

What Do You Know? Experts, Novices and Territoriality in Collaborative Systems

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ABSTRACT

When experts participate in collaborative systems, tension may arise between them and novice contributors. In particular, when experts perceive novices as a bother or a threat, the experts may express territoriality: behaviors communicating ownership of a target of interest. In this paper, we describe the results of a user study of a mobile social tagging system deployed within a museum gallery to a group of novices and experts collaboratively tagging part of the collection. We observed that experts express greater feelings of ownership towards their contributions to the system and the museum in general. Experts were more likely than novices to participate at higher rates and to negatively evaluate contributions made by others. We suggest a number of design strategies to balance experts' expressions of territoriality so as to motivate their participation while discouraging exclusionary behaviors.

Author Keywords

Territoriality, experts, novices, collaboration

ACM Classification Keywords

H5.3. Group and Organization Interfaces: Computer-supported cooperative work

General Terms

Human Factors

INTRODUCTION

The phrase 'turf wars' suggests conflict arising between individuals or parties over ownership of a territory. Lobstermen wrestle for access to fishing spots [3], while gang members fight over the control of streets and neighborhoods [37]. These territorial disputes are not limited to the physical world. A virtual equivalent occurs in

Wikipedia, where experienced users respond to inappropriate contributions with template warnings (and, in repeated cases, technical mechanisms such as blocking accounts or IP addresses) or apply defensive contribution strategies to control articles to communicate ownership of the space to others [34].

These types of conflict may become especially apparent in online systems when a collaborator perceives herself or himself as an expert. An individual may work towards becoming an expert collaborator and become possessive of his or her contributions to the system that are the product of those efforts (ie. articles in Wikipedia). He or she may experience benefits, such as higher status, because of his or her reputation as an expert. When other collaborators threaten that position, an individual's perceived social role as an expert in a collaborative system can itself become a territory that must be defended and maintained, often by appropriating features of that system such as using watchlists to closely monitor a Wikipedia article one feels stewardship over [34].

We propose that behaviors expressing one's sense of ownership are examples of the broader phenomenon of territoriality, and that analyzing interactions in collaborative systems through the lens of territoriality may lead to better understanding of these interactions as well as to better system designs. With respect to expert participants, territoriality can serve a number of purposes -- some that benefit collaboration and some that do not. On one hand, encouraging feelings of ownership may motivate experts to contribute more to something they value. On the other hand, if experts feel their contributions are marginalized and undervalued by other collaborators, extreme defensive reactions by experts may arise that cause a permanent schism in the group. For example, Wikipedians dissatisfied with perceived anti-expert bias established Citizendium as a separate and competing venue for their contributions [1].

In this paper, we describe the results of a field study of a mobile social tagging system deployed within a museum environment to users with a wide range of expertise. Our goal is to explore how expert users manifest territorial behavior and attitudes when employed in collaborative activity alongside novices. We look at a number of potential

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markers and indicators of territoriality, including whether experts feel more ownership than novices toward the museum, whether they will negatively evaluate others' tags, and whether they prefer objective terms and jargon to describe artwork. Overall, the answer is yes, they do, and our findings suggest that these expressions of territoriality will benefit user-generated content systems if increasing expert participation is the goal. However, they may also serve to discourage novices from becoming more active community members. From our results we draw design implications that may help creators of collaborative content creation systems harness the beneficial aspects of territoriality and ownership while limiting potential negative side effects.

RELATED WORK

Territoriality in Social Spaces

Territoriality can be expressed in both physical and online environments and its signals can be both tangible and intangible. One common expression of territoriality is marking, the placement of an object or substance within a space to indicate ownership and serve as a preventative measure to deter invasion [8]. In social computing, users appropriate features of systems to express territoriality as public signals of ownership. For example, groups might mark an online space by erecting virtual barriers such as requiring an account in order to access a discussion group.

Defense, another characteristic behavior, serves as a response to a perceived incursion into one's territory [8]. In a physical space, group members can discourage trespassing through direct confrontation, such as verbally warning unwanted parties. In social computing, users may also appropriate features of the system in order to defend territories. For instance, in collaborative tabletop systems, users can defend the artifacts used to complete shared tasks by placing them in a space only they can reach, rendering them inaccessible to other group members [32,39].

