Self-Archiving with Ease in an Institutional Repository: Microinteractions and the User Experience

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ABSTRACT

Details matter, especially when they can influence whether users engage with a new digital initiative that relies heavily on their support. During the recent development of MacEwan University's institutional repository, the librarians leading the project wanted to ensure the site would offer users an easy and effective way to deposit their works, in turn helping to ensure the repository's long-term viability. The following paper discusses their approach to user-testing, applying Dan Saffer's framework of microinteractions to how faculty members experienced the repository's self-archiving functionality. It outlines the steps taken to test and refine the self-archiving process, shedding light on how others may apply the concept of microinteractions to better understand a website's utility and the overall user experience that it delivers.

INTRODUCTION

One of the greatest challenges in implementing an institutional repository (IR) at a university is acquiring faculty buy-in. Support from faculty members is essential to ensuring that repositories can make online sharing of scholarly materials possible, along with the long-term digital preservation of these works. Many open access mandates have begun to emerge around the world, developed by universities, governments, and research funding organizations, which serve to increase participation through requiring that faculty contribute their works to a repository.[1] However, for many staff managing IRs at academic libraries there are no enforceable mandates in place, and only a fraction of faculty works can be contributed without copyright implications when author agreements transfer copyrights to publishers. Persuading faculty members to take the time to sort through their works and self-archive those that are not bound by rights restrictions is a challenge.

Standard installations of popular IR software, including DSpace, Digital Commons, and ePrints, do little to help facilitate easy and efficient IR deposits by faculty. As Dorothea Salo writes in a widely cited critique of IRs managed by academic libraries, the "'build it and they will come' proposition has been decisively wrong."[2] A major issue she points out is that repositories were predicated on the "assumption that faculty would deposit, describe, and manage their own material."[3] Seven

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years after the publication of her article, a vast majority of the more than 2,600 repositories currently operating around the world still function in this way and struggle to attract widespread faculty support.[4] To deposit works into these systems, faculty are often required to fill out an online form to describe and upload each work individually. This can be a laborious process that includes deciphering lengthy copyright agreements, filling out an array of metadata fields, and ensuring file formats or file sizes that are compatible with the constraints of the software.

In August of 2014, MacEwan University Library in Edmonton, Alberta, launched an IR, Research Online at MacEwan (RO@M; http://roam.macewan.ca). Our hope was that RO@M's simple user interface and straightforward submission process would help to bolster faculty contributions. The site was built using Islandora, an open-source software framework that offered the project developers substantial flexibility in appearance and functionality. In an effort to balance their desire for independence over their work with ease of use, faculty and staff have the option of submitting to RO@M in one of two ways: they can choose to complete a brief process to create basic metadata and upload their work, or they can simply upload their work and have RO@M staff create metadata and complete the deposit.

Thoroughly testing both of these processes was critical to the success of the IR. We wanted to ensure that there were no obstacles in the design that would dissuade faculty members from contributing their works once they had made the decision to start the contribution process. As the primary means of adding content to the IR, and as a process that other institutions have found problematic, carefully designing each step of how a faculty contributor submits material was our highest priority. To help us focus our testing on some of these important details, and to provide a framework of understanding for refining our design, we turned to Dan Saffer's 2013 book *Microinteractions: Designing with Details*. The following case study describes our use of microinteractions as a user-testing approach for libraries and discusses what we learned as a result. We seek to shed light on how other repository managers might envision and structure their own self-archiving processes to ensure buy-in while still relying on faculty members to do some of the necessary legwork. Additionally, we lay out how other digital initiatives may embrace the concept of microinteractions as a means of better understanding the relationship between the utility of a website and the true value of positive user experience.

LITERATURE REVIEW

User Experience and Self-Archiving in Institutional Repositories

User experience (UX) in libraries has gained significant traction in recent years and provides a useful framework for exploring how our users are interacting with, and finding meaning in, the library technologies we create and support. Although there is still some disagreement around the definition and scope of what exactly we mean when we talk about UX, there seems to be general consensus that paying attention to UX shifts focus from the usability of a product to more nonutilitarian qualities, such as meaning, affect, and value.[5] Hassenzhal simply defines UX as a

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"momentary, primarily evaluative feeling (good-bad) while interacting with a product or service."[6] Hassenzhal, Diefenbach, and Goritz argue that positive emotional experiences with technology occur when the interaction fulfills certain psychological needs, such as competence or popularity.[7] The 2010 ISO standard for human-centered design for interactive systems defines UX even more broadly, suggesting that it "includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and accomplishments that occur before, during and after use."[8] However, when creating tools for library environments, it can be difficult for practitioners to translate ambiguous emotional requirements, such as satisfying emotional and psychological needs or increasing motivation, with pragmatic outcomes, such as developing a piece of functionality or designing a user interface.

