy, governance, rituals (Herring 2004)

Not surprisingly, these qualitative aspects of a group are quite hard to operationalise, in a form whose collection can be automated. However, 1) does seem to relate closely to the second three aspects of Butler's (1999) participation structure and 3) to the first three. We also suggest that for Flickr some limited indication of the existence of 6) could be taken from the length of the group description text and the number of admin and moderators that have been defined for the group.

3. Proposed Metrics

From previous literature, we produced a preliminary set of metrics for Flickr groups prior to considering what was technically feasible. The purpose of such quantitative measures is to try and characterise the strength of “groupness” of Flickr groups, after Butler (1999). As the discussion of Herring (2004) points out, this can only be a very partial view of a complex, somewhat subjective phenomenon but is still a potentially useful exercise if understood with that qualification. Table 3 lists potential metrics with a description, expanded explanation and statement about its availability either through the publicly-accessible Flickr Application Programming Interface (API[4]) or through data or Web-scraping (i.e. automatically extracting relevant data from the HTML source of relevant Flickr Web pages).

Table 3 Theoretical Flickr group metrics and potential in gathering these metrics from Flickr

Measure	Description	Explanation	Availability on Flickr groups
1. Length of existence	How long the group has existed	Some level of continuity seems to be a potential indication of the value of a group	Proxied by date of first upload to group pool.
A. Membership			
2. Number of members		A crude measure of success of a group. Although having more members looks like more activity, very large groups are probably not functioning as communities.	Available through API
3. Continuity of membership	Proportion of previous members who have stayed members in second time period	Arguably, the development of a group culture is only possible if there is continuity of membership, though a level of churn could also be seen as healthy.	Date of joining not available
4. New members	Proportion of current membership that joined in last period (month/quarter)	Simpler variant on the above, equivalent to Butler’s (1999) group growth	Date of joining not available

[4] http://www.flickr.com/services/api/ (site accessed: 14/08/2010)

5. Internationalisation	Proportion of members from outside USA - either based on stated nationality or time zone of posting or time of day of posting	This would give us a sense of how diverse groups were	Not available, because Flickr users do store location in their profile, this is an uncontrolled text field.
6. Gender balance	Proportion of membership who are female	While topics may have different levels of interest between sexes, the balance of gender overall might be seen as an indicator of "health"	Not available, as not currently recorded in Flickr profiles.
B. Communication Activity			
7. Total number of photos posted			Available through API
8. Average number of photos per member	Total photos or recent photos divided by membership		Available through API
9. Number of recent Photos	Number of photos posted in last month/time period	A crude measure of activity	Date photo added to pool not available
10. Number of discussion threads	Total discussions threads ever initiated by group	Discussion about the group etc as opposed to simply uploading photos could be seen as evidence of group development.	Available by screen scrape
C. Participation Structure			
11. Levels of viewing of pooled photos		If photos in the group pool get a lot of hits, it suggests the group is active, although clearly one cannot simply attribute a high level of hits to group membership.	Not available in the database
12. Number of recent photos, interactively posted	Number of photos posted in last month/time period and that are heavily clustered in a particular short time span	Implies a wave of activity in the group, where one set of postings sets off others.	Hard to collect automatically
13. Level of in-group commenting	Proportion of all comments on a sample of group photos that are from group members		Hard to collect automatically
14. Uniqueness of group ("photo recycling")	Proportion of all photos that have only been posted to this group	If a photo is posted to lots of groups, presumably the photo is more important than the group. If the photo has only been added to this group it implies that the photo	Hard to collect automatically

		perfectly fits the purposes of this group and this group only.	
15. Thread length (Discussions)	Average number of replies to discussion postings	The more replies to a discussion posting, the more evidence there is of group interaction	Hard to collect automatically
16. Message length (Discussions)	Number of words in messages	Longer messages implies more complex discourse	Hard to collect automatically
17. “Participation ratio” - Proportion of different members surfacing a photo in the group	Number of members who have recently (or ever) posted a picture as a proportion of total membership	Measures “rate of participation”	Not available
18. Core user dominance	Proportion of all photos uploaded by two most active members	Measures the extent to which the group is dominated by a few people	Available by screen scrape, as Flickr records number posted by most active and top five posters of photos
19. “Lurking”	Proportion of members who have not recently posted / ever posted an image		Very hard to collect automatically
D. Formalisation			
20. Rules	Number of words in the rules of group	More complex rule making and description implies more activity in explaining the group. Unlikely to occur if the group is inactive.	Available by screen scrape from group home page
21. Administration	Number of owners, administrators, moderators	The more effort is being put into organizing the group more formally, the more active and self aware the group would seem likely to be.	Available by screen scrape from membership listing, except where the group has chosen special names for Admin roles

This set of metrics adds to Butler’s (1999) work in a number of ways. Butler did not look at the length of existence of groups, but we considered this might be an interesting metric to gather because it seems obvious that some level of continuity is needed for community feelings to develop. As regards “Membership”, we thought that it might be desirable to collect some data about the character of members, particularly given the claim of Flickr to be the “eyes on the world” (Naaman, 2006), implying an inclusive membership. We proposed looking at the degree to which members were in the US time zone as a way of very crudely judging how far this is really a global system. We also wanted to look at the gender balance of membership. In reality this information is not available. Although there is a field in the Flickr profile for a member's location, this is an uncontrolled text field, so it would have been difficult to reliably establish the geographical location of people in the sample. Again gender is not recorded in users' profiles so this could not be gathered.

As regards "Communication activity", we wanted to again look at the volume of activity. 10 relates specifically to forum activity, as opposed to photo related activity. As regards "Participation" structure, there were two elements of this in Butler (1999) the interactivity of postings and the level of participation of members. Again here we have 11-16 are equivalents of the first category of metric; 17-19 are equivalent to the second. Unfortunately all the possible interactivity measures were very hard to collect automatically. In addition, we have added a new section, some measures of the formalisation of the group, which relate to Herring's sixth aspect of virtual community.