Territorial behaviors can be beneficial: they can reduce ambiguity about a group's structure in terms of status and position and help define the boundaries of a social space, communicating who belongs through the use of insider signals such as jargon that only an expert would understand [24]. They can also help to effectively structure coordinated activity [21] so that experts can carve out a consistent role, suited to their expertise, and so that other collaborators can make use of this expertise. On the other hand, if expressed improperly, territoriality can harm collaboration by encouraging behaviors resulting from experts disregarding contributions made by novices solely because of their relative lack of experience and expertise [17].

Expertise and Status

When experts collaborate alongside new members, conflict may arise for a number of reasons. First, experts often have to serve as reluctant mentors to novices, despite limited resources and uncertain benefit, contributing to a sense that

one has to protect and defend their time against outsiders [30]. These behaviors can lead to negative consequences. For instance, Wikipedia has a policy called "Please Do Not Bite The Newcomers" that reminds experienced contributors that "nothing scares potentially valuable contributors away faster than hostility" [2]. Presumably, this policy exists because some experienced users bite newcomers—employing territorial behaviors to defend against newcomers' demands and mistakes.

Second, the location of expertise emerges as a socio-technical challenge for CSCW research. Expertise location systems typically help people find others in a community or company who have needed expertise on specific topics [4,25,33]. Despite the technical feasibility of expertise recommender systems, the ability to locate experts assumes that these social actors will be pre-disposed to distribute their knowledge and abilities. Group members, however, will not always want to share their expertise, particularly when knowledge is power and status comes when that power is withheld from others [26]. As a result, territorial behaviors may act as a strategy for established experts to hold onto their privileged positions.

Experts don't always seek to defend themselves. At times, they may desire the status and visibility that accompanies the role of expert, especially if that role is central to their identity [9]. To move into this position, individuals manage the impressions that others form about them as experts through a number of communicative strategies [17]. Within mediated online environments, users send signals of varying reliability that can indicate the likelihood that one possesses expertise in a certain domain [14]. For example, profile elements in a social system or demonstrated participation in blogs or online forums, can communicate a willingness to share knowledge with expertise seekers [33].

With respect to territoriality, the willingness to broadcast one's expertise through marking behaviors may be motivated by the potential benefits to the individual. However, when resources are limited or one is established as an expert, defensive strategies may be applied to remind novices of the pecking order. Territoriality, as expressed in the former strategy, serves as a benefit to the community by publicizing expertise [40]. In the latter, however, excessive defense may discourage newcomer contributions and devalue novice perspectives that may differ from the status quo.

Considering the Expertise of Museum Visitors

The museum is an interesting case for considering the relationship between experts and novices, as it provides CSCW and HCI researchers with a lens to consider the hybrid nature of expertise as constructed from cognitive and socio-cultural factors.

Expertise in art develops, in part, through education and training. In learning about specific subject matter content, experts acquire a specific vocabulary to describe objects

and they acquire analytical and critical skills that novices do not possess [7]. Specifically, experts in art employ terminology that describes objective characteristics of a piece to categorize it in a certain way (e.g. from a certain era, created by a certain artist) [23]. While this form of expertise is cognitive in nature, an in-group of experts can employ specialized vocabulary to maintain the boundaries of a social preserve [17]. That is, people can only gain entry into the group if they understand the terminology.

Subject matter expertise may also influence one's social position within a community of shared interests. For instance, in the social ecology of the museum, professional curatorial staff members are considered the most expert of the community by virtue of professionalized training and education [15]. The museum visitor population, however, is diverse and identification as an expert may not lie solely within the domain of the professional staff [13]. Residing in the hierarchy between museum professional and naïve visitor are docents, highly motivated volunteers who are trained to give tours and participate in education activities. In addition, there are museum visitors who are practicing artists, artists-in-training or serious connoisseurs who have demonstrated significant dedication to the arts. Through education and exposure to norms of the museum context, these "super-visitors" eventually occupy the social position of expert because of their commitment and standing within the community [41].

