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COMMUNITY PHOTO SHARING: MOTIVATIONAL AND STRUCTURAL ANTECEDENTS

Communautés de partages de photos : antécédents motivationnels et structurels

Research-in-Progress

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Abstract

In recent years there has seen a substantial growth of social computing. Content contribution from individual members is critical to the viability of social computing communities, and therefore it is important to understand what drives users to share content with others in such settings. We extend previous literature on user contribution by studying the factors that are associated with users' photo sharing in a social computing community. We draw on motivation theories as well as on network structural properties analysis, two critical concepts in predicting user behavior in communities. Our results indicate that users with higher commitment to the community and greater structural embeddedness tend to share more, whereas enjoyment shows no effect on the level of sharing. Counter to our expectations, the motivation of self-development was negatively related to photo sharing. Directions for further development of this research, as well as implications for theory and practice are discussed.

Keywords: Social computing, motivations, photo sharing, Flickr

Résumé

Nous étudions les facteurs associés au partages de photos entre utilisateurs au sein d'une communauté en ligne. Nos résultats indiquent que les utilisateurs les plus engagés dans la communauté et les plus enchâssés structurellement tendent à partager plus, alors que le plaisir n'a pas d'effet sur le niveau de partage. Etonnamment, la motivation de réalisation de soi est négativement reliée au partage de photos.

Introduction

In recent years there have seen a substantial growth in the popularity of social computing systems, or "new applications and services that facilitate collective action and social interaction online with rich exchange of multimedia information and evolution of aggregate knowledge have come to dominate the Web." (Parameswaran and Whinston, 2007b, pp. 762). These systems serve as intermediaries for social relations (Schuler, 1994), and are characterized by online community formation and user content contribution (Parameswaran and Whinston, 2007b). Some of the best known social computing systems are content sites such as Wikipedia, Flickr, YouTube, social networks such as MySpace and FaceBook, and social bookmarking services such as del.icio.us (Marlow et al., 2006; Parameswaran and Whinston, 2007a).

These social computing systems make very large amounts of information available to their users (OECD, 2007; Schueler et al., 2007): Wikipedia, for example, has more than 2 million entries in English alone (Nov, 2007), MySpace has more than 80 million users (Ahn et al., 2007), and Flickr has more than 1 billion uploaded photos (Arrington, 2007). Social computing has also been receiving increasing attention from information systems (IS) researchers: in their review of social computing IS research issues, Parameswaran and Whinston (2007a), stress that "research in information systems needs to evolve to encompass new theories and methodologies that can address questions posed by social computing, which extends the scope of usage of information and computing tools to the realm of social endeavor."

Sustained participation and content contribution from individual members are critical for the viability of all online communities (Butler, 2001; Chiu et al., 2006; Koh et al., 2007), and this is particularly the case with social computing systems, whose content is created entirely by their users. Reflecting this, researchers have focused their attention on identifying the motivations of content contributors (e.g. Ames and Naaman, 2007; Bryant et al., 2005; Nov, 2007; Peddibhotla and Subramani, 2007). However, to date, there has been no study of what underlies photo sharing. Online photo sharing is one of the social computing systems that have gained prominence in recent years. In general, an online photo sharing service such as Flickr enables users to upload, organize, and share their digital photos.

Like other forms of social computing services such as Wikipedia or product review and discussion site, photo sharing communities also rely on contributions from its users for content. However, photo sharing differs from other popular forms of content contribution in at least one aspect: unlike other forms of contribution, the act of contributing in the case of photo sharing is separate from the act of content creation. Millions of photographers, amateur and professional, have been taking photos throughout the years regardless of whether they can share it or not. In contrast, we can hardly imagine an average person would be willing to invest the time and effort in writing an encyclopedia entry, without the goal of publishing it on Wikipedia or a similar venue; or writing a detailed product review, without directing the content creation act at a certain audience. This difference may have implications as far as motivations for contribution go. On the one hand, the "second act" of contributing photos online is a completely optional action separated from the "first act" of photo taking; on the other hand, once photos have been created, uploading them for sharing is a fairly easy step and requires little additional mental effort. The studies on online knowledge sharing and social computing have mainly focused on those services where creation is tightly coupled with sharing, and to our knowledge this study is the first to investigate users' motivation for contribution that is decoupled from creation.

The research question we therefore address in the present study is: what factors are associated with photo sharing in social computing communities? It is important to note that our focus is on the act of sharing, rather than just uploading photos – we are interested in what drives users to designate their photos as public, thereby making the photos viewable to other community members.