It has been well documented that repository managers struggle to motivate academics to self-archive their works.[9] However, the literature focusing on how IR websites' self-archiving functionality helps or hinders faculty support and engagement is sparse. One study of note was conducted by Kim and Kim in 2006, who led usability testing and focus groups on an IR in South Korea. [10] They provide a number of ways to improve usability on the basis of their findings, which include avoiding jargon terms and providing comprehensive instructions at points of need rather than burying them in submenus. Similarly, Veiga e Silva, Goncalves, and Laender reported results of usability testing conducted on the Brazilian Digital Library of Computing, which confirmed their initial goals of building a self-archiving service that was easily learned, comfortable, and efficient.[11] The authors of both of these studies suggest that user-friendly design could help to ensure the active support and sustainability of their services, but long-term use remained to be seen at the time of publication. Meanwhile, Bell and Sarr recommend integrating value-added features into IR websites as a way to attract faculty.[12] Their successful strategy for reengineering a struggling IR at the University of Rochester included adding tools to allow users to edit metadata and add and remove files, and providing portfolio pages where faculty could list their works in the IR, link to works available elsewhere, detail their research interests, and upload a copy of their CV. Although the question remains as to whether a positive user experience in an IR can be a significant motivating factor for increasing faculty participation, there seems to be enough evidence to support its viability as an approach.

Applying Microinteractions to User Testing

Dan Saffer's 2013 book, *Microinteractions: Designing with Details*, follows logically from the UX movement. Although he uses the phrase "user experience" sparingly, Saffer consistently connects interactive technologies with the emotional and psychological mindset of the user. Saffer focuses on "microinteractions," which he defines as "a contained product moment that revolves around a single use case."[13] Saffer argues that well-designed microinteractions are "the difference between a product you love and product you tolerate."[14] Saffer's framework is an effective application of UX theory to a pragmatic task. Not only does he privilege the emotional state of the user as a priority

for design, he also provides concrete recommendations for designing technology that provokes positive psychological states such as pleasure, engagement, and fun.

Defining what we mean by a "microinteraction" is important when translating Saffer's theory to a library environment. He describes a microinteraction as "a tiny piece of functionality that only does one thing . . . every time you change a setting, sync your data or devices, set an alarm, pick a password, turn on an appliance, log in, set a status message, or favorite or Like something, you are engaging with a microinteraction."[15] In libraries, many microinteractions are built around common user tasks such as booking a group-use room, placing a hold on an item, registering for an event, rating a book, or conducting a search in a discovery tool. A single piece of interactive library technology may have any number of discrete microinteractions, and often are part of a larger ecosystem of connected processes. For example, an integrated library system is composed of hundreds of microinteractions designed both for end users and library staff, while a self-checkout machine is primarily designed to facilitate a single microinteraction.

Saffer's framework provided a valuable new lens on how we could interpret users' interactions with our IR. While we generally conceptualize an IR as a searchable collection of institutional content, we can also understand it as a collection of microinteractions. For example, RO@M's core is microinteractions that enable tasks such as searching content, browsing content, viewing and downloading content, logging in, submitting content, and contacting staff. RO@M also includes microinteractions for staff to upload, review, and edit content. As discussed above, one of the primary goals when developing our IR was to allow faculty to deposit scholarly content, such as articles and conference papers, directly to the repository. We wanted this process to be simple and intuitive, and for faculty to have some control over the assignation of keywords and other metadata, but also to have the option to simply submit content with minimal effort. We decided to employ user testing to carefully examine the deposit process as a discrete microinteraction and to apply Saffer's framework as a means of assessing both functionality and UX. We hoped that focusing on the details of that particular microinteraction would allow us to make careful and thoughtful design choices that would lead to a more consistent and pleasurable UX.

METHOD AND CASE STUDY

We conducted two rounds of user testing for the self-archiving process. Our initial user testing was conducted in January 2014. We asked seven faculty to review and comment on a mockup of the deposit form to test the workflow. This simple exercise allowed us to confirm the steps in the upload process, and identified a few critical issues that we could resolve before building out the IR in Islandora. After completing the development of the IR, and with a working copy of the site installed on our user acceptance testing (UAT) server, we conducted a second round of in-depth usability testing within our new microinteraction framework.

In April 2014 we recruited six faculty members through word of mouth and through a call for participants in the university's weekly electronic staff newsletter. The volunteers represented major disciplines at MacEwan University, including health sciences, social sciences, humanities,

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and natural sciences. Saffer describes a process for testing microinteractions and suggests that the most relevant way to test microinteractions is to include "hundreds (if not thousands) of participants."[16] However, he goes on to describe the most effective methods of testing to be qualitative, including conversation, interviews, and observation. Testing thousands of participants with one-on-one interviews and observation sessions is well beyond the means of most academic libraries, and runs counter to standard usability testing methodology. While testing only six participants may seem like a small number, and one that is apt to render inconclusive results and sparse feedback, it is strongly supported by usability experts, such as Jakob Nielson. During the course of our testing, we quickly reached what Nielson refers to in his piece "How Many Test Users in a Usability Study?" as "the point of diminishing returns."[17] He suggests that for most qualitative studies aimed at gathering insights to inform site design and overall UX, five users is in fact a suitable number of participants. We support his recommendation on the basis of our own experiences; by the fourth participant, we were receiving very repetitive feedback on what worked well and what needed to be changed.

