Changing Communication on ResearchGate through Interface Updates

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ABSTRACT

Informal scholarly communication across the Web is a growing component of the scholarly communication infrastructure. This study describes the effects of three different interfaces on these informal channels. Interface design has a widely studied effect on user behavior, and new users often encounter barriers during accessing social media tools. Using a mixed methods approach, we collected and grouped 413 posts across three distinct interfaces of ResearchGate's communication platform. Our results show that scholars were more polite in the initial group discussion interface but that user interface design did not change the core communication patterns of sharing information and opinions among scholars. The site also transitioned from one-to-many discussions to one-to-one posts, but new users were generally welcomed to the scholarly communications.

Keywords

Academic social networking site, user interface, scholarly communication patterns, social information seeking.

INTRODUCTION

While formal scholarly communication describes activities or scholarly outcomes that can be viable over time to an extended audience, Meadows stated that *informal scholarly communication* is made "available to a restricted audience only" (as cited in Borgman, 2007, p. 49) in channels where scholars can share information. This informal sharing through online tools such as listservs, online communities, forums, or social media can be captured and studied to a degree not possible before the Web.

Academic Social Networking Sites (ASNSs) such as Academia.edu or ResearchGate are becoming an important part of informal scholarly communication (Thelwall & Kousha, 2014). As more scholars build up their online presence and connect informally over the Web, many ASNSs compete for their social media attention (Mangan, 2012).

Even established services are constantly changing, hoping to improve their user experience.

User behavior can be influenced by the design of the user interface. Jianu and Laidlaw (2012) found that controlled user interface changes on a scientific analytical tool can influence scientists' analytic behaviors. As a social website must provide features and incentives that entice users to continue using its services (Burke, Marlow, & Lento, 2009), ASNSs constantly observe users' needs and preferences, and make changes to their features. However, it has not been well understood how interface design influences scholarly communication patterns on ASNSs. Because ASNSs have been developed so rapidly it is important to understand the impact of these changes. This poster aims to fill the gap by studying one group of scholars over four years, and three generations of interfaces on one ASNS - ResearchGate.

We chose ResearchGate (http://www.researchgate.net/) as a research site for examining how the different interfaces of a community page would influence users' behaviors. The platform was founded in 2008 and currently has over 4 million members with a mission to support collaboration among researchers around the globe (ResearchGate, n.d.). Research Q&A is a feature on ResearchGate that allows academic users to exchange information by asking and answering questions through a question and answer (Q&A) platform. This platform has gone through several updates over ResearchGate's lifespan, which prompted our research question: How do scholars communicate on an ASNS under different interface designs?

One facet of this research question is the barrier to entry for new users. This has been explored as a factor affecting social media use by other researchers (Burke et al., 2009; Choi, Alexander, Kraut, & Levine, 2010; Farzan & Han, 2014; Lampe & Johnston, 2005). ResearchGate's interface updates could play an important role in integrating new members into the contributing community by either promoting or discouraging new users. Again, while barriers to use have been considered in other social media platforms, it is not studied on an ASNS Q&A.
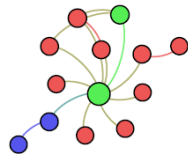
Figure 1. An example of scholars' communication patterns across three periods.

METHODOLOGY

Data Collection & Analysis

To achieve our study goal, we adopted a representative sampling method and collected 413 posts from ResearchGate Q&A in November 2013. These posts were created by 211 unique users within 38 question threads under the topic of "Library Information Services". A script was used to extract the relevant information, such as textual content, post date and time. Two authors manually coded the nature of the posts' content and the relationships between posts. The coding scheme for analyzing the first post of each thread was developed based on the system used by (Choi, Kitzie, & Shah, 2012; Fahy, Crawford, & Ally, 2001). We report data collection and coding schemes in detail at http://crystal.exp.sis.pitt.edu:8080/iris/rg.jsp.

ResearchGate Community Interfaces

Each post that we collected was attached a timestamp and can be traced from as early as September 21, 2009. This allowed us to categorize each post in three important periods in correspondence to ResearchGate's major interface updates for their community page.

I. Group discussion forum (GDF). The first stage of ResearchGate's community page was the group discussion forum, in use from September 16, 2009 to July 31, 2011. Users in this stage could join a group of their interests, initiate a discussion – generally a question – and any user could post a response. Within a top-level interest group, subtopics could be developed with the intention of organically creating a taxonomy of academic disciplines. For example, the "Bone group" had two subgroups: "Bone signaling proteins" and "Spondylo-enchondromatosis".

II. Topic Tags (TTG). The second stage runs from August 1, 2011 to October 4, 2012. In this interval, groups were deprecated in favor of topics. Older posts were converted to be tagged with the topic of the old group, and new threads in this stage were given the tag relevant to the post by the author. This was a dramatic move from the original design of joining a group to users now following a topic.

