Facilitating collaborative knowledge creation in a multi-faceted repair community

Applicant: Emmanuel Courtoux (Telecom Paris, IPP)

Advisor: Yvonne Jansen (LaBRI, CNRS/Université de Bordeaux/Bordeaux INP/Inria)

Host institution: Centre Inria de l'université de Bordeaux

Context and Problem Description

Since 2002 the EU encourages its members, through the WEEE directive, to contribute toward a circular economy regarding electrical and electronic equipment (EEE) and recommend the reparation and reuse of such equipment. In this continuity, a new text was adopted in April 2024 to promote the repair of goods via different measures named “right to repair” [2].

HCI and the sustainability literature studied human-repair interaction from different angles by investigating the social and cultural aspects of repair [10, 12, 16, 19], by considering the long-term challenges of repair processes [11, 15] but also the obstacles people are facing when trying to repair their devices [13, 17, 18]. While, according to surveys, citizens are interested in learning how to repair their devices, they often lack information about the source of the failure and how to get spare parts to repair it [14].

Online repair platforms such as ifixit [3, 6] try to answer those questions and push for more freedom in user rights to repair by providing large repair guide databases and access to spare parts. Additionally, distributed or local repair associations, such as repair café [5, 7, 8] contribute by organizing in-person events where volunteers train and guide people through reparation processes. In this project, we consider all types of repair initiatives as being part of a large repair community comprised of more than a thousand different groups [20] sharing the common goal of providing people with knowledge about repairs.

Even if the repair community created ways to gather data about its actions more broadly [20], important information about concrete experiences and failure points of community members are currently not being collected or not being rendered visible for community members. This includes, for example, aspects such as the price and availability of spare parts, missing/incomplete tutorials, or difficulties in specific aspects of the repair process. Online platforms sharing repair guides collections are a centerpiece in this ecosystem as they already attract people looking for repair tutorials but also experts willing to contribute to the database. However, especially for repair novices, it is currently unclear to them how they could contribute meaningfully and how data about their experiences could be of use to others in a similar situation [21].

In this project, we are interested in studying and facilitating collaborative knowledge creation in the repair community by taking inspiration from existing online platforms and small associations. We aim at facilitating the collection, exchange and visualization of data from and about the repair community by investigating this large scale and asynchronous collaborative setup [1, 9].

Objectives

The main objective of this research project is to study the effects of enriching online community interactions by surfacing data about activities and experiences of community members. The three guiding research questions for this project are:

RQ1: How can community members currently learn about each other's repair experiences and challenges?

RQ2: How can visualization of community-generated repair data support collaboration and inclusivity of diverse community members?

RQ3: What types of contextual data are most useful for different actors (novices, experts, organizers and institutions)?

Online repair communities are a particularly interesting and relevant community to study as they exchange about physical activities for which the actors can determine if they succeeded in that activity (actors are generally able to judge if they are happy with their repair outcome), and repair activities are diverse with some being very accessible to novices while others require extensive tools and are difficult to execute without extensive experience.

Challenges and Mitigation Strategies

The project faces three main challenges: (1) Challenges in recruiting a sufficiently large user base to engage with the proposed approach and contribute data, (2) Challenges to measure success, and (3) Data privacy challenges relating to community member actions. We intend to manage the first challenge through a co-design approach through workshops in both actual physical repair spaces, such as *Repair Café* meetings or local makerspaces as well as the use of technology probes for online community members (see Methods section for further details). Concerning the second challenge, it will be difficult to determine the success of our approach on collaboration between people through controlled experiments. Instead, as a measure of success, we will (1) analyze the contributed data for its richness and added value compared to unannotated tutorials as well as survey-based studies of community feedback, and (2) run workshops and technology probes with repair community members to collect direct impressions from end users. Concerning the third challenge, we do not expect that any identifiable information needs to be collected. However, there is a risk that some community members flood the collected data with false, useless, or misleading data. We will monitor carefully what kind of data is being contributed and will adjust our strategy while seeking advice from the GDPR lawyers at Inria, if necessary.