In addressing this research question we follow Wasko and Faraj (2005) and take into consideration the effects of two

sets of factors that are salient in the context of content sharing: individual motivations on the one hand and network structure factors on the other. Figure 1 presents a summary of our research model and hypotheses that are detailed in the next section.

Theoretical Framework and Hypothesis Development

Individual motivations

An important distinction in the motivation literature is made between intrinsic and extrinsic motivations (Deci and Ryan, 1985). Extrinsic motivations are instrumental in nature, and focus on extrinsic rewards, where the expected benefits of contributing are believed to exceed the contribution's costs (Lerner and Tirole, 2002). In the context of voluntary information contribution to the community, extrinsic motivations include improvement of skills (Lakhani and von Hippel, 2003) and enhancement of professional status (Lakhani and Wolf, 2005; Wasko and Faraj, 2005). Intrinsic motivations, on the other hand, tend to be terminal in that they emphasize inherent satisfactions rather than their separable consequences (Ryan and Deci, 2000). In the context of information contribution to the community, such motivations include altruism (Zeityln, 2003), fun (Torvalds and Diamond, 2001), reciprocity (Wasko and Faraj, 2005), intellectual stimulation, and a sense of obligation to contribute (Bryant et al., 2005; Lakhani and Wolf, 2005).

Reflecting this distinction, Lakhani and Wolf (2005), suggest a fine tuning of the typology of motivations to knowledge sharing in communities: they divide the intrinsic motivations to enjoyment-based motivations, and obligation/community-based motivations. Overall, they argue that motivations can be put into three major categories:

1) enjoyment-based intrinsic motivations,

2) obligation/community-based intrinsic motivations, and

3) extrinsic motivations.

Following Lakhani and Wolf's typology, in the present study we focus on these three motivations for photo sharing:

Enjoyment: Enjoyment is one of the key drivers of voluntary activities in general (Clary et al., 1998), and furthermore, enjoying the act of sharing in an online community has been shown to be a prominent reason for contributing to open source software projects (e.g. Lakhani and Wolf, 2005; Roberts et al., 2006) as well as open content projects such as Wikipedia (e.g. Nov, 2007). Following this line in the case of photo sharing would entail that

   H1: Individuals with a higher level of the enjoyment motivation will share more with the community.

Commitment: The second motivation involves commitment, or the desire to help other members of the community (e.g. Chiu et al., 2006; Hars and Ou, 2002; Lakhani and von Hippel, 2003). Commitment to the community has been shown to motivate individuals to share knowledge in various settings, such as open source software projects (Lakhani and Wolf, 2005), and open content projects (e.g. Bryant et al., 2005). In the case of sharing photos with other members of the community, we expect that

   H2: Individuals with a higher level of the commitment motivation will share more with the community.

Self development: The third, and most instrumental motivation for contribution involves self-development through learning from others in the field, receiving feedback, and enhancing one's abilities and skills (e.g. Bonaccorsi and Rossi, 2003; von Hippel and von Krogh, 2003). The self-development motivation - considered to be extrinsic because of its instrumental value (Lakhani and Wolf, 2005) - is associated with knowledge sharing (Lakhani and von Hippel 2003), and is one of the motivations for sharing in open content projects communities such as Wikipedia (e.g. Oreg and Nov, 2008). Therefore, we expect that

   H3: Individuals with a higher level of the self development motivation will share more with the community.

Structural embeddedness

In addition to the individual motivations we also consider structural properties of the community. According to Nahapiet and Ghoshal (1998), structural embeddedness is a concept that relates to the properties of the social system and of the network of relations as a whole, and describes the impersonal configuration of linkages between people or units. Structural embeddedness – which refers to the number of ties an actor has to other actors – is a key construct in this regard (Cao et al., 2006).. Tsai and Ghoshal (1998) argue that when a business unit has greater centrality in a multi-unit organization, the individuals inside the unit are more likely to learn and adopt organizational languages, values and norms through the inter-unit social interactions. Therefore, the collective value and vision of this unit would have a higher alignment with the organization, hence promoting inter-unit resource exchange. We believe that the same reasoning also applies to the individuals of an online community. In fact, in line with the view that highly structurally embedded individuals are likely to cooperate and comply with groups norms and expectations (Rogers and Kincaid, 1981), prior research has found a positive effect of individuals' structural embeddedness on their knowledge contribution in online professional networks of practice (Wasko and Faraj, 2005; Chiu et al., 2006). Therefore we expect to see a positive relationship between structural embeddedness of actors and their knowledge sharing. Hence,

H4: Individuals with greater degree of structural embeddedness will share more with the community.