Testing took place in faculty members' offices on their own personal computers so that they would have the opportunity to engage with the site as they would under normal workday circumstances. Each user testing session lasted 45 to 60 minutes, and was facilitated by three members of the RO@M team: the web and UX librarian guided each faculty member through the testing process, the scholarly communications librarian observed the interaction, and a library technician took detailed notes recording participant comments and actions. Each faculty member was given an article and asked to contribute that article to RO@M using the UAT site. The RO@M team observed the entire process carefully, especially noting any problematic interactions, while encouraging the faculty member to think aloud. Once testing was complete, the scholarly communications librarian analyzed the notes and identified areas of common concern and confusion among participants, as well as several suggestions that the participants made to improve the site's functionality as they worked through the process. She then went about making changes to the site based on this feedback. As we discuss in the next section, each task that faculty members performed, from easy to frustrating, represented an interaction with the user interface that affected participants' experiences of engaging with the contribution process, and informed changes we were able to make before launching the IR service three months later.

Basic Elements of Microinteractions

Saffer's theory describes four primary components of a microinteraction: the trigger, rules, feedback, and loops and modes. Viewing the IR upload tool as a microinteraction intended to be efficient and user-friendly required us to first identify each of these different components as they applied to the contribution process (see figure 1), and then evaluate the tool as a whole through our user testing.

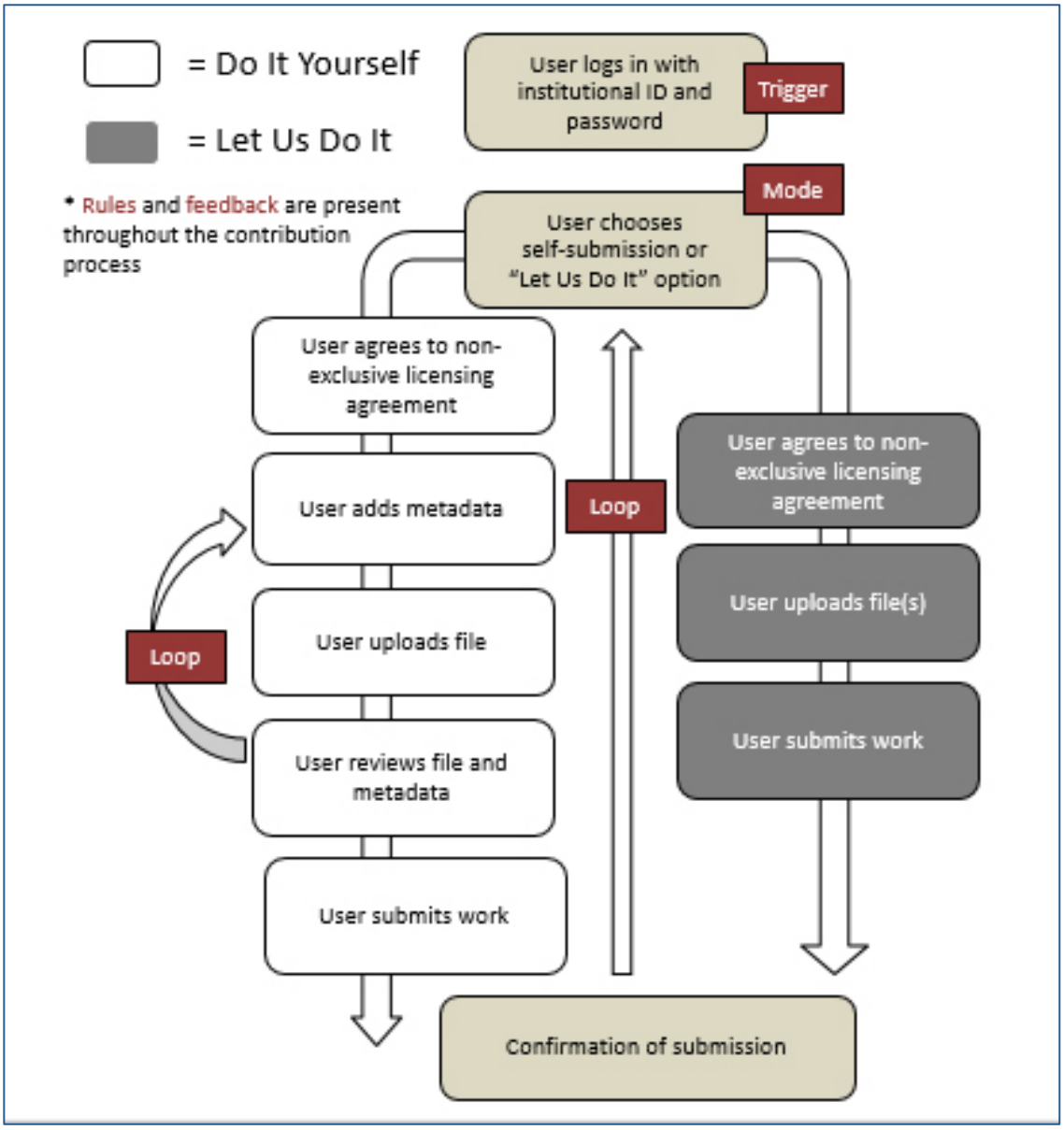

Figure 1. IR Self-Archiving Process with Microinteraction Components.