This diversity of art knowledge may also affect how different visitors perceive a successful museum experience. [5] describes three key components of the museum ecology from the visitor's point of view: liminality, sociality and engagement. Liminality characterizes the museum visit as transformative, spiritual and reflective. At the same time, visitors seek out social and educational experiences while in the museum space. An individual's level of expertise with art may determine how one wants to interact with technologies situated in the museum: a first-time visitor may want or need a different experience than a repeat patron of the museum.

Technology to support the museum visitor experience has taken on a variety of formats. For example, handheld guides (e.g. *Sotte Voce* [18]) can deliver content that has been professionally curated and also signal the social presence of other visitors. Participatory systems such as *Imprints* [6] and *ArtLinks* [12] allow visitors to personalize their visit and connect with other visitors through creating and viewing markers or tags attached to individual exhibits. More recently, museums have implemented social tagging systems in order to address the gap between how curators and the general museum audience interpret artifacts, as well as to encourage visitors to contribute to the experience. *Steve.museum* [36] is an online collaborative system in which distributed users tag items in a multi-institutional museum catalog, generating a more diverse vocabulary for describing art objects that is accessible to those who have less expertise. There is little barrier to entry with respect to

contribution in *steve.museum*—all that is required is registration.

At first glance, this kind of social tagging system may not allow museum visitors to communicate their expertise to others and otherwise express territorial behaviors. [35], however, suggest that members of an organization choose tags strategically in order to appear as experts to their audience. Because of their commitment to the arts and the museum, we hypothesize that these "unofficial" experts will feel ownership toward the museum and thus tend to exhibit territorial behaviors. We also expect that they will use features of the technology to express these behaviors.

Research Questions

Our high-level research question is to study how experts express territoriality when they work with novices in collaborative systems. To address this question, we conducted a study where we asked experts and novices to collaborate in creating a set of tags for museum objects, using an existing handheld tagging system called *MobiTags* [10]. *MobiTags* allows users to rate tags through voting and contribute to the body of tags¹ that describe objects in a small open storage collection at a university art museum located in the northeastern United States.

The case study poses the following specific research questions to observe how museum visitors with varying levels of art expertise express territoriality within this system. Because the expert museum visitor develops into that role through both social means (e.g. as a committed member of a community) and subject matter training (e.g. art education), we operationalize expertise using both socio-cultural and cognitive measures.

RQ1. *Do experts feel more ownership than novices toward the museum?* [41] suggest that as community members mature and become entrenched in the group's practices and norms, they become cognizant of the issues that face the community as a whole, as opposed to focusing on their individual concerns. We propose that experts, as more senior or committed members, will be more likely to exhibit a sense of global attachment to the museum and to participate at higher rates than novices.

RQ2. *Will experts be more likely to express territoriality by negatively rating contributions?* When confronted by contributions from novices, we propose that experts may perceive an invasion of territory by the novices. As a result, we hypothesize that experts will vote tags down more frequently than novices as a defensive territorial strategy.

¹ This collection is the same collection used by the original *MobiTags* system; these tags were primarily generated by a number of novices. Each participant encountered the same set of initial tags, as the system was reset before each trial.

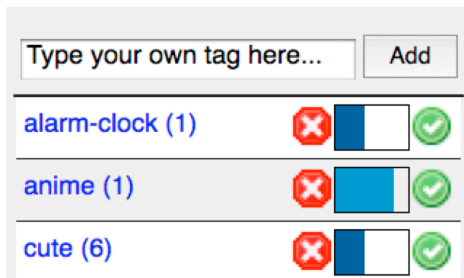


Figure 1. MobiTags voting interface, which shows tags other people have entered and how often others agree with them.

RQ3. *Do experts prefer objective terms to describe the artwork?* [23] observed that those with training in art and aesthetics are more likely to use objective words (e.g. metal, wood, Renaissance) as opposed to terms evocative of one's feelings about the piece (e.g. fierce, crazy). We thus hypothesize that experts will prefer tags that are objective in nature, rather than subjective ones.

RQ4. *Do experts use jargon to describe the objects?* [24] and [35] propose that insider terminology can be employed as a defensive territorial strategy to keep unwanted parties from contributing. We hypothesize experts may be more likely to prefer jargon to keep novice-generated terms from becoming prevalent in the collaborative system.