Control variable

In addition to the motivational and structural factors, another factor that adds to the number of photos shared by users is the users' tenure in the community. Previous studies have also shown that individuals with longer tenure in a community tend to participate more in the information sharing networks (e.g. Constant et al., 1996; Wasko and Faraj, 2005). In addition, the longer a user is a member of a photo sharing community, the more photos the user is likely to have uploaded throughout the years. Therefore, we assume that individuals with longer tenure in the community will have more content shared with the community.

Figure 1. Research Model
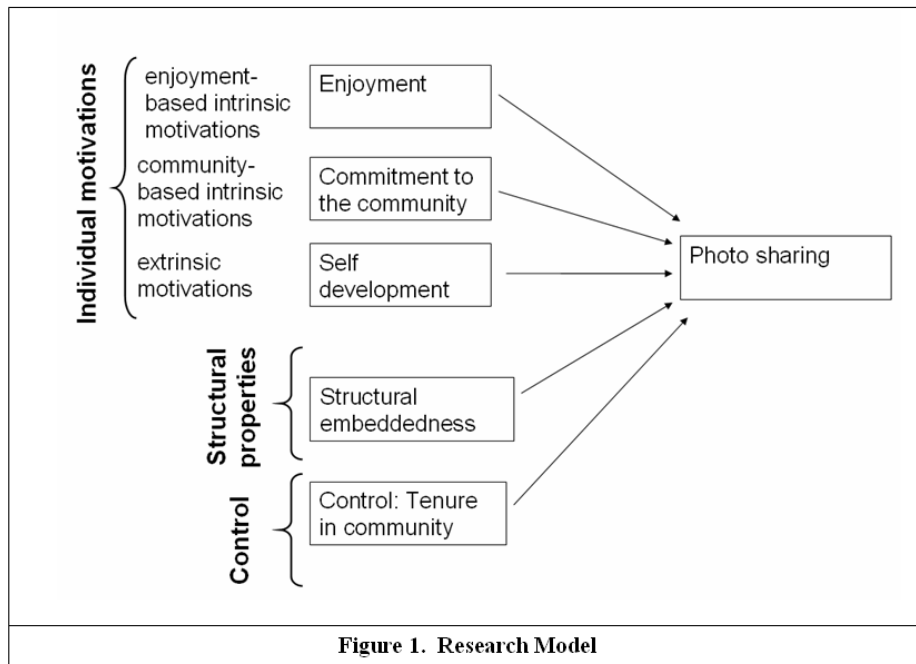
Methodology

We collected data for this study from Flickr, a large photo sharing community which has more than 1 billion uploaded photos, 15 million registered users, and 37.7 million unique monthly visitors (Arrington 2007). Flickr is a prominent example of a social computing and photo-sharing system (Lerman and Jones, 2007; Parameswaran and Whinston, 2007a) whose content is created, annotated and viewed by its users.

A web-based survey was administered to Flickr users, using a combination of survey responses and independent system data of the actual image uploading behavior of the user. Among the independent variables, the three motivations were measured using survey responses. To measure photo sharing motivations, we used existing scales adjusted to the Flickr context. Self development was adopted from Oreg and Nov (2008), commitment was adopted from Wasko and Faraj (2005), and enjoyment from Venkatesh (2000).

To measure photo sharing, we used the number of public photos a user has. Public photos are photos which were uploaded by the user and designated as free for all others to view. System data, such as number of photos for each user is available via Flickr's API (Application Programming Interface) system upon log in. The Flickr API allows third party websites to communicate with Flickr and exchange information. Respondents were asked, at the end of our web-based survey, to log in via the survey website to their Flickr account, and then to close their browser. This way, key data about the respondents' activities (e.g. the number of their public photos) was automatically extracted using and recorded together with the respondents' responses to the questionnaire. To measure structural embeddedness we used the number of contacts a user has, and retrieved it via the Flickr API together with the number of years the user has been a member of Flickr.

One potential methodological issue in interpreting results from survey based research is common method bias (Straub et al., 2004), which leads to inflated estimations of relationships between independent variables and the dependent variable when all of them are measured using survey responses from a single source. In our study, while the three motivations were measured using survey responses, other key variables, including the dependent variable, were retrieved directly through the Flickr API. As a strength of this study, the use of multiple data source enables us to overcome common method bias.

A randomly chosen sample of 2740 Flickr users who had at least one publicly viewable photo were emailed an invitation to participate in our web-based survey. A total of 422 valid responses were received. This represents a 15.4% response rate, with is typical of similar studies (e.g. Goode, 2005; Wu et al., 2007).