4. Methodology

To carry out the study, a two-stage methodology was used: (1) an initial empirical study of Flickr groups to provide overall group statistics based on a method to gather the numbers of groups; (2) a more detailed analysis of a random sample of 1,000 groups to derive characteristics of "groupness" and validate the proposed metrics. Data was collected from Flickr using the publicly-available API[5], combined with data-scraping for additional information not available through the API. The initial data was collected during September 2008 and the main sample in December 2008.

To analyse Flickr groups in-depth requires gathering a list of all possible groups from which to sample. Each Flickr group is referenced by a unique identifier and this is required to

[5] Publicly-accessible Flickr API: http://www.flickr.com/services/api/ (site accessed: 14/08/2010)

gather further information about each group (either with the API or using data-scraping). However, no publicly-available list of groups is provided by Flickr; the population is indeterminate. Our experience has shown that estimating the number of Flickr groups and creating a list of them is non-trivial. Initially we searched Flickr.com (group title and description) for the <*space*> character, assuming that most groups, regardless of language, would use such a character and this would occur with high frequency. This approach returned a total of 461,272 groups (as of 9:49:14 on October 15th 2008). However, Section 5.1 shows that such results can be misleading due to effects such as server load balancing and that the results will only include public groups. To generate a list of group identifiers we would have to execute multiple searches and extract the group identifiers from the HTML of the Web pages. This is possible but requires multiple calls which, without careful consideration, can put a high load on the hosting Web server and lead to being banned. Searching for Flickr.com using <*space*> is also now not possible and returns no results.

The more appropriate and repeatable approach is to use the publicly-accessible API provide by Flickr. The API also does not allow searches using characters such as whitespace. Therefore, to compile a list of as many groups as possible within the constraints of using the Flickr API, the following approaches were used: (1) compile lists of common words (or stopwords) in a range of languages[6] (English, Spanish, Portuguese, Italian, French, German, Dutch, Japanese, Chinese, Romanian, Swedish, Polish, Finnish, Arabic, Russian, Czech and Bulgarian), including punctuation markers ('approach 1'); (2) use the 20 most popular Flickr tags (as of 30/09/08) and translate these into the previously listed multiple languages ('approach 2'). Translation was carried out automatically using the publicly-available Google Translate tools[7] and verified manually. The Flickr API is then used to search for groups containing the given stopwords and tags. Using both approaches we were able to obtain a list (containing group identifier and name[8]) of 299,688

[6] Lists of common words in multiple languages are taken from the Snowball stemmer: http://snowball.tartarus.org/
[7] Google Translate: http://translate.google.com/
[8] Example groups include: "10003140@N00, Widescreen Wallpaper", "10005441@N00, ODD CHICAGO!!", "10005981@N00, Tour Bermuda", "10005982@N00, All About the Digit 5... Only.", "10017860@N00, Rock

distinct groups in total. The group identifier was used to gather more detailed information about each group using the Flickr API. Although this excludes private groups it gives an order of magnitude for Flickr groups and provides a large population from which to sample groups from and to gathering data for the proposed group metrics.

From the list of total Flickr groups we randomly sampled 1,000 groups and developed a custom crawler (using the Flickr API and data-scraping) to gather detailed information about the groups based on our proposed metrics. This enabled groups to be characterised and facilitated further analysis. Descriptive statistics for the sample group are: number of members (mean = 1,054 members; std dev = 2,497) and the length of written description, in characters, about each group (mean = 1,314 members; std dev = 2,646). To check the coverage of subjects for the sample group, a tag cloud was created for the top 200 tags from each using the most frequent 100 tags. Comparing this to a tag cloud for all photos in Flickr on 30/09/08 it was found that 84% of tags were the same, thereby indicating a similar coverage of topics for the photos in the sample group compared to Flickr as a whole.

Information gathered for each group includes the following: (1) Number of members, (2) Description length, (3) First page of discussion history (most recent discussions), (4) Number of uploaded photos, (5) Number of discussions, (6) First and last uploaded photo, (7) 200 most popular tags (and font size), (8) 5,000 most recent uploaded photos (if available) ~2M photos. For each photo (from ~2M gathered from 1,000 groups) we gathered the following information: Title, Owner, Tags and Date posted. For all owners from the photos collected previously we also gathered information about: the owner's geographical location, their Pro Account status, the total number of photos uploaded to date and a number of attributes capturing social links (contacts, favourites, group membership). This gathered information for the 1,000 groups provides a wealth of detailed information with which to study group behaviours.

Climbing", "10007737@N00, Slow Children"

5. Results and Analysis

5. 1 Overall Flickr Group Statistics

As mentioned in Section 4, searching the group title and description fields of Flickr.com returned a total of 461,272 groups, but due to constraints with executing searches on Flickr.com (overloading the server with requests can lead to being banned) this is not a sustainable (or feasible) approach for longer term data collection from Flickr. Using the previous approach to compute an estimate of the overall number of groups is also problematic as the figure provided by Flickr.com changes and is subject to various inconsistencies. For example, load balancing performed by the Web servers hosting Flickr causes unpredictable results, with the number of hits changing each time Flickr is queried, and the estimated number includes only publicly-accessible groups and some groups will not contain whitespaces within the title or description. A more usable metric is not a specific figure for the number of groups, but rather an estimate of the rate of change. To perform this, we recorded the number of groups (plus uploaded photos and new users) that include whitespace in the title or description fields at 10s intervals using Flickr.com during the course of one week. This resulted in 36,733 data samples for: (1) the number of groups, (2) the number of users, and (3) the number of photos. A steady increase in numbers should indicate new groups/user/photos being added and over the course of one week the effects due to sampling should be constrained.