Trigger

The first component to examine in a microinteraction is the trigger, which is, quite simply, "whatever initiates the microinteraction."[18] On an iPhone, a trigger for an application might be the icon that launches an app; on a dishwasher, the trigger would be the button pressed to start the machine; on a website, a trigger could be a login button or a menu item. Well-designed triggers follow good usability principles: they appear when and where the user needs them, they initiate the same action every time, and they act predictably (for example, buttons are pushable, toggles slide).

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Examining our trigger was a first step in assessing how well our upload microinteraction was designed. Uploading and adding content is a primary function of the IR, and the trigger needed to be highly noticeable. We can assume that users would be goal-based in their approach to the IR; faculty would be visiting the site with the specific purpose of uploading content and would be actively looking for a trigger to begin an interaction that would allow them to do so.

The initial design of RO@M included a top-level menu item as the only trigger for contributing works. In the persistent navigation at the top of the site, users could click on the menu item labeled "Contribute" where they would then be presented with a login screen to begin the contribution process. This was immediately obvious to half of the participants during user testing. However, the other half immediately clicked on the word "Share," which appeared on the lower half of the page beside a small icon simply as a way to add some aesthetic appeal to the homepage along with the words "Discover" and "Preserve." Not surprisingly, the users were interpreting the word and icon as a trigger. Because of the user behavior that we observed, we decided to add hyperlinks to all three of these words, with "Share" linking to the contribution login screen (see figure 2), "Discover" leading to a Browse page, and "Preserve" linking to an FAQ for Authors page that included information on digital preservation. This increased visibility of the trigger significantly for the microinteraction.

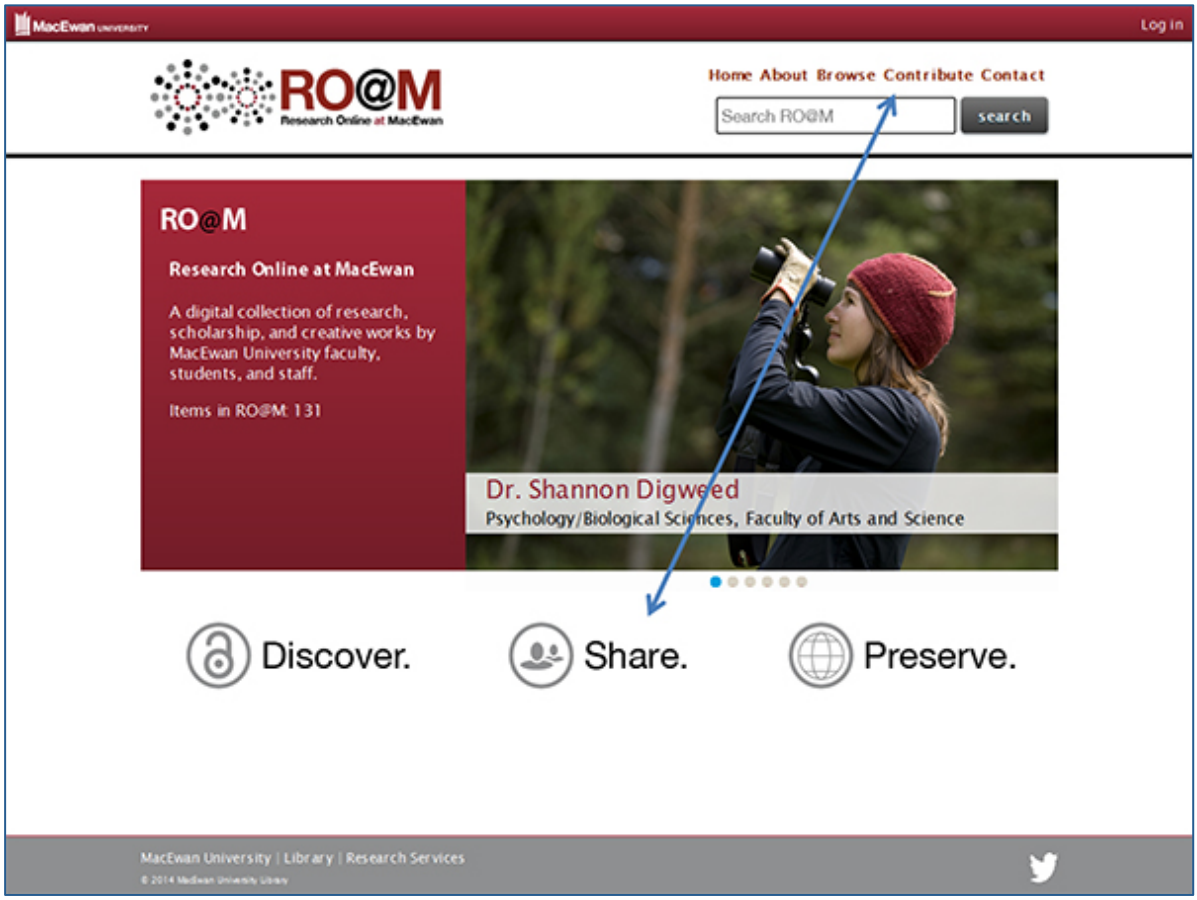

Figure 2. "Share" as Additional Trigger for Contributing Works.