Results

Instrument Validation

To validate the perceptual measures in our study, we conducted a principle component analysis (PCA) with varimax rotation using SPSS. Three factors emerged in the PCA with 76% total variance explained. Each item has higher than 0.7 factor loading on the intended construct and less than 0.3 cross-loadings. Table 1 presents the mean, standard deviation, and factor loadings of each measurement items.

Table 1. Item Means, Standard Deviations, and Factor Loadings						
		Mean	SD	1	2	3
1	DEV1	4.96	1.52	**.876**	.009	.142
	DEV2	5.08	1.36	**.835**	.169	.137
	DEV3	4.87	1.36	**.898**	.168	.005
2	ENJ1	5.68	1.04	.205	**.855**	.240
	ENJ2	5.48	1.07	.007	**.825**	.186
	ENJ3	6.07	4.96	.177	**.782**	.146
3	COM1	5.40	1.56	.003	.008	**.860**
	COM2	5.24	1.43	.162	.242	**.847**
	COM3	4.69	1.54	.165	.289	**.777**

We also calculated the average variance extracted (AVE) for each construct to confirm convergent and discriminant validity (Fornell and Larcker, 1981). For each construct, AVE is expected to exceed .50 to display convergent validity, and the square root of AVE is expected to be higher than the correlation with other constructs to display discriminant validity (Fornell and Larcker, 1981; Chin, 1998). As illustrated in Table 2, all construct satisfy these requirements. In addition, all constructs have Cronbach's alpha values that satisfy the generally agreed upon lower limit of 0.70 for confirmatory research (Straub et al., 2004), indicating that all measures are reliable. Table 2 also presents the intercorrelations among the three perceptual constructs. All correlations between these constructs were lower than .50.

Table 2. Means, Standard Deviations, Reliability, Intercorrelations, and Average Variance Extracted						
Construct	**Mean**	**SD**	**α**	**1**	**2**	**3**
1. Self Development	4.97	1.26	.86	**.870**		
2. Enjoyment	5.74	.87	.81	.355**	**.821**	
3. Commitment	5.11	1.30	.83	.288**	.461**	**.829**

Note: The diagonals are the square root of the AVE of each factor
* Significant at the 0.05 level, one-tailed test
** Significant at the 0.01 level, one-tailed test

Hypotheses Testing

Table 3 lists the results from regression analysis using SPSS. In the regression analysis, logarithm of the dependent variable (public photos shared) and two independent variables (years and contacts) were used to normalize these variables. As illustrated in Table 3, with log(years) entered in step 1 of the regression, the model is significant overall (F = 81.948, df = 1, p < 0.001), with an adjusted R^2 of 0.155. After entering the other independent variables in step 2 of the regression analysis, the adjusted R^2 increased to .229, with a Delta R^2 of .074. The coefficients of log(contacts) and commitment were significant in the predicted directions. The coefficient of self development was significant at opposite to the predicted direction. The coefficient of enjoyment was not significant. Among the hypothesized factors, structural embeddedness (contacts) show the strongest predicting power on contribution, followed by commitment and self development. Table 4 summarizes the support of our hypotheses from these results.

Table 3. Regression Results

		Step 1			Step 2		
	Independent Variables	β	t	*p*	β	t	*p*
Results of predictors	Constant	-	98.806	.000	-	13.432	.000
	Tenure/log(years)	.396	9.053	.000	.269	5.872	.000
	Structural embeddedness/log(contacts)	-	-	-	.249	5.258	.000
	Self Development	-	-	-	-.126	-2.705	.007
	Enjoyment	-	-	-	-.007	-.153	.879
	Commitment	-	-	-	.170	3.496	.001
Results of the overall model	R^2	.157			.238		
	Adjusted R^2	.155			.229		
	F	81.948 (df = 1, $p < .001$)			27.317 (df = 5, $p < .001$)		

Table 4. Research Hypotheses and Results

Research Hypotheses	Result
H1: Enjoyment → Information Sharing	Not Supported
H2: Commitment → Information Sharing	Supported
H3: Self Development → Information Sharing	Negative relation was found
H4: Structural embeddedness → Information Sharing	Supported

Discussion and Implications

In recent years there has been a substantial growth of social computing, and online photo-sharing represents one prominent example of this phenomenon. Given the importance of user contributed content for these systems - to the extent that participation and contribution from individual members is critical for the sustainability of computer mediated virtual communities (Chiu et al., 2006; Koh et al, 2007) - practitioners and researchers can both benefit from a better understanding of what motivates user contribution. The present study, therefore, attempts to address this question.

