Responsible Innovation through Reflective Practice: The Value of Insights from the Behind the Scenes of Research

Susan Lechelt
UCL Interaction Centre
University College London
London, UK
susan.lechelt.15@ucl.ac.uk

ABSTRACT

How can researchers for whom Responsible Innovation (RI) is not the core focus, begin adopting RI perspectives and practices? Here, I propose that a starting point can be documenting and reflecting on observations from "behind the scenes" of formal research studies. This form of reflective practice can lead to rich insights about stakeholders' and target users' values, which can help to reshape research trajectories. To demonstrate the value of this approach, I present a selection of the insights gained from my own "behind the scenes" reflections while carrying out research with UK schools, and discuss how this oriented the research agenda.

INTRODUCTION

In recent years, new frameworks and descriptions of Responsible Innovation (RI) processes have done much to clarify how RI can be carried out in practice. For instance, the AREA framework posits that researchers adopting an RI approach should continuously **anticipate** the impacts and implications of their research; **reflect** on its purposes, assumptions and potential implications; **engage** in dialogue about the research vision; and **act** on their reflections to reshape their research agenda [1]. In the growing field of value-sensitive HCI research, which includes Sustainable HCI, participatory design and speculative design, these types of RI processes are fundamentally embedded into the research approach, and often made manifest in research outcomes.

Figure 1: The Magic Cubes are a handheld tangible device for teaching children about computing.

However, much research in HCI is focused predominantly on issues related to technology design, for instance, evaluating the usability and user experience of a specific interface. Here, explicitly engaging with RI processes is often not a primary goal. The question this raises is: *how can we encourage all HCI researchers to begin adopting RI perspectives and practices, especially when RI is not a core focus of their research*?

I argue that because HCI fundamentally involves working with stakeholders and communities, opportunities to begin engaging with RI processes and perspectives can readily manifest themselves throughout the research process. In particular, there is a wealth of opportunity for insights to be gained **behind the scenes** of formal studies. For instance, asking potential participants about their hesitations for participating in a study can shed light on their values. Similarly, reflecting on the challenges observed when working with a particular community—e.g., teachers' lack of time and the lack of funding in schools—can open up new questions about the viability of an envisioned technology, and orient the research agenda towards exploring how these challenges might be confronted and overcome.

Here, I suggest that documenting these types of "behind the scenes" observations, and making the insights that they give rise to explicit, can be a time- and cost-effective method for researchers interested in RI to begin developing RI-centered perspectives and practices. Next, I describe how I documented behind the scenes observations while working on a research project that aimed to introduce new forms of tangible interfaces to UK computing classrooms. I show how the insights gained from a diversity of sources, like informal conversations with teachers and schools visits, helped shape the research agenda around the values and challenges of the school system. Finally, I argue that while encouraging HCI researchers to document their behind the scenes observations can serve as a starting point for increasing engagement with RI principles, there is a need for guiding frameworks that address *what types* of insights to look for behind the scenes, *how* and *where*.

CASE STUDY: REFLECTING ON THE MAGIC CUBES PROJECT

The Magic Cubes project (Figure 1) has aimed to investigate how the affordances of new, tangible interfaces might influence interaction and collaboration between students within computing classrooms [2,3]. In this way, the primary focus of the research was initially on evaluating the design of the Magic Cubes interface, in terms of usability and user experience.

To achieve the aims of the project, a number of studies were conducted in real classroom settings in nine different UK schools. In addition, the Magic Cubes were demonstrated at a variety of events (e.g., festivals, computing outreach sessions, museums) where teachers, schoolchildren, parents and policymakers were present. These events were originally envisioned predominantly as a way of recruiting participants, however, I quickly found that they were instrumental to enabling me to build a deeper understanding of the schools' and stakeholders' values, as well as the potential barriers to adoption of the Magic Cubes, beyond the constraints of the research project.

In effort to make these insights explicit, and to consciously adapt the research trajectory in a value-sensitive way, I began to document the processes through which these insights emerged. Specifically, I kept reflective notes about my experiences in schools and with various stakeholders. Next, I present four short vignettes that summarize a selection of the observations, and how they led me to reflect on the challenges and values of UK schools. The insights came from a diversity of sources behind the scenes of formal evaluation studies - including informal conversations with stakeholders, study planning meetings and site visits.