III. Q&A platform (QAP). The third interface update came on October 5, 2012. This final stage can be characterized as allowing users to easily create a discussion and by posts being up and down-voted. A user in this stage could ask a question from any page of the Q&A section rather than having to select an appropriate topic before creating a post.

Once the connections between posts and major platform updates were codified, we used a network visualization tool,

Gephi, to visualize the inter-person communication patterns in a thread. As shown in Figure 1, all edges should be read clockwise from an actor node to its target. Also in Figure 1 the color scheme of our periods is introduced. GDF is green, TTG is red, and QAP is blue.

A network takes one of four shapes when it is visualized. A line passes information from one actor to the next (Figure 2a). The wheel pattern, as illustrated in Figure 2b, has a central actor all other actors interact with. The circle in Figure 2c has all actors interacting directionally, with information eventually coming back to the original actor. Finally, the complex network has many of these connection patterns between all actors, and information can flow easily between any two actors.

RESULTS

GDF was comprised of 49 posts in 9 threads. TTG contained 153 posts and 13 new threads. QAP had 211 posts and 16 new threads. Over all stages, the average length of a thread was relatively short ($M = 10.87$ posts, $SD = 16.47$, $Median = 6$) with the average response each containing 83.22 words ($SD = 77.613$).

Results of the content analysis of responses (posts that were coded as answer responses, N=291) are presented in Table 1. In the first interface stage (GDF), users were more likely to make social contacts to each other. Posts in GDF had significantly more social cues, $\chi^2 (2, N = 291) = 27.084$, $p = .0001$; and were found significantly more polite $\chi^2(2, N = 291) = 30.929$, $p = .0001$.

Several other trends emerged from the stages. First, users in all stages were equally likely to provide opinions or information. Per Table 1, there was no statistically significant difference in authors providing their opinions or information, which are two major types of scholarly content.

Response with…	GDF (N=21)	TTG (N=94)	QAP (N=176)	Total (N=291)
Social cues**	16	27	39	82
Providing resources	7	26	42	75
Adding new info	11	29	56	96
Providing opinions	10	65	108	183
Referring to others	0	5	7	12
Providing personal experiences	2	6	26	34
Further talks	0	1	2	3
Being polite**	15	24	30	69
Agreement	1	10	12	23
Disagreement	0	4	4	8

Note: **: $p<0.0001$

Table 1. Cross-tabulation of the number of responses in three stages.
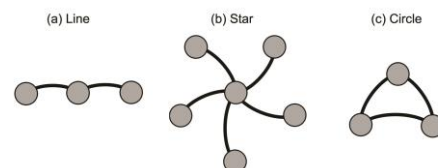
Figure 2. Elements of network patterns.
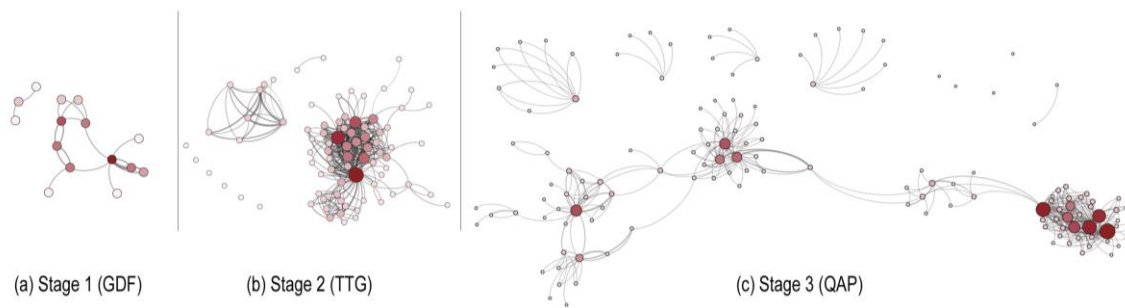
Figure 3. Author Networks by Stage.

Threads in Stage 3 (QAP) were viewed more than the threads in the other two stages, χ^2 (2, $N = 38$) = 8.001, $p = .018$. The average of the total view counts in GDF, TTG, and QAP fell at 96.33 ($SD = 72.91$, $Median = 80$), 295.62 ($SD = 509.54$, $Median = 139$), and 551.88 ($SD = 783.86$, $Median = 218.5$) views. Despite having more time to accumulate viewership, the early threads were less popular than newer threads.

Figure 3 illustrates the network structure of communication between unique authors in each stage. Read from left to right, GDF is a circle network (Figure 3a), TTG has more edges and forms a complex network (Figure 3b), and QAP is a circle network (Figure 3c).

The intention of the initiating post had no significant impact on the length or content of communication in any stage. The length of discussion question (DQ) threads varied from GDF ($Median = 4$), to TTG ($Median = 3$), to QAP ($Median = 6$). Information question (IQ) threads followed a similar pattern with 5, 4.5, and 8 median posts per thread in GDF, TTG and QAP, respectively.

