Towards Repurposeful Thinking in Interaction Design

Teddy Seyed
Microsoft Research
Redmond, Washington, USA
teddy@microsoft.com

Steve Hodges
Microsoft Research Cambridge
Cambridge, UK
shodges@microsoft.com

SelfSustainableCHI 2020, April 25–30, 2020, Honolulu, HI, USA
ACM 978-1-4503-6819-3/20/04.

Abstract

In this position paper, we describe our concept of repurposeful thinking in the context of sustainable interaction design (SID). We first ground this concept through an everyday scenario of a device such as a smartphone that needs to be repaired. Through this example, we highlight the value of designing devices to support not only repair but also re-use for different purposes, e.g. using a smartphone as a media player. Similarly, we believe that designing devices to support re-manufacturing and ultimately effective recycling will become increasingly valuable. Collectively, we think of these considerations as repurposeful thinking, which we hope will increase the longevity of interactive devices and ultimately their sustainability.

With this paper, we aim to engage in an initial dialogue on using repair and re-use practices as a means of designing for repurpose. Ultimately we hope this discussion can contribute to the community's goals for sustainable interaction technologies.

Author Keywords

Sustainable interaction design, HCI, electronic devices, design for re-use, re-manufacturing, recycling

CCS Concepts

•Human-centered computing → Human computer interaction (HCI);

Introduction

Over the past several years, sustainability has become an increasingly important topic for HCI researchers and practitioners. From a focus on supporting sustainable ways of living [2, 10, 11], to shaping a narrative around software and sustainable interaction design (SID) [1], sustainability has become manifest in a number of different ways.

One interesting area for exploration in the context of SID and interactive devices, is to further examine how we can treat objects differently during their lifetime, thus reducing our need to dispose of them [8]. Furthermore, there is also a question of how a "broken" object–not necessarily completely useless, but perhaps with a cracked screen or non-functioning button–has different value for different people [6], and whether or not enriching the ability to repair these objects can impact sustainability [5]. If we are able to repair objects likes smartphones simply, or they are designed in a way that allows us to readily repurpose their functionality, or their components can be re-used in different configurations, what would be the impact on lifecycle and lifetime?

In the next section, we describe a simple scenario of a smartphone breaking down (building upon scenarios described from [4, 5]) to frame our discussion around repurposeful thinking in SID.

An Everyday Scenario

James is a university student who has just saved up enough money to purchase a new foldable smartphone; it contains all the latest features and cutting edge tech available on the market. It quickly becomes an integral part of his daily life, acting as a digital wallet, navigator, among many other functions. In particular, James enjoys watching films on his phone, and a year later, while he is at a coffee shop waiting in line and watching a YouTube video, his arm is accidentally bumped and the phone drops from his hand and hits the ground. Despite the phone being protected with a case, its screen shatters with fractures all over its front. James is disappointed and decides to find out how much it is going to cost to repair his phone.

Using James as a thought experiment, we iterate on three hypothetical outcomes, described next.

Scenario I: Cost Doesn't Matter
As James recently just started a high-paying job, the broken phone isn't a major concern as he has the money to replace it. As he just wants to continue using his apps and not interrupt his daily routine, he decides to purchase the same phone from a local electronics store. After restoring all his apps, he is quickly back to normal and he drops his broken phone off to an electronics recycle depot.

Scenario II: Cost Does Matter
James heads to a local repair shop, where he drops off his broken foldable phone for a repair assessment. After waiting a few hours, he finds out the cost of repair is more than half of the cost of what he originally paid for the phone. While James is upset with this assessment, he has no choice to repair the phone as he can't afford a new one and needs access to his apps. James pays for the repair of his broken screen with a new one, and gets back his phone back.

Scenario III: Do It Yourself
James heads to a local repair shop, where he drops off his broken foldable phone for a repair assessment. After waiting a few hours, he finds out the cost of repair is more

than half of the cost of what he originally paid for the phone. Instead of paying this cost, James decides to repair the phone himself. He returns home and searches for repair guides for his phone. He orders a new screen, soldering equipment and a screwdriver pack as described by the guide he is following. As James progresses through the 25 step process of fixing his phone, he realizes he needs more equipment, such as a specialized suction cup to remove glass from the old screen before he can replace it with his new screen. Even with the suction cup he's unsure if he has the skills to do a good job. Frustrated, James decides to give up and returns to the repair shop, pays for the repair of his broken screen and gets back his phone back.

Developing a Sense of Repurpose

Despite the fictitious nature of the outcomes described above, we believe they are representative of a common situation. With today's tightly integrated devices and closely-protected component supply chains, repair is difficult and expensive. This doesn't just apply to mobile devices like smartphones and tablets, it's increasingly applicable to all manner of electronic devices such as watches, toasters, televisions, etc.

From a SID perspective, Scenario I is the least desirable outcome as the old mobile phone results in unnecessary waste; apart from the screen, its components could be suitable for re-use but this is unlikely to happen. At the other end of the spectrum, Scenario III seems ideal because the repair avoids unnecessary waste and costs the least. However, as we hypothesized, this is not an easy task to accomplish.