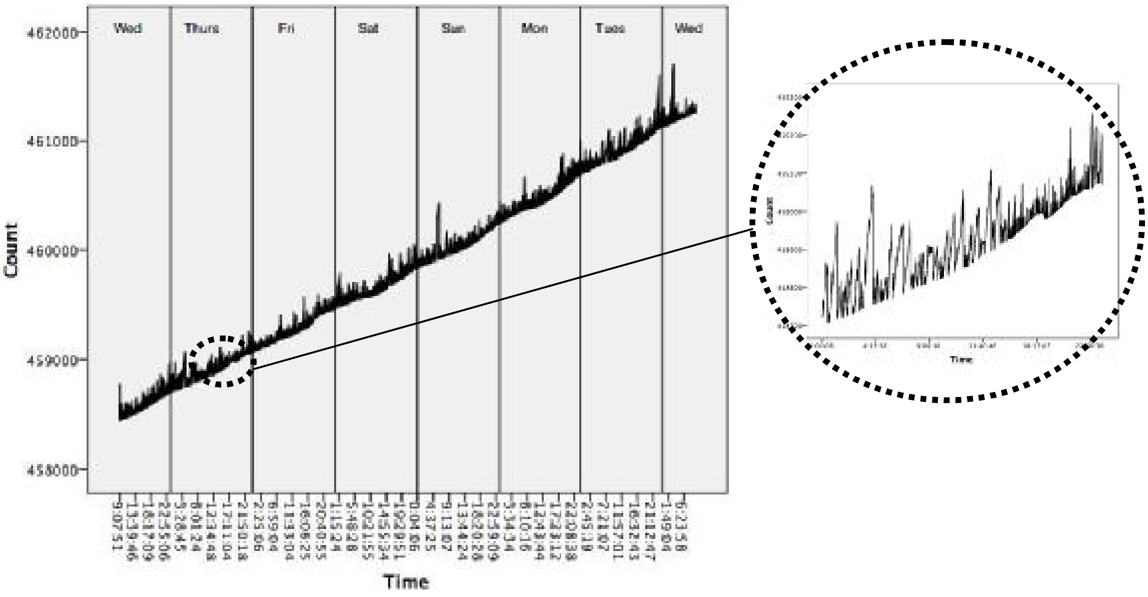

Figure 1 Illustration of the rate of growth for the number of groups on Flickr (36,733 samples for 1 week period).

The growth rates (or rates of change) help to indicate the scale of Flickr and users involved in interacting with the application. Figure 2 shows an example of the resulting growth rate for the number of groups on Flickr based on searching titles and descriptions with the whitespace character. The growth appears linear and fitting a linear regression line to the data gives the following: y = 0.077x + 458447 (R^2 = 0.993; p<0.001). According to this linear regression line, Δy/Δx = 0.073: on average a new group is added every 13 intervals or 2.2 mins (13 x 10s = 130s/60 = 2.2 mins). Sampling the growth rate for the number of uploaded photos containing whitespace characters in the title or description, a total number of 1,011,909,272 publicly-accessible photos have been uploaded. A resulting linear regression line of y = 255.221x + 1.002*109 (R^2 = 0.872; p<0.001) suggests that, on average, a new photo gets uploaded every 0.004 intervals (0.004 x 10s = 0.04s), i.e. in every 10 second interval around 255 photos are uploaded (26 photos uploaded per second). Finally, the number of registered Flickr users that are found using whitespace to search titles and descriptions is 30,480,789, with a resulting linear regression line: y = 3.064x + 3.036e^7 (*R2* = 0.995*;* p<0.001). This implies that, on average, a new member joins Flickr every 0.33 intervals or 3.3s (0.33 x 10s = 3.3s). These results highlight the rate at which Flickr is changing and growing, a characteristic of most “megawebsites”.

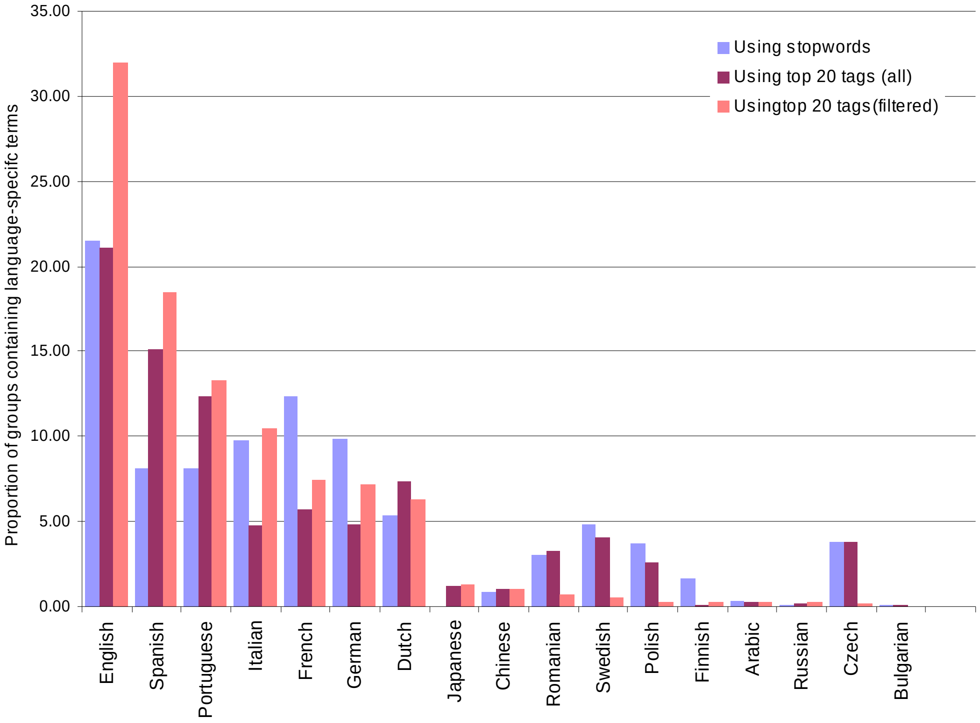

Figure 2 Proportion of groups across languages (ordered by using filtered top 20 tags).

Using the data collection described in the methodology section, a total of 299,688 unique group identifiers (and titles) were gathered and form the population from which to sample groups. The aim of this stage was to gather a complete list, where possible, of all group identifiers. Figure 1 shows the estimated language distribution (as proportion of groups) of collected groups based on: (1) using the lists of language-dependent stopwords, (2) using the top 20 tags[9] translated into multiple languages, and (3) using a filtered version of the top 20 tags whereby only tags that do not appear as tags in other languages are used. This latter version gives a truer perspective on the language distribution because the same tags may be shared between languages (e.g. if loan words), thereby mis-representing the language of the group. Unsurprisingly, English and Spanish dominate the language of the groups, followed closely by other European languages.