STUDY DESCRIPTION AND METHODS

MobiTags has a number of features; here we focus on the tagging features, shown in Figure 1. Each object displays the tags previous visitors have associated with the object, as well as how many people agree that the tag is appropriate for the object. Users can vote up or down on a tag to rate it positively or negatively and can also add new tags by using a text box that provides an auto-complete feature populated with already existing tags. Since encouraging contributions from both experts and novices was a primary design goal for MobiTags, social tagging was chosen as a low effort way for users to provide their opinions. This lowered barrier encourages museum visitors to contribute to the system, despite what fears they may have due to a lack of expertise about art or museums [16].

In order to emphasize the cooperative nature of the system and to encourage contributions, we delivered a script to participants stating that we were hoping to obtain the highest quality tags possible and asked them to contribute as best as they could. To make the possibility of the threat to one's contributions more salient, we emphasized that different groups of users would be able to vote on their contributions, as in the excerpt of our script below.

We've asked people who are knowledgeable about art, such as those who study art, as well as museum visitors who don't have any formal training, to help contribute tags of their own, which are displayed here.



Figure 2. Object description with popular tags highlighted.

However there is limited space in the tour interface, so we will be choosing the best 5 tags created by users to be displayed permanently alongside the object in the tour. We plan on making this decision in the next week so your input is especially important at this time.

As we've mentioned before, one special thing about MobiTags is the ability to create tags and view tags chosen by others. So, if you are unsatisfied with the tags left by others, then you can vote them down. If you are pleased with the other tags, you can vote them up as well.

Keep in mind that other visitors will be able to vote your tags down as well.

Finally, we emphasized that the interface highlighted only the most popular tags on the initial page describing the object (Figure 2).

We recruited 15 novice participants, self-described as having little or no experience with art or this specific museum, from a university-wide database of psychology experiment volunteers. We also recruited 15 more expert participants, consisting of 7 docents, 1 museum intern and 7 members of the Museum Club, a group of undergraduate students interested in art and the museum. The mean age of the experts was 30.45 years (SD=18.24) while the mean age of the novices was 19.6 years (SD= 0.99). All participants were female with the exception of 5 participants in the novice condition. This gender balance is consistent with research suggesting that the ratio of men to women art museum volunteers is 25:75 [20].

Upon arrival at the museum, participants filled out a short questionnaire to confirm their level of expertise with art and the university art museum under study. We then briefly instructed them on how to use MobiTags and asked them to

use the tag voting features of the system for 30 minutes. To accomplish this task, each participant spent time in the gallery space, looking at the objects within the open storage cases and voting on or adding tags. After using MobiTags for the specified amount of time, participants filled out another short questionnaire and completed a semi-structured interview where we asked them to revisit the objects they had viewed and to share the motivations for their votes on specific tags. Upon completion of the task, participants received \$10 in compensation for their time.

RESULTS

Log data indicates that participants completed the task as requested, spending an average of 29.27 minutes ($SD=3.37$). Like previous studies of tagging systems, including the initial user evaluation of MobiTags [10], tag popularity roughly followed a power law distribution (of 466 distinct tags, 87 were applied once). We now use the quantitative and qualitative data gathered to answer the four research questions that we posed.

Q1: Do experts feel more ownership than novices towards the museum?

We wanted to confirm the presence of ownership since it is central to our definition of territoriality. To measure the construct of ownership, we included an adapted version of [27]’s 7-point scale on psychological ownership on our post-task questionnaire. On average, experts ($M=2.87$, $SD=1.72$) were more likely than novices ($M=4.53$, $SD=1.64$) to agree with the statement indicating “a very high degree of personal ownership” towards the museum ($t(28)=-2.7$, $p<0.01$). In comparison with the novices ($M=3.40$, $SD=1.45$), the experts ($M=2.33$, $SD=1.29$), on average, were also more likely to agree that they felt “the tags chosen were mine” ($t(28)=2.12$ $p<0.04$).

Consistent with the idea of feeling ownership toward tags, six expert participants and two novices said they would be disappointed if other visitors would vote down their tags.