1. Informal conversations. *Observation:* Through informal conversations, I discussed with teachers how they support students with learning difficulties, especially those who do not have dedicated key workers. This highlighted that classrooms often have students with diverse learning needs, and that ensuring they are all able to partake in learning activities is of core concern to teachers when deciding whether to adopt a new technology. *Reflection:* This raised the question of how the Magic Cubes interface can be made more inclusive to children with a wide range of abilities and difficulties, both in special education needs and in mainstream classroom settings [3].

2. Observed hesitation during the recruitment process. *Observation:* While recruiting schools to participate in formal studies, I noticed that a few of the teachers hesitated to volunteer their class time for the studies, instead asking us whether we could offer extracurricular sessions to their students. This was found to stem from concern about whether the computing topics that the Magic Cubes would teach (e.g., critical thinking about sensor data) could be directly connected to the national computing curriculum. *Reflection:* This led to more sensitivity about the extent to which policy (i.e., the national curriculum) influences the adoption of a new technology in a classroom.

3. Study planning conversations. *Observation:* Before each formal classroom study, I spoke with class teachers about their expectations for the study, and the level to which they wanted to get involved in running the sessions with the Magic Cubes. I found that a number of computing teachers noted that they were not formally trained in computer science, and hesitated to take an active part in running the Magic Cubes sessions. This was due to the barrier of not feeling confident enough in their knowledge of specific computing topics, together with the time required to prepare the materials to teach them. *Reflection:* This observation shed light on the fact that teacher confidence, training and time constraints are major barriers to adoption of a new classroom technology. This shaped future research questions around how the Magic Cubes could be designed to facilitate the teacher on-boarding experience, and enable teachers to easily design their own learning materials.

4. School visits. *Observation:* By working with a variety of primary and secondary schools throughout the research, I was able to gain an understanding of the ways in which schools and the resources at their disposal varied. I noticed that there was much diversity in terms of technology infrastructures across different schools, especially between state funded and independent (private) schools. The ways in which they varied was not only in terms of the types of devices (e.g., desktop computers versus iPads) at their disposal, but also the amount of IT support available. *Reflection:* This challenged me to consider how to prioritize the devices that the Magic Cubes software would

support; moreover, it brought to light the importance of creating software with inbuilt support that would enable schools with limited access to IT professionals to easily install and use it.

In sum, the practice of explicitly reflecting on behind the scenes observations fundamentally challenged my understanding of how the Magic Cubes, and other new interfaces for teaching computing, could be envisioned to fit into real classrooms. Ultimately, these reflections led to a wealth of new RI-centric research questions, including:

How might we enable teachers who are not specialists in computing to adopt the Magic Cubes in their classrooms?

How might we reduce the barriers to adoption for schools, for example by designing for schools with limited IT support structures in mind?

How can the Magic Cubes interface, as well as the learning activities it supports be made inclusive, for example to students with diverse special education needs?

CONCLUSION

I propose that encouraging explicit reflection on the "behind the scenes" of formal studies can be a starting point to engaging a wider body of HCI researchers with RI perspectives and practices. As I have demonstrated, insights from behind the scenes can help challenge our understanding of how technologies might fit into an envisioned context, and to reorient the research agenda in terms of the values of stakeholders and communities. However, there is still a need to create guiding frameworks, that address the "what, how and where" of reflective practices. Specifically, there is a need for (i) frameworks of guiding questions that suggest **what** HCI researchers should reflect on based on RI principles, (ii) practical guidance on how HCI researchers can engage in reflective practice (see e.g., [4]), and (iii) suggestions for potential sources and contexts where rich insights can be readily arise (e.g., informal conversations with stakeholders, site visits, reflexivity).

REFERENCES

[1] EPSRC. The AREA Framework. Retrieved 2 February, 2018 from https://epsrc.ukri.org/research/framework/area/

[2] Lechelt, Z., Rogers, Y., Marquardt, N., & Shum, V. (2016, May). ConnectUs: A new toolkit for teaching about the Internet of Things. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*(pp. 3711-3714). ACM.

[3] Lechelt, Z., Rogers, Y., Yuill, N., Nagl, L., Ragone, G., & Marquardt, N. (2018, April). Inclusive Computing in Special Needs Classrooms: Designing for All. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (p. 517). ACM.

[4] Taylor, J. L., Soro, A., Roe, P., Lee Hong, A., & Brereton, M. (2018, April). "Debrief O'Clock": Planning, Recording, and Making Sense of a Day in the Field in Design Research. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (p. 308). ACM.