[9] Top 20 most popular tags (30/07/2008): water, white, light, portrait, flower, sunset, tree, yellow, girl, clouds, summer, fun, new, sea, photography, family, park, architecture, show.

5.2 Characteristics of the Flickr Group Sample

Based on data gathered for the proposed metrics in Section 4, we now present the results for each metric and discuss the implications for group. The results are categoriesed under membership (Section 6.3.1), communication activity (Section 6.3.2), communication structure (Section 6.3.3) and formalization (Section 6.3.4).

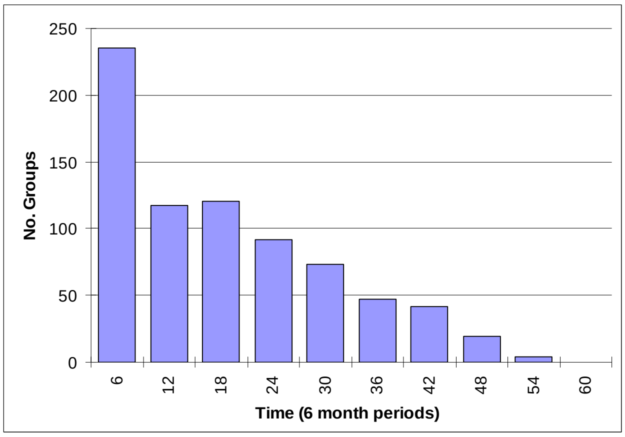

Figure 3 Distribution of length of group existence (based on 6 month time intervals), N=749.

5.2.1 Membership

Length of existence. The length of existence of the group provides a possible indicator of the groupness, on the crude assumption that elapsed time allows groups to become closer. Figure 3 shows the length of existence for the Flickr group sample. The length of existence is calculated using the date of the first upload of a photo to the group photo pool as a proxy for the date of the foundation of the group. For 211groups no photo has been uploaded presumably because the group was created but never used, so the date of creation cannot be inferred. For another 40 groups unusable data was returned. For the 749 groups for which there was a date, the pattern indicates that nearly 50% of the groups had been created in the last year. This suggests either a surge of activity of group creation, or that groups are commonly deleted[10], for example if they are not successful or conceivably they might be hidden from the searches through which the sample was

[10] A group can only be deleted if it contains no members (i.e. when the last remaining admin person leaves the group).

collected.

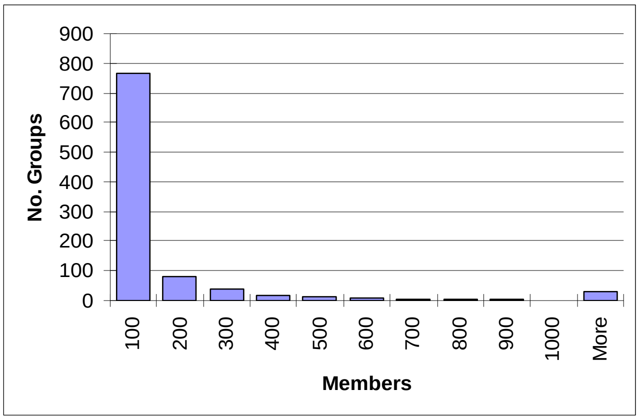

Figure 4 Distribution of number of members for group sample, N=967.

Number of members. From the group sample, 20% had only 1 member; nearly 50% had less than 10 and nearly 80% of groups had less than 100 members (mean = 192; mode = 1; median = 12; max = 29,021); thus many groups are small. Nearly 95% of groups have less than 500 members; only 3% (31 groups) have over 1,000 (see Figure 4). These figures show the groups sizes as small, often akin to classic small groups examined in social psychology. Figures regarding private groups cannot be publicly accessed but these, by their very nature, would probably be small too, so the impression of Flickr is that there are significant numbers of small groups. The very large groups are important and very visible, but there is an undergrowth of small groups that are easily overlooked. Butler's figure for the average membership of Listservs was 163; the maximum 2,245. The maximum for Flickr is vastly larger, showing how Flickr associations can be very different in quality, even if many groups might be operating in comparable ways to yahoo groups.

5.2.2 Communication activity

Total photos posted. 20% of groups had no photos, probably indicating groups that were created but never really used. Nearly 50% of groups had less than 100 photos, see Figure 5. A few groups have very large numbers of photos, with one group having over 1 million and three others over 100,000 photos (mean = 2,983; mode = 0; median = 79; max = 1,315,519).

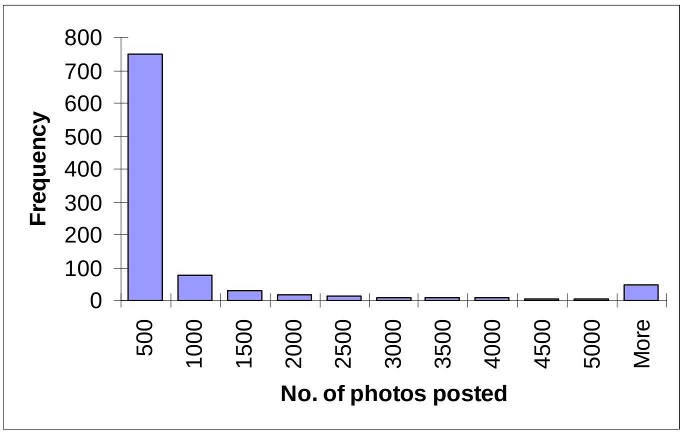

Figure 5 Distribution of number of photos posted for group sample, N=967.