I guess I would feel hey...this is what I do. Why are you voting down my tag? This tag makes sense. Why would you vote it down? (R, docent, expert)

Well, I feel...like I worked kind of hard to do this...to vote

	Experts	Novices	Total
Up votes	2,435 (52.8%)	1,538 (63.9%)	3,973 (56.6%)
Down votes	2,178 (48.2%)	868 (37.1%)	3,046 (43.4%)
Total	4,613 (100%)	2,406 (100%)	7,019 (100%)

Table 1. Breakdown of upward and downward votes on tags by experts and novices. Percentages are the relative to the total number of votes by the group.

on all of the tags...to...like, contribute. So, yeah, I would be a little bummed, sure. (T, novice)

These quotes illustrate a key difference we observed with respect to ownership between the expert and the novice participants. The novice participants were more concerned with the amount of effort they used in order to complete the task. In the case of the expert, the down vote appears more like a negative judgment of one’s expertise and knowledge. However, all of the participants, including the ones who expressed mild dismay, noted that they were accepting of the possible down votes on their tags since they were not likely to reuse the MobiTags system. This is in contrast to other user-generated content systems such as Wikipedia that encourage and depend upon repeat participation for continued health and success.

We also observed that some of the expert participants, though they displeased with the quality of some of the tags, were grudgingly hopeful that systems with user-generated content would draw new visitors to the museum.

Um, so but, maybe by using these kinds of terms that maybe somebody that’s not in museums...or with an art or art history background...would allow more people to find objects that they were interested in...and maybe then...they’d come to the museum more often. (R, docent, expert)

This, uh, [system], isn’t...something that I would choose to do but I can see how other people...maybe who don’t come to the [museum name] might learn something. I think it would be great to get...uh, more visitors so I like seeing, um, these new technology [sic]. Maybe get them more involved too, later. (B, docent, expert)

Despite the tag-level territorial behaviors by experts that we observe below, they ultimately wanted the museum to thrive and attract newcomers, even if the experts did not want the same kind of experience they believed novice participants desired.

Q2: Will experts be more likely to vote tags down?

The activity logs recorded a total of 7,019 tag votes. Table 1 summarizes the voting patterns of both experts and novices. Experts more frequently voted on tags than novices and cast more down votes than novices. Overall, subjects in this study voted tags down more frequently than users in the initial MobiTags evaluation, who voted tags up 197 times (81.1%) and down 46 times (18.9%) [10]. There may be a few reasons for this difference. In the current study, the participants used MobiTags for a longer period of time, and the script in this study emphasized a goal of collecting tags that best described an object, rather than the user experience of the system itself. This suggests that emphasizing quality of the tags as a goal may have influenced how participants rated the tags compared to the prior study.

Predictor	B (SE)	Sig.	Exp(B)
Constant	1.287 (0.653)	0.05	3.621
Expert (RQ2)	-1.481 (0.364)	0.0001	0.227
Objective (RQ3)	-.226 (0.125)	0.07	0.798
Expert*Obj (RQ3)	1.417 (0.147)	0.0001	4.126
Control			
Ownership	0.96 (0.116)	n.s.	0.91
Age	0.004 (0.008)	n.s.	0.99

Table 2. Results of General Estimating Equation. N=7019

To measure whether experts were more likely to vote tags down than novices, we built a logistic model using the General Estimating Equations (GEE) method [19]. GEE controls for within-cluster correlations in regression models with binary outcomes, which allowed us to account for the fact that people had varying levels of activity and voted on a number of tags.

Table 2 presents the complete model. The response variable was a participant's tag vote (up/down) and the predictor variable "expert" was coded as a binary outcome (yes/no). We will discuss the other predictor variables when we address RQ3; for the current question, the model shows that experts are 0.23 times less likely than novices to rate a tag positively by voting a tag up (Exp (B)=0.23, $p<0.0001$). That is, given the total number of votes, the population of experts was more likely than novices to vote a tag down.

In the interviews, six of the seven docents and four of seven museum club members expressed some dissatisfaction about the quality of some of the tags in that they seemed to be chosen by art neophytes.