Approach

The main objectives of this project are two-fold: (1) Facilitate the collection of contextual data through grassroot-driven asynchronous collaboration (inspired by Kittur et al. who focused on surfacing community generated content for knowledge tasks [22]) and (2) Study the effects of enriching existing websites (such as ifixit.com) with visualizations of the contributed data. We hypothesize that the collection of data and its visualization will increase the perceived efficacy of novices challenged with a repair project, and encourage in turn the contribution of data by such novices.

Originality

Our approach is original in multiple ways. We target both online and offline repair community members and aim to make their activities mutually more visible to each other. Our approach is also novel in that it is grassroot-driven, extending existing infrastructure instead of proposing yet another platform with low likelihood of being taken up. Furthermore, we are also original in that we use visualization not just for communication but as a tool for community knowledge creation.

Methods

The project will combine different methods. We will first perform content analysis to study current collaboration dynamics in repair related subreddits and understand current collaboration practices (RQ1). Based on the findings of this first analysis, we will then run co-design workshops with participants recruited from online and physical repair communities to identify needs of community members and explore different visualization concepts (RQ2). The findings of these will then feed into a technology probe [22] to test and refine potential

designs in context with a focus on answering RQ3. We currently plan to design that probe as a community generated overlay for repair guides on the ifixit.com website, but we may adapt to other or additional communities based on our findings from earlier stages to ensure ecological validity.

Anticipated Results

We anticipate results of both empirical and technological nature. Studying current repair community dynamics will result in a better understanding of how this large and heterogeneous community currently interacts and which kinds of data and information may be beneficial to support the flourishing and inclusivity of such communities.

We will also contribute a grassroot-driven approach to enrich existing community websites with data on the physical experiences and outcomes of community members activities. While the project focuses specifically on repair communities, we believe that such tools may be beneficial for other communities that have formed around other topic areas (e.g., arts and crafts or DIY activities more generally).

Overall we expect our results to profit online communities by providing new tools to strengthen their bonds even if their geographical distribution is spread worldwide.

Positioning: PC4: CONGRATS

Our research will target the repair community in all its diversity and design visualization tools based on the input of different groups and their relation to repair guides data. It connects more specifically to PC4 as we plan to 1) collect and study data from the repair community about contribution to repair guide collections, 2) design tools to facilitate collaboration in creating knowledge by leveraging aforementioned data and 3) reinforce the engagement of both novice and expert users when learning repair processes and sharing their experiences. As such, this project could fit in between the second and the third theme of the PC4.

Project organization, duration, milestone

We plan to start in January 2026 for a duration of 24 months to allow sufficient time for: 1) A content analysis of community interactions within online repair communities, specifically ifixit.com and repair related subreddits (6 months). 2) Co-design workshops focused on repair guides and which kinds of data to facilitate surfacing with the inclusion of different actors of the repair community (6 months). 3) Designing and iterating on prototypes to run technology probe studies to explore the level of engagement within the repair community and the perceived usefulness by its members (6 months). 4) Implementing the prototypes at a larger scale and studying how they may affect collaboration practices at the global community scale (6 months).

Partnership: presentation and role of co-advisors

Postdoc: Dr Emmanuel Courtoux (Telecom Paris, IPP) is working on Data Physicalization for deliberation and has a strong background in physical interaction design.

Advisor: Dr Yvonne Jansen (CR CNRS) studies the benefits of situated (in-context) visualizations both in physical environments and online.

This project will be based in Bordeaux, hosted by the Inria-CNRS team Bivwac. We will build on existing collaboration on campus with the two local fablabs (EirLab and CoH@bit) as well as the living lab projects on the Université de Bordeaux (UB) campus coordinated by UB's Institut de Transitions. We will also seek collaboration with local repair associations, including the Bordeaux Repair Café and Etu'Recup (https://eturecup.org/) who run workshops on the campus to encourage the reuse and repair of existing objects.

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