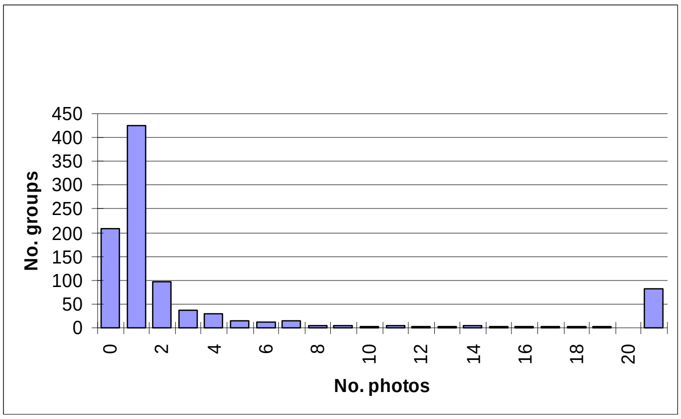

Figure 6 Average photos uploaded per day, N=959.

Average number of photos uploaded per day. 41 groups with an apparent existence of less than 1 day were excluded, since they produced absurd potential upload rates. In about 20% of groups the average upload per day was 0 because no photos were ever posted. In 44% of all groups the average was 1; in another 10% of groups it was 2 (see Figure 6). This compares “favourably” for the activity levels on Butler’s Listservs, where the mean is only 1.635 messages per day (mean = 6.22; median = 0.58; maximum = 1,055).

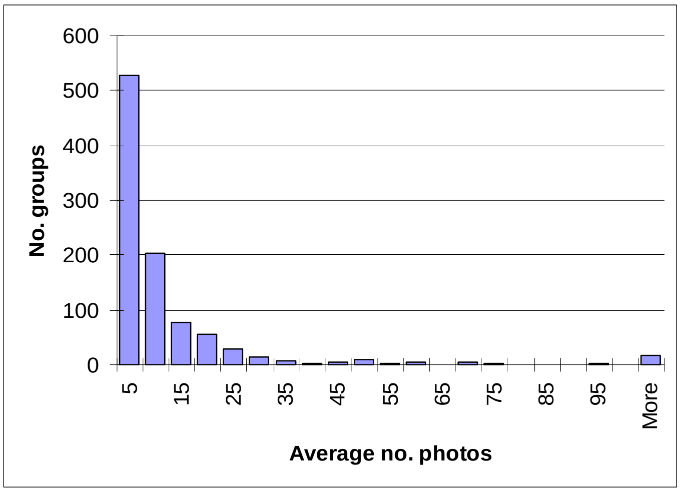

Figure 7 Average number of photos in group pool per member, N=967.

Average number of photos per member. Over 50% of groups have less than 5 photos uploaded per member and around 80% have less than 10 photos per member (mean = 21.09; mode = 0; median = 4.41; maximum = 8,876), see Figure 7. These figures support Negoescu & Gatica-Perez's (2008) observation of low "group loyalty" (defined as a tendency to post most of one's photos to one group). There were 17 groups with more than 100 photos per member, only one had more than 6 members; it had 111 members. Thus, it does not seem to be the big groups that attract large numbers of contributions from a single individual.

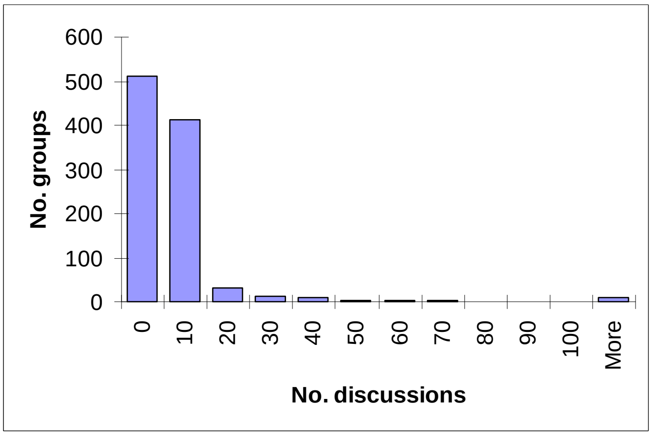

Figure 8 Total number of discussions per group, N=1,000.

Total number of discussions. 50% of groups have never had any discussions. 40% of groups have had 1 discussion, i.e. one forum thread (see Figure 8). Nine groups had had more than 100 discussions. The figures support an interpretation that generally photos, with comments, not textual discussion are the centre of Flickr.

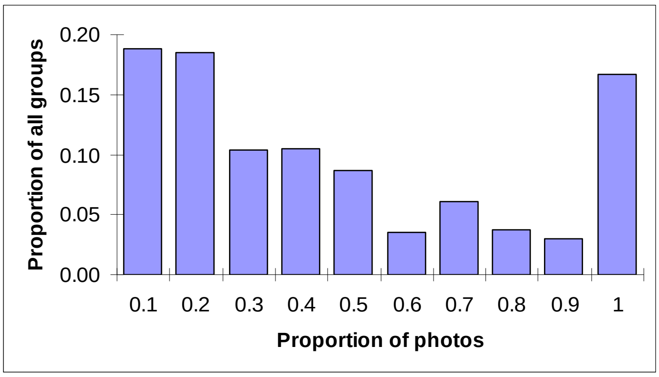

Figure 9 Proportion of all photos posted by most active poster, N=769.

5.2.4 Communication structure

Core user dominance. In around 20% of groups the top poster had posted only 10% of all photos; in another 20% they had posted more than 10 and less than 20% (see Figure 9). This, again, suggests significant numbers of groups where the power law of contribution does not apply; a few individuals are not dominating participation. In contrast, in another 17% of groups one individual had posted between 90 and 100% of all photos; with 100 groups where 100% of photos were by one person. Yet these were all small groups with less than 10 members and around half of them only had one member. Butler found that typically the two most active posters were posting more than 30% of postings (1999: 34). The figures here are not quite comparable, but imply lower levels of concentration, except in some small groups.

5.2.5 Formalisation

Number of characters in rules of group. 66 groups had 0 characters in their description and another 30% have less than 100 characters (see Figure 10), i.e. the description is no more than a sentence long (the sentence you have just read, up to the brackets, is 122 characters long). Nevertheless, there were over 100 groups with more 1000 characters and two groups with more than 10,000 (mean = 484; median = 158; mode = 0; maximum = 23,581).