Oh, I, uh, voted them [tags] down a lot. They just seemed wrong to me. Like added by people didn't know what they were seeing, like they didn't know about art. (E, museum club member, expert)

...like [the tag] 'starwars'. And, uh, I just didn't know what people were thinking when they chose that. So, it didn't...really seem like they had any idea about art. I didn't think those, uh, kind...[of] tags were useful or...good. (S, docent, expert)

These observations, combined with the higher frequency of tag down votes, suggest that our expert participants appropriated the voting feature in an attempt to prevent the lower quality tags from becoming more popular. In addition, these participants assumed that these tags were also added or voted up by novices—and the experts did not see much value in their contributions.

It is fair to ask whether these are expressions of territorial behavior or just experts correcting errors. Theoretically, our findings are consistent with prior observations of the threat of competition as encouragement for territorial behaviors. Socio-biological models of territoriality (see [31] for a review) suggest that the perception of limited resources

would incent actors to mark and defend their territories. Four of the expert participants expressed some awareness of novice participation and its perceived effect on the visibility of the expert contributions.

Well...yes, probably I might find this more useful, uh, if I was able to see more from...people who knew more about the museum...You know, the art. I would add tags about the stuff I know about but...who knows who else could see it?

Maybe....um...that's why I voted those [tags] down....so maybe I could see stuff from those people [other experts]. (B, docent, expert)

When asked to participate in this particular collaborative activity, the experts may have felt threatened by the novices, in that their contributions would be given the same weight in the interface as more educated choices made by fellow experts. Consequently, expert participants respond to this perceived threat to the quality of the system by voting tags down to lessen the impact of the tags that they assumed were created by people who were less knowledgeable about art than they were.

Q3: Do experts prefer objective terms to describe the artwork?

Two raters coded the 7,019 tag votes into the categories of objective and evocative ($\kappa=0.78$, $p<0.01$). To obtain inter-rater agreement, the raters first coded a sample of 50 tags to reach consensus on how the tags should be categorized. Examples of objective tags included "african", "abstract", "modern", and "ceramic", while sample subjective tags included "dreamy", "strange", and "evil." Of the 7,019 tags, 4,285 were coded into the objective category and 2,734 were categorized as subjective.

We created a binary predictor variable, Objective, to describe whether or not a tag was objective (Table 2). To observe how experts rated objective tags, we created an interaction variable, Expert*Obj, which was dummy coded into two levels (expert/objective and the other conditions combined). Again, the response variable is tag vote (up/down). Our data suggests that tag objectivity is a marginally significant predictor; overall, objective tags were more likely to be voted down than up by experts and novices combined, (Exp (B)=0.79, $p<0.07$). The interaction variable, Expert*Obj, suggests that given the total number of votes, the population of experts were about 4 times more likely to vote on objective tags (Exp (B)=4.106, $p<0.0001$).

To obtain a better sense of experts' tag category preference, we also split the tag corpus into two parts: tag up votes and tag down votes. Experts were no more likely than novices to vote either up or down on objective tags. However, we observed a marginally significant difference between experts (69.1%) and novices (30.9%) with respect to voting subjective tags down, $\chi^2(1, n=3044)=3.03$, $p<0.08$, suggesting that they were more likely to disagree with that category of tags than novices.

Combined with data from our interviews, we suggest that the experts and novices have differing preferences for objective and subjective tags because each group had a distinct conception of the overall purpose of the system's tagging features. We observed that the expert participants characterized MobiTags as a navigational device, akin to a more traditional handheld tour. As such, experts believed tags should be used to search for objects of interest, and deemed the subjective tags unsuitable for searching.

For this [statue]... Bodhissava...Guanyin and Buddhism. So, those are categories to search for. These [other tags] are descriptions...that it's "strange"? Who's going to search for that? (B, docent, expert)

Questionnaire data revealed that novice participants had less experience on average ($M=1.20$, $SD=0.414$) than the expert participants ($M=1.93$, $SD=1.01$) with other museum mobile tours ($t(28)=4.05$, $p<0.022$). This relative lack of familiarity may have led to novices being more receptive to the subjective tags and their affective nature—that is, tags are just as much a tool for expression and reflection as they are for categorization [10].