Working towards realizing this third scenario, brings forth a notion of repurposeful thinking, where it would be interesting if James could repurpose the device (or even parts of it) for other tasks that don't require its full functionality. For example, what if he could repurpose the device to make a simple home security camera system? Or perhaps he could remove the phone's motherboard and hook it up to a screen and keyboard, turning it into a simple desktop computer. Perhaps he should replace the entire smartphone with a new model, but in the process he could sell the old device so that the working constituent parts could be repurposed by others?

In order to accomplish this type of repurposing, how would the design of devices need to change? Does making repair (and thus repurposing) easier change the perspective of what it means for an object to be "broken"?

Prior work by [3] demonstrated how Bangladeshi phone repair practices resulted in the proliferation of technical skills, an attitude for minimal waste of components, and even community building. In many respects, one important result of their practices was an attempt at building a sustainable behavior. Additionally, as components are continually reused, there is an overall higher longevity of devices.

Building upon this, can we encourage similar behaviors by designing for repurpose and also having a broader effect on community building and sustainability?

Sustainability Context

As described by Blevis [1], SID is concerned with the integration of sustainability into what already exists, or creating something new that results in sustainable interaction design as a practice. Repurposeful thinking builds upon this, by specifically emphasizing the creation of something new.

The concept of repurposing has existed for several decades, with more recent examples on the internet demonstrating how to turn an old computer into a home theatre PC or a

jukebox, or turning a webcam into a security system, to even turning old computer parts into art. Kim and Paulos describe a similar concept with electronic waste, and proposed a re-use composition framework focused on aspects such as reuse as-is, remake, and re-manufacture [7].

Taking these ideas a step further, the design of electronic devices could change when considering this type of repurposing from the very beginning, rather than after like much of the existing work to date. Using a modular approach in the design of a phone in a similar way to Project Ara from Google [9], could be one approach to tackle this challenge. In turn, similar to the Bangaldeshi communities, devices can both become something different and have a higher longevity.

Conclusion

In this workshop paper, we describe our early concept for repurposeful thinking and everyday scenarios where they are both derived from and could apply. Fundamentally, SID strives to provide a combination of usefulness for as many people as possible, across ownership groups and purposes, while reducing wastelessness [1]. We hypothesized on how to build upon this by thinking further about objects (specifically electronics in this paper) and their design. Ultimately, we aim to start a discussion around what activities or areas are possible for SID and repurposeful thinking, particularly in the context of self-sustaining interfaces, and if we can apply self-sustaining scenarios to designs as well.

REFERENCES

[1] Eli Blevis. 2007. Sustainable interaction design: invention & disposal, renewal & reuse. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. 503–512.

[2] Tony Fry. 2017. Design after design. *Design Philosophy Papers* 15, 2 (2017), 99–102. DOI: http://dx.doi.org/10.1080/14487136.2017.1392093

[3] Steven J Jackson. 2014. 11 Rethinking Repair. *Media technologies: Essays on communication, materiality, and society* (2014), 221–39.

[4] Steven J Jackson, Syed Ishtiaque Ahmed, and Md Rashidujjaman Rifat. 2014. Learning, innovation, and sustainability among mobile phone repairers in Dhaka, Bangladesh. In *Proceedings of the 2014 conference on Designing interactive systems*. 905–914.

[5] Steven J Jackson and Laewoo Kang. 2014. Breakdown, obsolescence and reuse: HCI and the art of repair. In *Proceedings of the SIGCHI conference on human factors in computing systems*. 449–458.

[6] Eleni Kalantidou. 2015. Share + repair = care. Recoding reuse and establishing dematerialization practices by design.

[7] Sunyoung Kim and Eric Paulos. 2011. Practices in the Creative Reuse of E-Waste. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. Association for Computing Machinery, New York, NY, USA, 2395–2404. DOI: http://dx.doi.org/10.1145/1978942.1979292

[8] William Odom, James Pierce, Erik Stolterman, and Eli Blevis. 2009. Understanding why we preserve some things and discard others in the context of interaction design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. 1053–1062.

[9] David Pierce. Project Ara Lives: Google's Modular Phone Is Ready for You Now, year = 2016, url = https://www.wired.com/2016/05/project-ara-livesgoogles-modular-phone-is-ready, urldate = 2020-02-09. (????).

[10] M. Six Silberman, Lisa Nathan, Bran Knowles, Roy Bendor, Adrian Clear, Maria Håkansson, Tawanna Dillahunt, and Jennifer Mankoff. 2014. Next Steps for Sustainable HCI. *Interactions* 21, 5 (Sept. 2014), 66–69. DOI:http://dx.doi.org/10.1145/2651820

[11] Bill Tomlinson, M. Six Silberman, Donald Patterson, Yue Pan, and Eli Blevis. 2012. Collapse Informatics: Augmenting the Sustainability & ICT4D Discourse in HCI. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. Association for Computing Machinery, New York, NY, USA, 655–664. DOI: http://dx.doi.org/10.1145/2207676.2207770