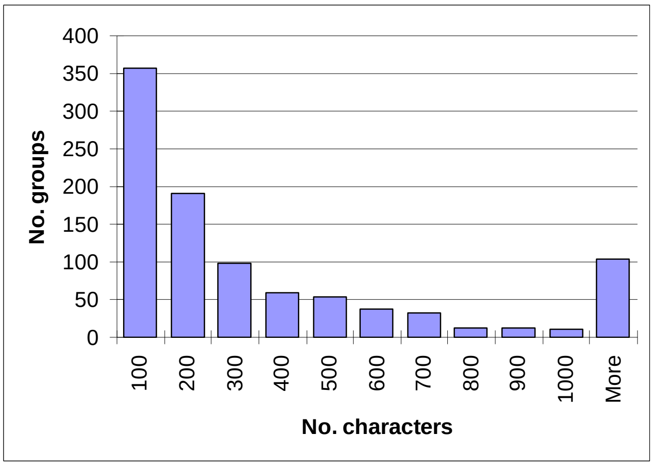

Figure 10 Length of group description (in characters), N=967.

Group administration. 274 groups in the sample had apparently no Admins, this could be because the admin had hidden their ID from the listing or because they had actually left a group after they set it up, but it was probably mostly because they had customised the name of the role, meaning that the screen scrape we used to collect the data would not collect information as this was based on searching for the term “Admin” on the group web page. This was unfortunate as it would seem the most active groups might be difficult to gather data for on this metric. Nearly 90% of the groups with any admin, have 1 only (see Figure 11). This is the default in Flickr, where the creator of the group is automatically admin. Ten groups had over 10 Admins (mean = 1.57; mode = 1; median = 1; maximum = 121).

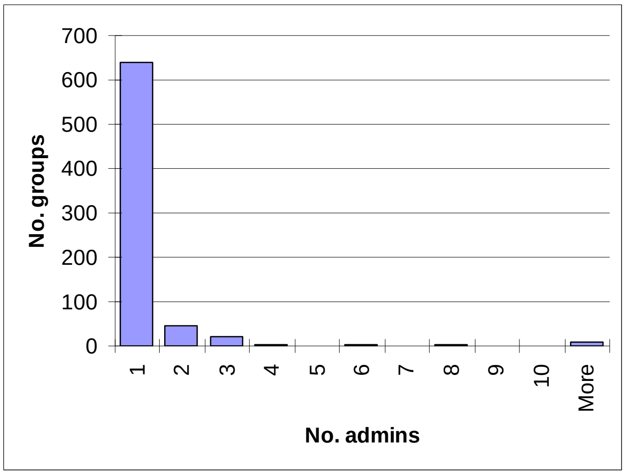

Figure 11 Number of Admins, N=725.

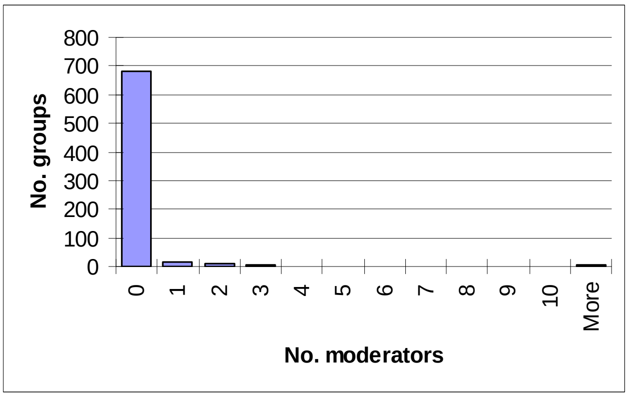

Figure 12 Number of moderators, N=725.

To examine the pattern of moderation, the 25% of all the groups that had no Admins were not counted. Some groups do appear to have moderators without an admin. 90% of groups had no moderators. 18 had one (see Figure 12). Three groups had more than 10 moderators.

5.3 Characteristics of large and small groups

While the sample contained a lot of smaller groups, 20% of groups had more than 100 members. Typically these had up to 1,000 members, a few (about 30) more than this. Such groups were rather massive in their activity, the average membership across them was 855, the average number of photos posted was 13,721 photos. Not surprisingly the profile of length of existence was a bit different from the whole sample, nevertheless 10% of the large groups had been created in the previous six months and a quarter were less than a year old. Interestingly, the top poster only accounted for about 3% on average of the photo pool in the large groups and for nearly 90% of these groups the top poster accounted for less than 20% of photos. Thus there isn't this sense of one or a few members dominating participation. Of the sample of 1,000 groups, 466 had 1-10 members, 202 had 1 member only (see Figure 13).

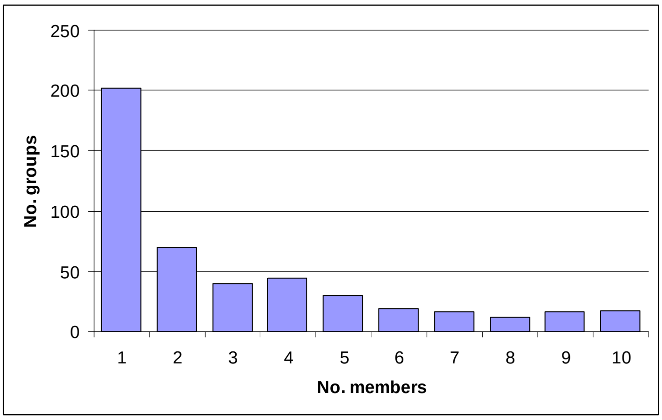

Figure 13 Distribution of the number of members for groups with 10 or less members, N=466.

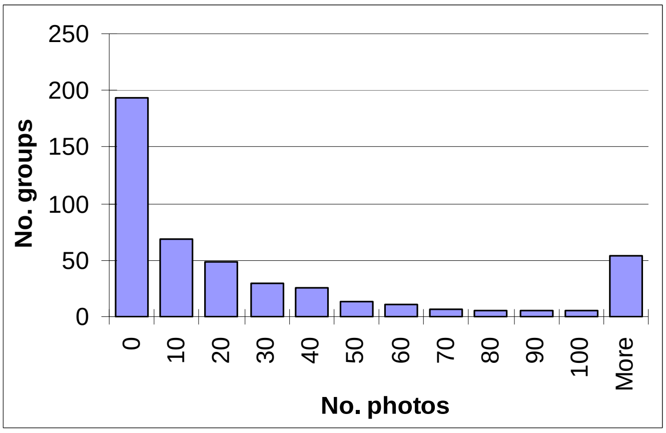

Figure 14 Distribution of the number of photos for groups with 10 or less members, N=466.

