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# Towards Digitally Encoded Experiences with Real-World Artifacts

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**Abstract**

Supported through interactive networked technologies, *collaborative consumption* enables effective and efficient sharing of vehicles and housing. Furthermore, an increasing amount of community groups and organizations have formed collections and libraries of shared things (e.g., tool and equipment coops) to leverage the collaborative use of various resources (e.g., woodworking spaces, fab labs). However, current inventory management systems and online platforms often do not account for challenges of that these kinds of organizations face, which include transience, anonymity and nurturing creative interactions among community members. We designed and developed Roaming Objects, an interactive system aimed at supporting the capture and sharing of equipment-use experiences among members. We deployed the system for two months in a tool-sharing community to explore how it might help address the challenges faced by members of these organizations on both individual and social levels. In this position paper we describe the Roaming Objects ecosystem, outline on nascent findings from our pilot study, and reflect on early opportunities our work suggests for decentralized peer-to-peer applications.

**Author Keywords**

Shared use; digital histories; interaction design.

### **ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

### **Introduction and Background**

Currently half of the world's population lives in urban areas and this number will concomitantly increase for the foreseeable future [3]. In addition to increasing access, resource sharing organizations play key roles in supporting environmental sustainability efforts in two important ways: (i) by maximizing the use of artifacts (e.g., tools) and thus minimizing the consequences and effects of manufacturing new things [4] and (ii) through promoting acts of DIY repair, re-use, and renewal of things (e.g., a broken chair) and places (e.g., the home), over disposal and acquisition of new things [10].

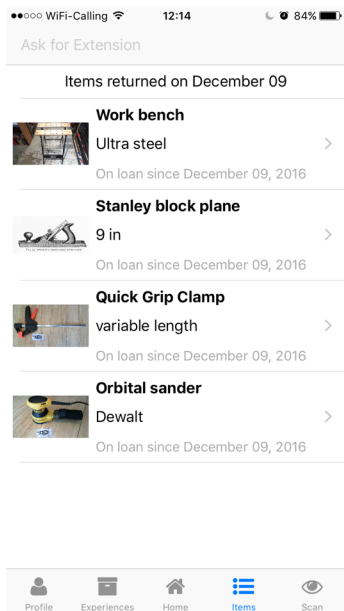
However, prior research illustrated and articulated several challenges that resource-sharing communities and organizations face. These include a) the large degree of anonymity among 'community members' [1], b) the fact that much of the work of community members nearly always takes place off-site and is thus not visible to other community members [7], c) a general sense of transience of community membership [1], and d) the often poor treatment of (and lack of accountability for) the tools themselves [7]. These challenges have major implications for resource sharing communities, particularly in terms of their long-term sustainability.

One option to address these challenges may be offered by the recent convergence of social, mobile, and cloud computing. In the context of resource-sharing communities, these technological shifts could support

the capture and subsequent sharing of tool-use experiences among community members. We developed Roaming Objects (RO), a system that capture digital recordings of real-world experience. We argue that RO could potentially help document the creative potential of members, increase the appreciation of individual tools, de-anonymize community members and in general create a stronger and less transient sense of community membership.

To date in the HCI community there has been nascent and emerging work that has investigated how interactive systems can enable people to capture, archive, and share digital objects and histories that capture their everyday things and everyday lives [2,5]. Despite that little work has explored how these capabilities could be extended to and support non-profit sharing economy communities (e.g. libraries of things). Following emerging research in HCI that explored how digital histories of individual and shared experiences can become valuable resources for self-reflection and social connection [6,8,9], our objective is to further our understanding on how new technological intervention can shape relation with everyday objects (e.g. through personal creative practices) and to examine sharing practices around physical objects in the broader social organization of objects/tools sharing.

To investigate this opportunity, we created Roaming Objects (RO), a software ecosystem that aims to support the capture, retrieval and sharing of digital experiences with tools that *roam* from one borrower to another. We deployed the Roaming Objects with 16 members of the Vancouver Tool Library (VTL) over a two-month period in order to elicit descriptive accounts of people's attitudes toward and perceptions of digital



**Figure 1:** The user interface of the smartphone app that shows borrowed tools

records of shared tools to explore how these experiences might shape their practices on individual and community levels.

## Roaming Objects Ecosystem

The ecosystem to support “experience-enabled” roaming objects consist of (1) a set of augmented physical rental objects, (2) an iPhone application to capture and share end-users’ experiences with them, and (3) a web service to maintain objects’ inventory and to handle the loans.

### Augmented Physical Objects

In the case of our field deployment with the Vancouver Tool Library, we have utilized VTL’s alphanumeric inventory codes from the subset of tools (100 out of 2000+) that the VTL possesses. This code was used a unique identification of the tool within the RO system. We have decided to include the most frequently used tools in our study: sanders, power drills, and Mitre saws, striving for repeated rentals in order to build richer digital history for them capturing various projects that members created with the tools. To facilitate the collection of histories of use we have bootstrapped provenance details to the rental tools.