Rules

The second component of microinteractions described by Saffer are the rules. Rules are the parameters that govern a microinteraction; they provide a framework of understanding to help users succeed at completing the goal of a microinteraction by defining "what can and cannot be done, and in what order."[19] While users don't need to understand the engineering behind a library self-checkout machine, for example, they do need to understand what they can and cannot do when they're using the machine. The hardware and software of a self-checkout machine is designed to support the rules by encouraging users to scan their cards to start the machine, to align their books or videos so that they can be scanned and desensitized, and to indicate when they have completed the interaction.

The goal when designing a self-archiving process in RO@M was to ensure that the rules were easy for users to understand, followed a logical structure, and were not overly complex. To this end, we drew on Saffer's approach to designing rules for microinteractions, along with the philosophy espoused by Steve Krug in his influential web design book, *Don't Make Me Think: A Common Sense Approach to Web Usability*.[20] Both Krug and Saffer argue for reducing complexity and removing decision-making from the user whenever possible to remove potential for user error or mistakes. The rules in RO@M follow a familiar form-based approach: users log in to the system, they have to agree to a licensing agreement, they create some metadata for their item, and they upload a file (see figure 1). However, determining the order for each of these elements, and ensuring that users could understand how to fill out the form successfully, required careful thinking that was greatly informed by the user testing we conducted.

For example, we designed RO@M to connect to the same authentication system used for other university applications, ensuring that faculty could log in with the credentials they use daily for institutional email and network access. Forcing faculty to create, and remember, a unique username and password to submit content would have increased the possibility of login errors and resulted in confusion and frustration. We also used drop-down options where possible throughout the microinteraction instead of requiring faculty to input data such as file types, faculty or department names, or content types into free-text boxes.

During our user testing we found that those fields where we had free-text input for metadata entry most often led to confusion and errors. For instance, it quickly became apparent that name authority would be an issue. When filling out the "Author" field, some people used initials, some used middle names, and some added "Dr" before their name, which could negatively affect the IR's search results and the ability to track where and when these works may be cited by others. When asked to include a citation for published works, most of our participants noted frustration with this requirement because they could not do so quickly, and they had concerns about creating correct citations. Finally, many participants also became confused at the last, optional field in the form that allowed them to assign a creative commons license to their works.

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Our user testing indicated that we would need to be mindful of how information like author names and citations were entered by users before making an item available on the site. Under ideal circumstances, we would have modified the form to ensure that any information that the system knew about the user was brought forward: what Saffer calls "don't start from zero."[21] This could include automatically filling in details like a user's name. However, like many libraries, we chose to adapt existing software rather than develop our microinteraction from the ground up; implementing such changes would have been too time-consuming or expensive. In response, we instead added additional workflows to allow administrators to edit the metadata before a contribution would be published to the web so we could correct any errors. We also changed the "Citation" field to "Publication Information" to imply that users did not need to include a complete citation. Lastly, we made sure that "All Rights Reserved" was the default selection for the optional "Add a Creative Commons License?" field in the form because this was language that with which our users were familiar with and comfortable proceeding.

Policy constraints are another aspect of the rules that provide structure around microinteractions, and can also limit design choices that can be made. Having faculty complete a nonexclusive licensing agreement that acknowledged they had the appropriate copyright permissions to allow them to contribute the work was a required component in our rules. Without the agreement, we would risk liability for copyright infringement and could not accept the content into the IR. However, our early designs for the repository included this step at the end of the submission process, after faculty had created metadata about the item. Our initial round of testing revealed that several of our participants were unsure of whether they had the appropriate copyright permissions to add content and didn't want to complete the submission, a frustrating experience for them after spending time filling out author information, keywords, abstract, and the like. We attempted to resolve this issue by moving the agreement much earlier in the process, forcing users to acknowledge the agreement before creating any metadata. We also used simple, straightforward language for the agreement and added additional information about how to determine copyrights or contact RO@M staff for assistance. Integrating an API that could automatically search a journal's archiving policies in SHERPA RoMEO at this stage in the contribution process is something we plan to investigate to help reduce complexity further for users.

Feedback

Understanding the concept of feedback is critical to the design of microinteractions. While most libraries are familiar with collecting feedback from users, the feedback Saffer describes is flowing in the opposite direction, and instead refers to feedback the application or interface is providing back to users. This feedback gives users information when and where they need it to help them navigate the microinteraction. As Saffer comments, "the true purpose of feedback is to help users understand how the rules of the microinteraction work."[22]

Feedback can be provided in a variety of ways. An action as simple as a color change when a user hovers over a link is a form of feedback, providing visual information that indicates that a segment of text can be clicked on. Confirmation messages are an obvious form of feedback, while a folder with numbers indicating how many items have been added to it is more subtle. While visual feedback is most commonly used, Saffer also describes cases where auditory and haptic (touch) feedback may be useful . Designing feedback, much like designing rules, should aim to reduce complexity and confusion for a user, and should be explicitly connected both functionally and visually to what the user needs to know.