194 groups or 40% of groups with fewer than 10 members have no photos see Figure 14); 149 of these only have one member. However, fifty have more than 100 and one group has 8876

photos. It would require qualitative studies to confirm this, but the impression is that most small groups are not especially active.

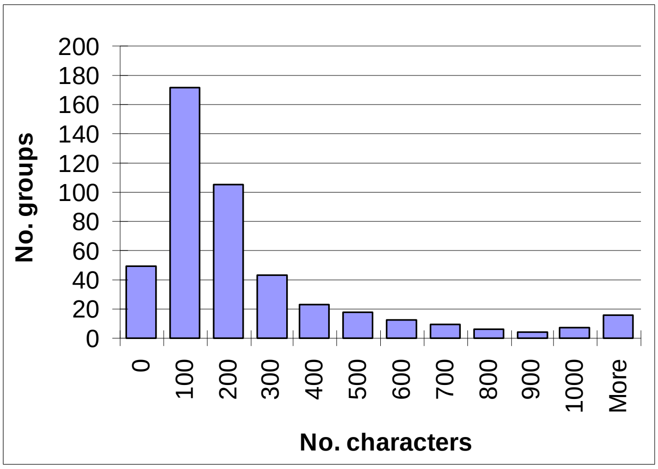

Figure 15 Distribution of the length of descriptions for groups with 10 or less members, N=466.

10% of such groups have no description (see Figure 15). 37% have less than 100 character description.

Thus rather than being very active, the small groups are probably better understood as often being failed groups. Three quarters do not have much activity. This impression might be changed if we had data on private groups, which could be quite active with a restricted membership. Given the scale of Flickr, however, the fraction of small groups that are or have been active provide an important part of the system as a whole.

Table 4 The 5 largest groups from our group sample

Group	No. of members	Desc. length (chars)	Uploads by 1st poster	No. of photos	No. of moderators	No. of admins	Avg. uploads/ member
Closer and Closer Macro Photography	30,525	3,301	2,172	46,827	6	0	15
Green is Beautiful	29,645	636	901	278,346	0	1	9
Sunrise: Sunset -- Anything Sun!	24,187	213	533	38,836	0	2	10
Urban Fragments (No People)	23,886	2,120	1118	32,498	3	3	14

visit the world - the travel guide	19,303	1,903	12,666	64,886	0	0	34

Tables 4 and 5 provide details of the 5 smallest and largest groups from the sample (ordered by the number of members) indicating the diversity of groups exhibited within the sample.

Table 5 The 5 smallest groups from our group sample

Group	**No. of members**	**Desc. length (chars)**	**Uploads by 1st poster**	**No. of photos**	**No. of moderators**	**No. of admins**	**Avg. upload/ member**
Balbriggan Counrt Dublin	2	0	74	74	0	1	37
For-all-Religions/	2	93	3	4	0	0	2
St. Patrick´s Day Shenanigans	2	35	1	1	0	0	1
Kitty Pics	1	34	115	115	0	1	115
TREES OF IRELAND	1	0	77	77	0	1	77

6. Discussion

In order to produce a more detailed characterization of Flickr groups, we proposed emulating Butler's (1999) earlier study of Listervs to look at aspects of membership, communication activity and communication structure in Flickr groups, using the API and data-scraping to collect data for a large sample of groups. One contribution of the paper is to establish the order of magnitude of groups on Flickr. Butler was interested in what the metrics for different online groups suggested about the most appropriate metaphor to describe them, be that small group, voluntary association or online collective. Taking into account the differences between photo sharing and online discussions, we proposed a number of other potentially interesting metrics. For example, we suggested looking at formalisation of rules and roles.. Another contribution of the paper is to take forward a discussion about the most appropriate metrics for exploring the "groupness" of large sites built from user contributions, one particularly adapted for analysing Flickr.

What stands out from the group metrics is the large number of groups with only a handful of members and low levels of activity. Nearly 50% of groups have less than 10 members; 20% have only 1. This undergrowth of small groups may be an important part of the ecology of Flickr. On the other hand, there are also some large and very groups, whose scale is very much larger than those seen in Butler's work, in terms of numbers of members and contributions. The big groups tend not to be dominated by a few individuals. So although many writers have talked about a power law in participation, this does not seem to apply to Flickr groups as such.

Web2.0 as the "social web" is different in quality from the world of online communities. The social network model of design seems to be superseding or more accurately overlaid on the online community model. Yahoo! groups, for example, organize social activity around participation and interaction in interest groups, where the group is a central reference point. In the SN model the individual is central, and membership of groups more fleeting, less exclusive. Much Flickr activity is not really centred on groups. 50% of people do not ever post to groups (Negoescu & Gatica Perez 2008). The sites are social in that content is created by a mass of individuals, but the levels of direct interaction are not always very high. Yet groups do also form and the large number of Admins and moderators point to a level online community feeling emerging too.

A further contribution of the paper revolves around the accessibility of information about large sites such as Flickr. Despite the existence of much publicly available information for Flickr and an open API, there is much that is not or cannot be known about such sites. This arises from two main factors. Firstly, some information is simply not recorded. Thus although profiles on Flickr did originally have a field for sex, this was removed, so it is not recorded in profiles. The place where the member is based is a free text field, so this data is hard to process. It is also hard to interpret: the information could be about where the person originates or were born, but it could just be about where they are now. Secondly, the structure of the database makes it very hard to extract some forms of information through the API efficiently. What is available for groups is rather limited. Thus it would be interesting to look at the extent to which group members commented on each other’s photos. But the only way to measure this would be to scrape the IDs of (a sample of) photos in the group pool, then scrape commenter IDs from the photo’s page, and then compare these to the list of group members (which would itself have to be scraped from the member listing). Thus many of the questions one would like to ask are not easily answerable from the accessible data.