Some threads were continued over multiple periods, such as non-question (NQ) 1 depicted in Figure 1. This thread began in GDF with two posts, was continued in TTG by nine posts, and finished in QAP with two posts. However, in total there were only five threads that lasted over multiple periods.

Finally, new members were accepted and welcomed into the discussion in all stages, although their distributions were found to be different. Figure 4 illustrates the number of users that posted in each stage, with overlapping areas equaling the number of users that posted in both or all stages. 17 unique authors contributed in GDF. 75 new users contributed in TTG (6.25% retention rate); QAP gained 121 new posters (9.09% retention rate).
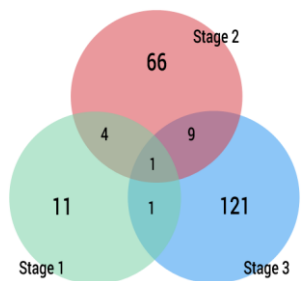
Figure 4. Unique contributors (actors) in each stage.

DISCUSSION

This study investigated how academic users communicate under different community page designs on ResearchGate– in the form of group forum, topic, and Q&A platform.

Interface design limited use of social cues. As we found that users in GDF were more likely to post their messages with social cues, we assert that a group forum setting may create an inherent sense of membership, thereby leading to politeness and other social messages. Once this feature of joining a group was removed in TTG, posts held less social content. While one might think that this could result from a case of old users becoming settled into a platform and losing politeness, we observed that QAP had over one hundred new users, and only 11 returning users, who all contributed to the less social postings of the period. Therefore, it is clear that users did not simply become accustomed to the site or lose politeness through intimacy.

Further, new users are not the variable that created politeness on ResearchGate. Despite having 66 new users in TTG and 121 new users in QAP, users in these stages were not inclined to be especially social or polite. Therefore, the significant incidence of social cues in GDF must be attributable to something other than expert or novice users, namely the interface design.

Barriers to new users, retention, and community turnover. As we observed that many of the users' threads were responded to by other new users, ResearchGate shows a general atmosphere of welcomed participation and low barriers to new users. There are not any clear barriers presented to new users, unlike in the previous literature. New users did not receive much feedback on their initial contributions to the platform, but often did not create more than one post. This leads to a high turnover rate of scholars on ResearchGate. This may be due to platform differences: whereas users of Wikipedia (B. Choi et al., 2010; Farzan & Han, 2014), Slashdot (Lampe & Johnston, 2005) or Facebook (Burke et al., 2009) expect a certain input from new members, a scholarly Q&A platform has unclear expectations and no expectation of conformity to group norms. Lacking this input of what was valuable content, scholars were not incentivized to return to any of ResearchGate's informal communication systems.

If a specific question is interesting to a user they may post an answer. The expectation of the community on new users may simply be that if they have knowledge to share about a specific topic, they do so. Thus with specialization even within a discipline, like the divisions of the "Bone Group", it becomes less likely that a user will be able to confidently contribute to many threads.

Broadcasting vs. Peer-to-peer interactions. TTG and QAP presented two network structures. Scholars in TTG were more likely to respond to all other users in the thread. This led to a highly connected complex network structure between authors. The authors in QAP were more likely to respond to individual posts, leading to a circle-shaped network with a few vital authors connecting the group.

We found that TTG users felt that they were broadcasting to a community. This led to one-to-many postings that explicitly addressed the entire group, creating a complex network. On the other hand, QAP users were responding only to one post, fulfilling one individual's specific information need. The circle network of QAP was formed when one author initiated this one-to-one communication in two or more threads, making that author a key connection between disparate communications.

Common characteristics among scholarly information exchanges. We found that some characteristics such as providing information, opinions, and experience did not vary among the different stages. No interface was more likely to elicit one type of sharing over another. Further, the nature of various question types did not change over the stages. These common traits of posts in each stage are the vital pieces of information exchange and suggest that ResearchGate successfully supported informal scholarly communication over each stage.

Better design is needed for promoting knowledge reuse. The current interface does not support easy access to older discussions, which are moved to the bottom of the activity feed for the topic. As ResearchGate grows, it will be the new discussions that accumulate the most views and have the most scholarly content. Old threads will remain static, though there is no mechanism in place to close a thread. Possible solutions include randomly displaying old posts at noticeable positions.

CONCLUSION & LIMITATIONS

We conclude that ResearchGate has supported scholarly information exchange across all its interfaces and types of discussions. It also has provided a low barrier to use for newcomers unlike other social media platforms. Users joining a group in the first stage were more likely to provide social cues and politeness than in later stages where users follow a topic.

The sample size presents the main limitation of this study. However, our sample size is of similar size to related work in communication analysis such as (Bowler, Mattern, Jeng, Oh, & He, 2013; Liu & Tsai, 2008). By narrowing our study to one field on one ASNS, we were able to minimize the impact of external variables, but ResearchGate is only one site, and the LIS discipline is also just one discipline of many. Additional case studies or a longitudinal study on ResearchGate and other platforms would contribute to a fuller understanding of ASNS communication across interface updates.

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