In this study we extend previous literature on user contribution in online community environments by studying the factors that are associated with users' contribution of photos. Our research model draws on motivation theories, especially, Lakhani and Wolf's (2005) typology of motivations to knowledge sharing in communities, and includes three intrinsic and extrinsic motivations (enjoyment, self development, and commitment). We also follow Wasko and Faraj (2005), and extend this motivation framework by incorporating structural embeddedness - a key concept in predicting user behavior in communities to investigate photo contribution.

Our results demonstrate that, as expected, users with higher commitment to the community and greater structural embeddedness tend to share more photos. Enjoyment, however, shows no correlation with the amount of

contribution. This may be attributed to the peculiar characteristics of photo-sharing. Unlike an online discussion forum or other social computing systems such as Wikipedia, for a photo-sharing service, content creation (taking the photos) and content sharing (uploading the photo to Flickr) are two separate steps. Therefore, the users may be motivated more by the "fun" in the content *creation* part of the process, and the enjoyment of *sharing* per se become less salient. This difference between the "first act" and the "second act" of sharing photos is different from many other forms of social computing sharing, and has so far received no attention in the literature. The present study contributes to the literature on social computing by addressing the case where creation is decoupled from sharing.

Another unexpected finding is the negative correlation between the self-development motivation and the level of photo sharing. One explanation for this may be rooted in the tradeoff between contribution quality and quantity: the more a user is motivated by self development, the more the user will focus his or her efforts on the quality (rather than the quantity) of the photos shared. This is because those who are using photo sharing websites for learning would be more cautious about sharing their photos, and only post their best photos in order to get feedback. This may be at the expense of the quantity of photos shared, leading to a negative correlation between this motivation and the number of photos shared. As this paper represents research-in-progress, we would like to address this question in further research.

Before we discuss the implications of our study, we need to caution that it has several limitations. First, our study applies a cross-sectional survey design; therefore, we can not address the causality among the variables in our model. Although theoretical arguments can be made for the causal relationships between the independent variables (individual motivations and Structural embeddedness) and the dependent variable (photo sharing), our data analysis only permits us to demonstrate significant correlations in those hypothesized links. Future research can address this limitation by conducting a longitudinal study that tests these relationships. Second, our study was conducted on a specific social computing service – the Flickr online photo sharing community. Studies of other types of social computing communities – social bookmarking such as del.icio.us, video sharing such as Youtube.com – can help verify the generalizability of our findings.

Findings from this study have several implications for theory and practice: first, the study contributes to the body of information systems literature on user contribution by developing a framework to help understand users' motivations to contribute in a new IS-facilitated phenomenon – social computing and in particular online photo sharing. User motivation to contribute has been studied in other social collectives such as online knowledge sharing communities. Social computing services such as Flickr and YouTube enable a vast number of individual users to be contributors and users of content. Therefore, researchers also need to take a user-centric approach in understanding the dynamics of content contribution in these social computing environments. In this study we illustrated the role of individual motivations and structural embeddedness in user contribution. This understanding may serve as a useful first step for further research of social computing phenomena. The contribution of this work also points for directions for further research: the decoupling of the "first act" of creation from the "second act" of sharing appears to have consequences that separate photo sharing from other forms of sharing, and requires further exploration. The second contribution of this study is in exploring the relationship between the self-development motivation and the amount photos shared: the negative association found warrants further research on the tradeoff between quantity and quality of contribution in a social computing context. A relevant yet distinct question is what motivates users to increase the quality of their contribution, and future development of this research project involves investigating the antecedents of contribution quality.

Our study revealed that structural embeddedness, followed by motivation to help the community, are the strongest factors associated with contribution. These results suggest that user contributions in online photo-sharing systems are mainly socially motivated. As this study represents work in progress, we plan to extend it to other settings and compare the findings with observations of other types of social computing systems. For example, there could be contextual factors that moderate the effects of these motivations on contribution.

Findings of this study also have interesting practical implications for managers and organizers of social computing initiatives. It is advised that managers of collaborative content systems seeking to increase user activities focus their marketing and user-cultivation efforts on those factors that have a strong impact on the level of contribution. As users' photo contributions are highly driven by social factors, opportunities for social interaction are essential to social computing systems and the inclusion of avenues for social interaction as part of the design of such systems need to be encouraged. Further, beyond the systems' design, social interaction can be increased by encouraging users to use all the existing social interaction avenues of the system.

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