7. Conclusions and Future Work

This paper has explored the role of groups on Flickr. It has discussed suitable metrics for examining activity levels, especially to capture the “groupness” of a group. It has shown how many groups there are. It has also begun to show what Flickr groups are typically like. It has pointed to the importance of small groups on Flickr. This was not apparent before because the large active groups are more visible, e.g. in search results. Thus although it is vast in terms of numbers of photos and members, groups in Flickr operate at a more human scale. This might be one aspect of its success: that nested within the larger groups there are patches of activity and organisation. Some feel for the overall character of groups on Flickr allows us to benchmark specific groups. The paper has also demonstrated some quite profound obstacles to fully exploring the character of participation, at least to doing so efficiently.

It is not part of our suggestion that groups are necessarily central to the experience of Flickr for many users. Only committed users join groups. But it is one aspect of Flickr, and clearly in complex ways has contributed to the success of the design. Understanding how individual centred activity such as organizing one’s own photos or commenting on those of others links to online community activity in such web sites is important. Qualitative studies could examine the character of different sized groups, looking more closely at the different types of group, how these relate to different photographic practices, as well as motivations to participate and group feeling.

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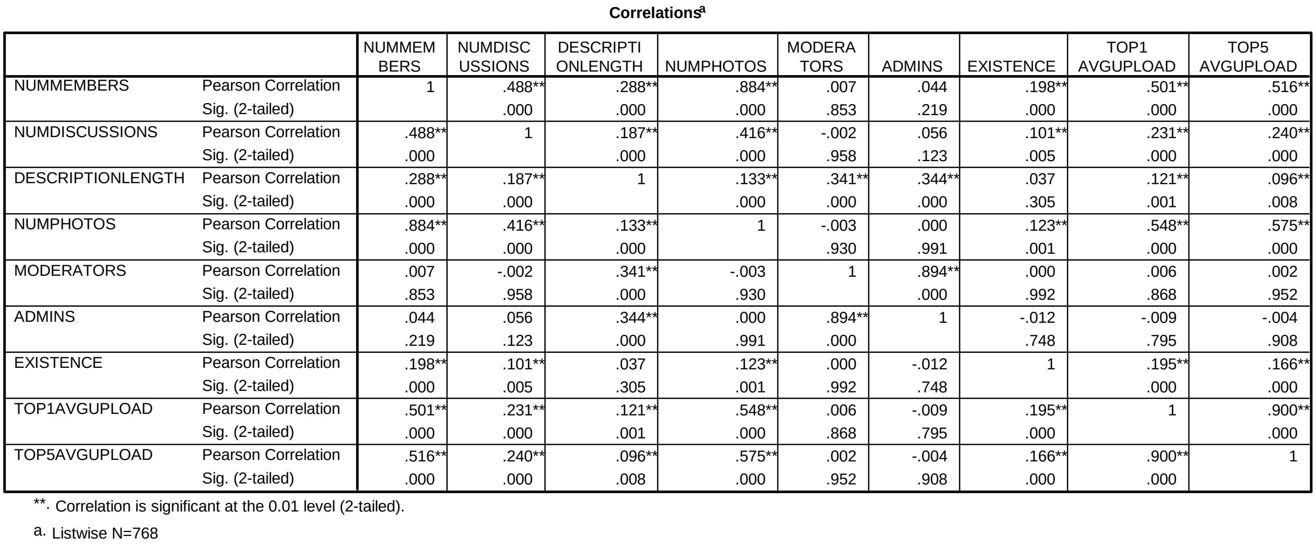
Appendix



Correlations[a]

		NUMMEM	NUMDISC	DESCRIPTI		MODERA			TOP1	TOP5
		BERS	USSIONS	ONLENGTH	NUMPHOTOS	TORS	ADMINS	EXISTENCE	AVGUPLOAD	AVGUPLOAD
NUMMEMBERS	Pearson Correlation	1	.488**	.288**	.884**	.007	.044	.198**	.501**	.516**
	Sig. (2-tailed)		.000	.000	.000	.853	.219	.000	.000	.000
NUMDISCUSSIONS	Pearson Correlation	.488**	1	.187**	.416**	-.002	.056	.101**	.231**	.240**
	Sig. (2-tailed)	.000		.000	.000	.958	.123	.005	.000	.000
DESCRIPTIONLENGTH	Pearson Correlation	.288**	.187**	1	.133**	.341**	.344**	.037	.121**	.096**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.305	.001	.008
NUMPHOTOS	Pearson Correlation	.884**	.416**	.133**	1	-.003	.000	.123**	.548**	.575**
	Sig. (2-tailed)	.000	.000	.000		.930	.991	.001	.000	.000
MODERATORS	Pearson Correlation	.007	-.002	.341**	-.003	1	.894**	.000	.006	.002
	Sig. (2-tailed)	.853	.958	.000	.930		.000	.992	.868	.952
ADMINS	Pearson Correlation	.044	.056	.344**	.000	.894**	1	-.012	-.009	-.004
	Sig. (2-tailed)	.219	.123	.000	.991	.000		.748	.795	.908
EXISTENCE	Pearson Correlation	.198**	.101**	.037	.123**	.000	-.012	1	.195**	.166**
	Sig. (2-tailed)	.000	.005	.305	.001	.992	.748		.000	.000
TOP1AVGUPLOAD	Pearson Correlation	.501**	.231**	.121**	.548**	.006	-.009	.195**	1	.900**
	Sig. (2-tailed)	.000	.000	.001	.000	.868	.795	.000		.000
TOP5AVGUPLOAD	Pearson Correlation	.516**	.240**	.096**	.575**	.002	-.004	.166**	.900**	1
	Sig. (2-tailed)	.000	.000	.008	.000	.952	.908	.000	.000	

**. Correlation is significant at the 0.01 level (2-tailed).

a. Listwise N=768

[Insert Appendix Here]

Author Note

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Footnotes

[Insert Footnotes Here]

Table 1

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