In an online web environment, much of the feedback we provide the user should be based on good usability principles. For example, formatting web links consistently and providing predictable navigation elements are some ways that feedback can be built into a design. Providing feedback at the users' point of need is also critical, especially error messages or instructional content. This proved to be especially important to our RO@M test subjects. While the IR featured an "About" section accessible in the persistent navigation at the top of the website that contained detailed instructions and information about how to submit works, and terms of use governing these submissions, this content was virtually invisible to the users we observed. Instead, they relied heavily on the contextual feedback that was included throughout the contribution process when it was visible to them.

These observations led us to rethink our approach to providing feedback in several cases. For example, an unfortunate constraint of our software required users to select a faculty or school and a department and then click an "Add" button before they could save and continue. We included some instructions above the drop-down menus, stating "Select and click Add" in an effort to prevent any errors. However, our participants failed to notice the instructions and inevitably triggered a brief error message (see figure 3). We later changed the word "Add" in the instructions from black to bright red hoping to increase its visibility, and we ensured that the error message that displayed when users failed to select "Add" clearly explained how to correct the problem and move on. We also observed that the plus signs to add additional authors and keywords were not visible to users. We added feedback that included both text and icons with more detail (see figure 4). However, this remains a problem for users that we will need to further explore. On completing a contribution, users receive a confirmation page that thanks them for the contribution, provides a timeline for when the item will appear on the site, and notes that they will receive an email when it appears. Response to this page was positive as it succinctly covered all of the information the users felt they needed to know having completed the process.

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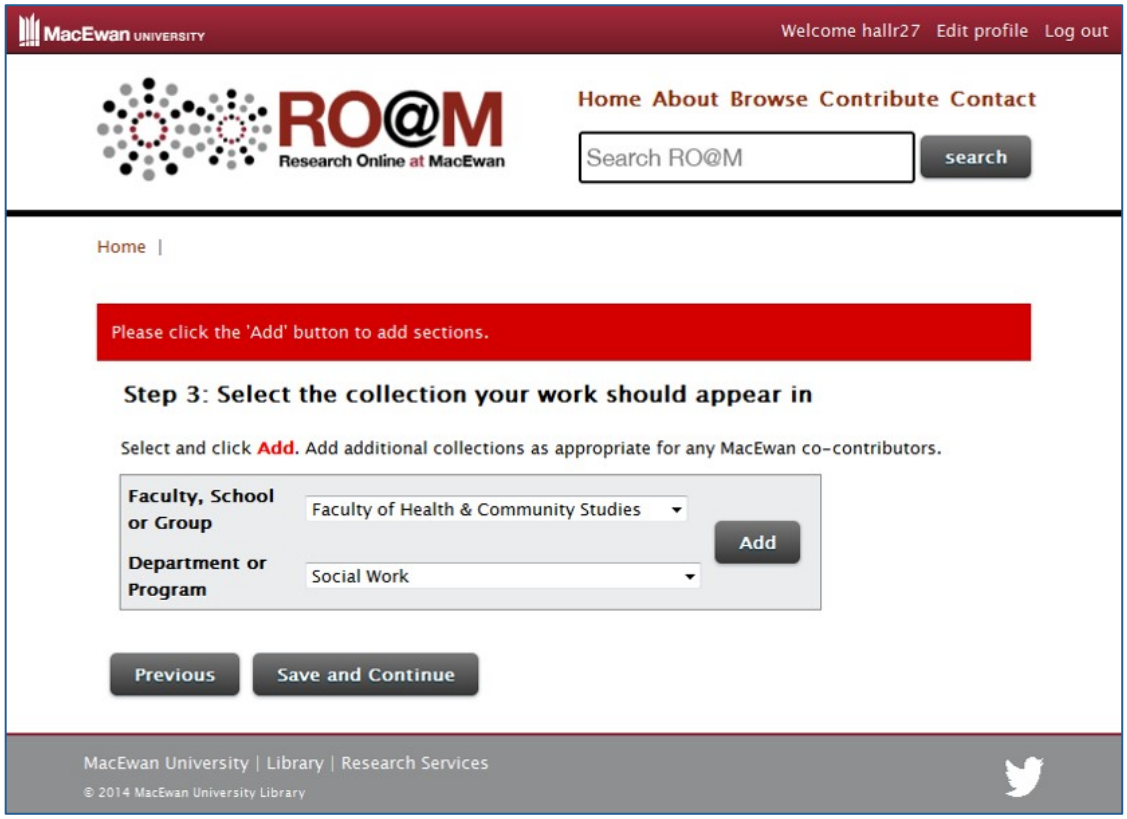

Figure 3. Feedback for the "Add" Button.