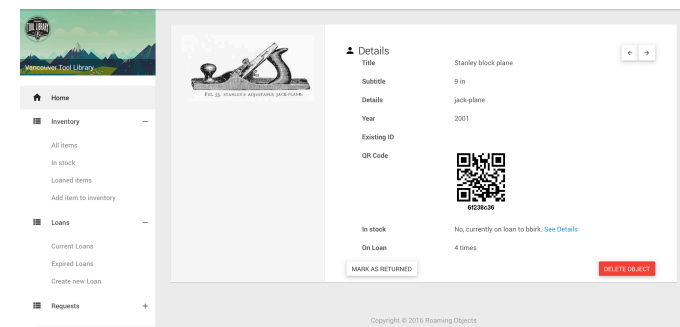
### Smartphone App

The smartphone app (Figure 1) that allows one to “connect” to a borrowed tool in order to add and retrieve digital information encoded “into” the tool. The types of information that can be encoded could be textual information (e.g., comments, ratings), personal media (photos and videos) taken during the rental period of the equipment, or location details (GPS path where the tool was used). System-generated information can be added automatically (how many

times a tool was lent, how long it was used, etc.), while user-generated information could be added manually using the smartphone app.

### Web-service

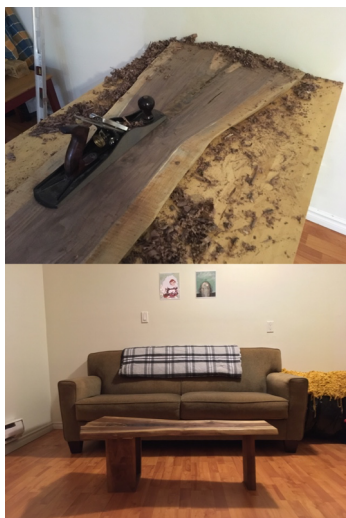
The web-service handled inventory, storage and retrieval of the tools. The back-end is implemented using Java-based Spring framework and non relational database (MongoDB) to enable robust deployment and scaling. A companion web application (Figure 2) that allows a rental shop administrator to maintain an inventory, to retrieve a status of a tool, and notify the current user about the upcoming expiration date. The front-end is designed using Dust, a Javascript templating language. Despite that current implementation of the prototype is centralized (server-based), it could further extended to incorporate distributed transactions (e.g. blockchain) in order to facilitate allocation and access to the shared resource.



**Figure 2:** The user interface of the web-based inventory management system that shows details of a tool (jack plane)

## Early Findings and Discussion

Currently we are analyzing the results of our field deployment. We would present our initial findings at



**Figure 3:** An example of the personal project one participant submitted to the Roaming Objects app: from work-in-progress (above) to finished wooden coffee table (below).

the workshop. Throughout the deployment of the RO system in the VTL we have observed that it was generally well perceived not only by community members but also volunteers and the management. While current inventory systems (e.g. MyTurn<sup>1</sup>) provide comprehensive statistics about the registered rental transactions, experiential details from the borrowers is often unknown to the library stakeholders. The Roaming Objects system sheds some light on how the library's tools were used. For example, a library volunteer could provide timely tool maintenance after a prior user left a comment indicating that the edges of a jigsaw were dull. Moreover, through collecting personal projects—which spanned from home and garden maintenance to creative gifts—the RO helped unveil the creative potential and practices of the members (Figure 3).

Furthermore, from open-ended interviews, participants prospectively reflected on further applications of the RO beyond tool sharing organizations. They speculated on how shared bike programs, car sharing coops, sport gear swapping, and money tracking initiatives could potentially benefit from the RO ecosystem where capturing and annotating personal experience with shared resource would benefit community members. This suggests there is an opportunity in exploring further the intersection of collaborative content production and resource sharing communities.

Additionally, we would like to initiate discussion within the interaction design community about the challenges and opportunities that encoding personal experiences through real-world shared artifacts would bring. As the

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<sup>1</sup> <https://myturn.com>

next step, we see the value in conducting a study to explore practices around sharing personal everyday artifacts. For example, in Switzerland the online service “pumpipumpe.ch” provides a set of stickers for a mailbox to let neighbors see what things one can borrow. However, the service does not specify how sharing of those items can be arranged. We see the major opportunity in incorporating ‘decentralized’ organization of personal inventories. The Roaming Objects has already enables creation and management of pop-up inventories. However, with the rapid advent and adoption of blockchain technologies and smart contracting beyond financial transactions, but also in transportation (e.g. lazooz.org) and music distribution (e.g. ujomusic.com), these new technological shifts not only bring new infrastructural challenges, but also design opportunities and issues. How can we bring *experience economy* design toward distributed autonomous organizations? Our early research with the Roaming Objects system has offered a promising start in beginning to explore a set of emerging design opportunities and issues.

### **Acknowledgments**

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