Compare the reactions of two participants, one novice and one expert, in describing the tags associated with the same Tiffany glass vase.

I chose tags because of the way the object made me feel. So, this one [the Tiffany vase] was my favorite...because it was so feminine...I used the word "delicate" because of how it made me feel. (G, novice)

To me, that [Tiffany] vase is nothing about dreaming and when I look at a vase, I usually think of glass or pottery. Just dreaming? I don't think I ever think of vases and dreams. (M, museum club member, expert)

These distinct conceptions of what tags are satisfactory may eventually contribute to the formation of an in-group and out-group, in which experts are less tolerant of those who would use the system differently than they, particularly in an area in which they hold knowledge. Based on their preference for the objective tags for the purposes of information seeking, we suggest that the expert participants more highly value the education component of Bell's [5] museum ecology, while novices may be more open to systems that better support the components of liminality and sociality.

Q4: Do experts use jargon to describe the objects?

We asked two expert raters (a curator/PhD candidate in Art History and a practicing artist with a MFA) to view the objects and tags featured in MobiTags and then select jargon terms of a specialized nature. Because novices generated the initial seed list of tags, the number of jargon tags was relatively small: "cubist", "gold-filigree", "Kawaii", "monochrome", "Murakami", "pastiche", "symmetrical", and "totem."

These tags received relatively few votes—together, they received 46 up votes and 17 down votes from experts, and 18 up votes and 7 down votes from novices. We speculate that the relative unpopularity of these specialized tags in voting was due to two factors. First, there is a "rich get richer" phenomenon where more popular tags received more attention, especially if users were navigating the system via the initial tag list interface. Second, however, is that in order to vote on these tags, one needs to know what they mean.

Our qualitative data did suggest that there were experts who did attempt to find and vote up more specialized tags. Six of the expert participants revealed in their interviews that they were attracted to tags that were similar to ones that they used in art history coursework, and they expressed some surprise that these terms were not more frequently used, especially they were aware that other expert participants were also evaluating the tags in the system.

I was surprised that Murakami was not one of the tag names. It's become almost like a household word because Murakami has a distinct style and I follow his work closely so I added the tag...I thought other people who would know about it might vote it up later. (L, museum club member, expert)

Rather than actively creating a barrier between novices and participants, these expert participants hoped that the usage of the specialized tags would speak to others who may have a similar background. While the intention may be to create community among peers, we speculate that novices may be less likely to evaluate these contributions because they may not have the specific content knowledge to do so.

DISCUSSION

In summary, expert participants expressed territoriality through both frequent participation and down-voting of tags as a way to signal their commitment. While the higher frequency of expert down-voting may be, in part, motivated by the correction of inaccuracies, the presence of increased levels of ownership towards their tags as well as the museum suggests that experts expressed their attachment to the space by contributing to the best of their abilities by explicitly sharing their expertise with others.

We now describe the novel contribution of our research. First, we observe and describe how experts apply defensive territorial strategies when they perceive a threat in an online space. Second, we see that experts and novices can define and perceive a territory differently.

Online defense against perceived threats. Our data revealed that expert participants were more likely to down vote tags assumed to be created by novices. We propose that this behavior may be a defensive expression of territoriality in response to a perceived threat because one's identity within the group may be structured around his or her self-concept as an expert [9]. Because higher status members of a social group may reap benefits (e.g. increased visibility, the power

to accept changes in open source software, the ability to block users in Wikipedia), it is possible that experts may choose to express territoriality in a defensive manner in order to maintain their possession of that standing.

Divergent perceptions of “the territory.” In the current study, we observed that experts and novices differed in their conception of what the goal of the MobiTags system should be. The expert participants viewed the system as a navigational device while the novices were open to the social and affective possibilities of the design. Four of the novice participants were also first-time visitors to this particular museum, and they indicated that they particularly enjoyed the informality of these subjective tags. With respect to user-generated content systems, such as *steve.museum* [36], the different values held by experts and novices may hinder the development of a diverse collection of tags to describe museum objects, particularly if experts have the ability to negatively evaluate newcomer contributions.