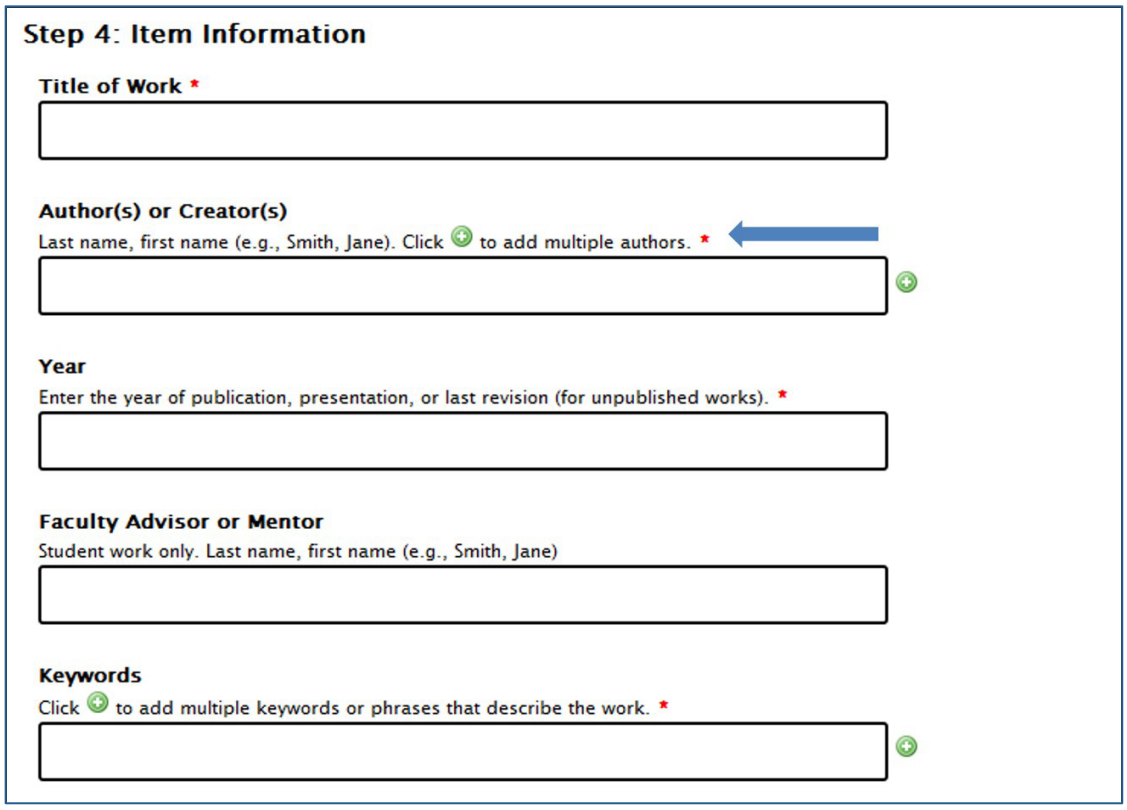

Figure 4. Feedback for Adding Multiple Authors and Keywords.

Modes and Loops

The final two components of microinteractions defined by Saffer are modes and loops. Saffer describes a mode as a "fork in the rules," or a point in a microinteraction where the user is exposed to a new process, interface, or state.[23] For example, Google Scholar provides users with a setting to show "library access links" for participating institutions with OpenURL compatible link resolvers.[24] Users who have set this option are presented with a search results page that is different from the default mode and includes additional links to their chosen institution's link resolver. Our microinteraction includes two distinct modes. Once logged in, users can choose to contribute works through the "Do It Yourself" submission that we've described here in some detail, or they can choose "Let Us Do It" and complete a simplified version that requires them to acknowledge the licensing agreement, upload their files, and provide any additional data they chose in a free-text box (see figure 5). The majority of our testers specified that they would opt for the "Do It Yourself" option because they wanted to have control over the metadata describing their work, including the abstract and keywords. However, since launching the repository, several submissions have arrived via the "Let Us Do It" form, which suggests a reasonable amount of interest in this mode.

