eBirding: Technology Adoption and the Transformation of Leisure into Science

Andrea Wiggins
Syracuse University
337 Hinds Hall
Syracuse, NY 13244 USA
awiggins@syr.edu

ABSTRACT

The decreasing cost of technology and Internet access has resulted in increasingly large-scale scientific research projects that rely on technology-mediated public participation. This poster takes a process theory perspective to discuss how technology adoption in a citizen science project influences participation and thereby scientific outcomes. The case study finds that some birders change their established practices upon adopting eBird, an online checklist program for bird observations, because the additional effort supports individual satisfaction and community recognition. This dramatically increases the value of the data for research, promoting improved scientific outcomes.

Categories and Subject Descriptors: K.4.3 [Computers and Society]: Organizational Impacts–*Computer-supported collaborative work*

General Terms: Design, Management.

Keywords: citizen science, eBird, technology adoption, cyberinfrastructure, birding.

1. INTRODUCTION

Public participation in scientific research can take many forms, including citizen science, a type of intentional collaboration between professional researchers and volunteers on real-world scientific research [1]. The decreasing cost of technology and Internet access has resulted in increasingly large-scale research projects structured around technology-mediated participation. Cyberinfrastructure for organizing and supporting public participation in scientific research is still in early stages of development, but the growing visibility of this mode of scientific collaboration is fueling interest from researchers, funders, and the public.

1.1 Motivation

Citizen science has a long history of engaging volunteers; for example, the annual Audubon Christmas Bird Count has been growing since 1900. Participation in such voluntary work is often undertaken as a leisure activity, even when it has additional value to participants beyond entertainment. Prior research on citizen science projects has focused on the value to science and participant learning outcomes, leaving a gap in our understanding of the influence of technology adoption on participation. A project manager's story of a birder who "likes eBird so much that instead of doing his bird census once a week, he does it every day now," provides a compelling example of one way that technology adoption can influence work practices. The research question that this research addresses is, *How does technology adoption change the way work is done in citizen science?*

1.2 Related Work

The technology adoption literature presents the prevailing view that people adopt technologies that appear useful and not too difficult to use (e.g. Technology Acceptance Model [2], Task-Technology-Fit Model [3]). Numerous studies of technology adoption in business contexts have collectively identified a variety of additional moderators that may influence adoption [5]. The variance theory perspective of these theoretical frameworks generally conceptualizes work practices as static tasks, and does not address the potential for technology adoption to change established practices. This poster takes a process theory perspective to discuss how technology adoption in a citizen science project influences participation and thereby scientific outcomes.

2. METHODS

This ongoing dissertation research employs a case study methodology using field research methods. The case study site is eBird (http://ebird.org), one of the most successful examples of technology-supported citizen science. Data sources include participant observation as an eBird contributor, interviews with project staff and related organizers, and approximately 200 documents related to project planning and management. The analysis presented in this poster is based on inductive qualitative content analysis focusing on the question of how eBird is changing birding.

2.1 Birding

Birding is a multi-million dollar leisure industry and the fastest-growing hobby in the United States [6]. Birders constitute a distinctive subculture, ranging from casual bird watchers to avid birders for whom the "life list" of bird species sighted in their lifetime truly becomes a way of life. Local bird clubs provide in-person contact and socialization,

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while bird festivals and competitions provide opportunities to engage with the broader community. Among serious birders, information is the currency upon which reputation is based, with community status established through lists of bird sightings at varying geographic and temporal scales.

Technologies supporting birding practices include software to help birders with tasks like managing their life lists and customizing metadata and playlists of bird song recordings. Electronic field guides incorporate the images and text found in traditional field guides, along with audio recordings and real-time details on locations of recent sightings. Email lists are the nexus of up-to-the-minute information exchange; according to a lifelong birder: "you see a rare bird, go to the listserv, report it, and then they all argue about it."

2.2 eBird

Launched in 2002 by the Cornell Lab of Ornithology, in partnership with the Audubon Society, eBird is an online checklist program that enables reporting of and access to information about birds [4]. In addition to the main eBird web site, external organizations manage and promote custom eBird portals with localized branding and content, as well as eBird Trail Tracker kiosks at visitor centers in wildlife refuges and reserves. More than 50 million observation records from over 800,000 locations are incorporated into multiple research repositories, making eBird one of the largest biodiversity data sets in the world. In addition to a variety of uses by the birding community, the data are used in scientific research and for decision support in resource management and environmental policy.

3. FINDINGS

The basic expectation from the literature is that technology is adopted based on the fit for the people and tasks it supports. As expected, initial adoption of eBird is based on usefulness as a recordkeeping tool: it helps manage and share observations and lists, supporting the existing practices. The technology adoption process does not end there, however; once birders recognize the additional personal value that eBird can offer, some change their birding practices to produce more valuable data.

Improving the data requires following increasingly stringent scientific methods, a substantial change from recreational birding practices. eBird was initially based on a science-centric model of participation, but shifted to a birder-centric model when contributions plateaued in 2005; according to a project leader, "we decided to build a tool that people actually wanted to use, not to build something that they felt like they had to use." Major changes to the technology included development of unique features specific to birder interests, and in the next five years, contributions went from a few thousand to 2 million observations per month, showing no sign of slowing in exponential growth.

In the process of adopting the technology, birders become eBirders, and eBirders do birding differently. Entering observation data online for a citizen science project is an obvious change to previous practices, but the more substantive changes are those occurring in the field. According to a project leader, "eBird wants more than your general birder collects," because the usual recordkeeping practices yield relatively unspecific observations with little metadata. eBird suggests three changes for better data: submitting complete checklists that include all observed species, contributing counts instead of presence-absence data, and recording effort information about locations, times, and methods. Some birders are willingly changing the way they bird, recording substantially more information in the field, because eBird provides greater reward for greater effort.

To make their personal observation data more valuable, a portal manager reported that "people are keeping track of all the birds they see, they are trying to estimate numbers as best they can, and most importantly, they're trying to do it on a regular basis. So they are really gearing their birding towards eBird, and eBird rewards them by producing checklists and graphs and maps." This dramatically increases the value of the data for research, promoting improved scientific outcomes. Using eBird makes the value of more scientific observation methods self-evident to participants, and birder community practices reward recordkeeping with status and respect. Since information is the currency of social capital in birding, eBird acts as a credit union to the birder community by keeping account of observations. According to a project staff member, "This data is among the most loved data, I think, anywhere. People have spent just millions of hours of accumulating it. It's really irreplaceable."

4. CONCLUSION

eBird's results are exceptional, and are inspiring new technology-mediated citizen science projects in other domains. This study finds that eBirders choose to change their birding practices because eBird provides greater reward for greater effort. These changes are rewarded on multiple levels, producing records that support individual satisfaction and community recognition. Further work is needed to adequately conceptualize the relationship between the technology and the community of practice. Future research will compare eBird to projects in other domains to better understand the role of cyberinfrastructure in organizing and supporting public participation in scientific research.

5. ACKNOWLEDGMENTS

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