IMPLICATIONS FOR DESIGN

Designers should carefully consider places where feelings of ownership are likely to arise in collaborative systems and lead to territorial expressions using features of the system. Our data suggests that there is a core problem of mismatched values between groups using the system, which can lead to territorial behaviors. In this case, experts believed that certain tags were suitable and devalued contributions made by novices by negatively rating them. As such, we suggest that novices may require additional validation to encourage participation and develop feelings of attachment and ownership towards the collaborative community. To accomplish this, it may be helpful for designers to encourage the expression of territoriality by providing markers to broadcast the quality of their contributions so that others perceive that their participation is valuable. Such markers could consist of user-generated templates that would highlight the positive aspects of their work. In addition, it may also be useful to provide a way for novices to more quickly learn the jargon that might be specific to a collaborative endeavor.

However, designers need to keep experts engaged as core members of a community, as our study suggests that they are more likely to feel higher levels of ownership towards—and contribute more to—the target to which they are attached (e.g. the museum). On the other hand, if these feelings of ownership cause experts to become overly protective through territorial expressions that exclude novices, the community does not benefit. As a result, we propose that directing experts’ feelings of ownership toward appropriate targets by appealing to their sense of commitment and community may be a way to both allow experts to express commitment and ownership while opening spaces for newcomers to contribute.

For instance, experts could be encouraged to express ownership about the community as a whole and channel

territorial expressions to activities at a more global scale. Designers can include incentives to encourage experts to participate in policy-making decisions where tenure is a benefit [22], as opposed to defending low-level territories such as their day-to-day contributions (e.g. rating tags, line edits on Wikipedia articles). Such incentives may include higher visibility on a leaderboard specifically intended for service activity, or matching appropriate experts to policies through intelligent routing according to interest, expanding on [11]’s SuggestBot for Wikipedia. By encouraging a more holistic application of territoriality, designers may help experts become more aware of a community’s overall health and to engage in leadership and coordination tasks that only experienced members can successfully tackle.

Systems might also help experts find higher-level ways to contribute in the production and management of content. [29] observed that shared file repositories become unwieldy as users do not express ownership of the shared space and irrelevant files pile up. System designers can call attention to the inefficiencies of a bloated system (e.g. time to complete a search query) and appeal to an expert’s sense of ownership through explicit reminders of their particular knowledge (e.g. time spent working on a project) that lead to suggestions to motivate action (e.g. deleting old files, renaming directories). Other collaborative communities have similar issues: wikis tend to become cluttered and their pages need occasional consolidation, cleanup, and organization; discussion groups often find themselves answering a set of frequently asked questions and the creation of FAQ documents is valuable; open source projects evolve and become complex, eventually benefiting from refactoring of the source code. In all of these cases, committed experts are the community members who have both the motivation and the global perspective needed to successfully contribute toward these problems.

Emphasizing the benefits of inclusion may also minimize the threat of competition from novices. We saw that many experts do hope that novices join the community; designs that make the benefits of encouraging novice participation salient may reduce potentially harmful territorial expressions aimed at newcomers. For example, including visualizations of community health as influenced by newcomer and novice participation may help make the benefits of those contributions more visible.

Finally, we want to emphasize that not all defensive expressions of territoriality are harmful. For example, vigilant responses to vandalism help to improve the quality of Wikipedia articles [38]. When longtime community members admonish trolls, groups can become more civil and welcoming [28]. One could imagine appealing to the experts’ sense of ownership so that they become valuable gatekeepers against the truly malicious behaviors that threaten the community.

CONCLUSION

Territoriality is an emergent pattern of behaviors and attitudes, based on feelings of ownership that can arise when individuals of varying expertise come together for a cooperative goal. These behaviors can strengthen one's identity as an expert and signal feelings of ownership toward both specific contributions and toward a community as a whole. However, it is important to ensure that novice contributors do not feel marginalized or excluded because of the territorial expressions from expert collaborators. The challenge for designers lies in managing the inevitable points of tension that will arise when a novice asserts his or her particular perspective and the expert feels threatened by novice attitudes or activities. Successful collaborative groups will need to strike this balance in order to remain healthy and vital.

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