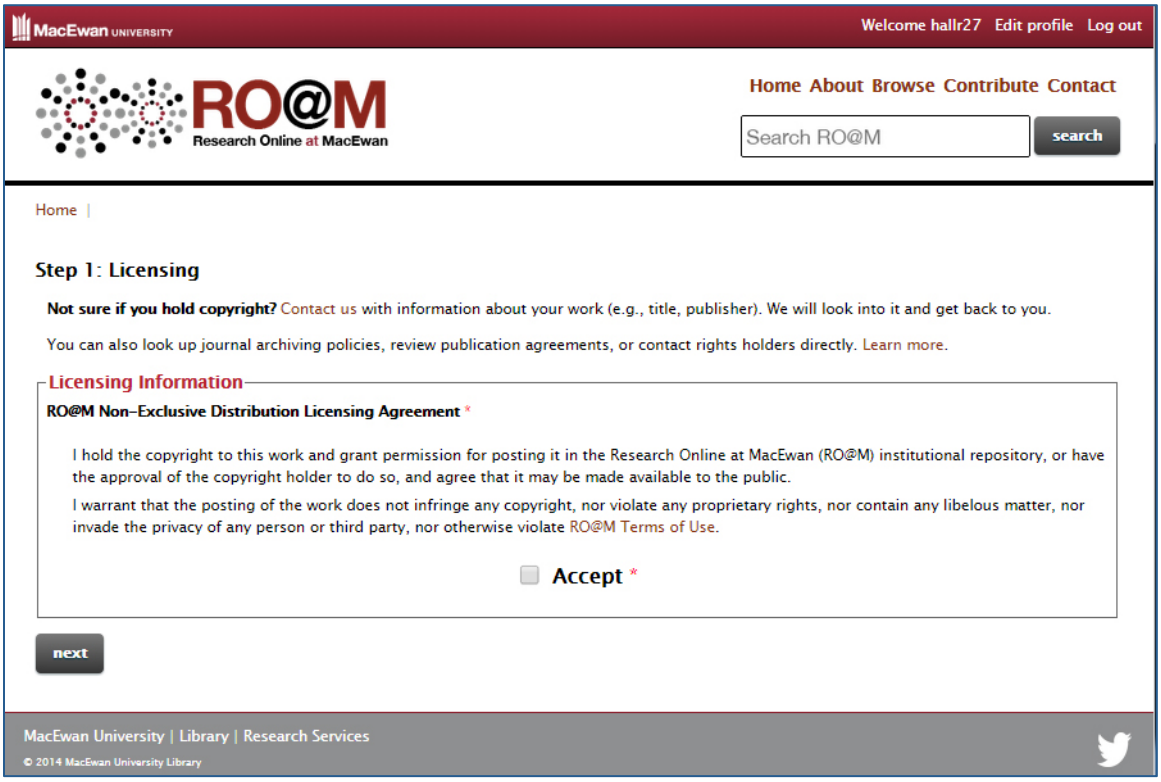

Figure 5. The "Let Us Do It" Form.

Loops, on the other hand, are simply a repeating cycle in the microinteraction. A loop could be a process that runs in the background, checking for network connections, or it could be a more visible process that adapts itself on the basis of the user's behavior. For example, in the RO@M submission process users can move backward and forward in the contribution forms; both have

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"Previous" and "Save and Continue" buttons on each page to allow users to navigate easily. The final step on the "Do it Yourself" form allows users to review their metadata and the file that they have uploaded. They can then use the Previous button to make changes to what they have entered before completing the submission. Ideally, users would be able to edit this content directly from this review page, but software constraints prevented us from including this feature, and the "Previous" button did not pose any major challenges for our testing participants. Another example of a loop in RO@M is a "contribute more works" button embedded in the confirmation screen that takes users back to the beginning of the microinteraction. This feature was suggested by one of our participants, and it extends the life of the microinteraction, potentially leading to additional contributions.

DISCUSSION AND CONCLUSIONS

Focusing on the details of the self-archiving process in our IR provided extremely rich qualitative data for improving the user interface, while analyzing the structure of the microinteraction, following Saffer's model, was also a valuable exercise in thinking about user needs and software design from a different perspective from standard usability studies. The improvements we made, based on both Saffer's theory and the results we observed through testing, added significant functionality and ease of use to the self-archiving process for faculty. Thinking carefully about elements like placement of buttons, small changes in wording or flow, and timing of instructional or error feedback highlighted the big effect small elements can have on usability.

However, there are some limitations to both the theory, and our approach to testing and improving the IR that affect how well we can understand and utilize the results. Of particular concern is how well this kind of testing can capture the UX of a faculty member beyond the utility or ease of use of the interaction. In an observational study we can rely on comments from participants and key statements that may indicate a participant's emotional or affective state, but we didn't include targeted questions to gather this data and focused instead on the details of the microinteraction. We didn't ask how they felt while using the IR, or if successfully uploading an item to the IR gave them a sense of autonomy or competence, or if this experience would encourage them to submit content in the future. Nevertheless, improving usability is a solid foundation for providing a positive UX. Hassahzhal describes the difference between "do-goals" (completing a task) and "be-goals" (human psychological needs like being competent, or developing relationships).[25] While he argues that "be-goals" are the ultimate drivers of UX, he also suggests that creating tools that make the completion of do-goals easy can facilitate the potential fulfillment of be-goals by removing barriers and making their fulfillment more likely. Ultimately, however, a range of user testing strategies can lead to improvements in a user interface, whether that testing relies on carefully detailed examination of a microinteraction, analysis of large data sets from Google Analytics, or interviews with key user groups. Microinteraction theory is a useful approach, and valuable in its conceptualization, but it should be one of many tools libraries adopt to improve their online UX.

Similarly, focusing on the UX of IRs must be only one of many strategies institutions employ to improve rates of faculty self-archiving. There have been recent studies that argue that regardless of platform or process, faculty-initiated submissions have proven to be uncommon.[26] Instead, they suggest that sustainability relies on marketing, direct outreach with individual faculty members, and significant staff involvement in identifying content for inclusion, investigating rights, and depositing on authors' behalf. It would be short sighted to suggest that relying solely on designing a user-friendly website, or only developing savvy promotional and outreach efforts, can determine the ongoing success of an IR initiative. Gaining and maintaining support is an ongoing, multifaceted process, and largely depends on the academic culture of an institution as well as available financial and staffing resources. As such, user testing offers qualitative insights into ways that processes and functions might be improved to enhance the viability of IR initiatives in tandem with a variety of marketing and outreach

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