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# Bear & Co: Simulating Value Conflicts in IoT Development\*

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**ABSTRACT**

Bear & Co. is a fictitious immersion into the world of being part of an IOT start-up. We invite visitors to join the company, and facilitate their journey through various ethical conundrums, as they become part of the company. First, they must state their values - what they will bring to the company and care most about. Then, we test those values through different scenarios, and problems that are unexpected and that do not have easy answers. Finally, we debrief our visitors and invite them to peruse explanations for various ethical approaches presented as maps and diagrams, where they can interrogate their own decisions against three different philosophical viewpoints.

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**KEYWORDS**

Ethics; value considerations; design process; IoT; connected devices

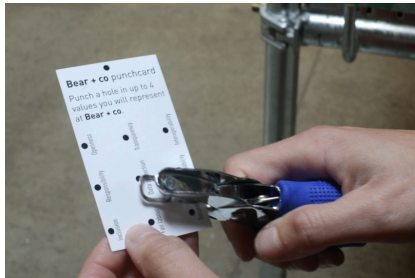


**Figure 1: A Bear & Co welcoming letter for new employees.**

**1 INTRODUCTION**

Imaginations of ubiquitous computing have inspired countless inventions and developments, drawing on Weiser's vision of computers that disappear [8]. These visions have resulted in real Internet of Things (IoT) technologies that also struggle with issues of personal data management, mounting privacy concerns, an increasingly complex regulatory environment, and the extra problems that hardware brings along. Whether it is air quality measurement, instrumenting of water services or putting a futuristic gadget into a private home, the very physicality of these devices can make issues of data ownership, reliability and adherence to safety and security standards more acute. In spaces instrumented with IoT devices, the onus of ethical decision making about what data ought to be collected or how data processing algorithms must behave necessarily shifts further onto those developing and deploying the relevant technologies and services [6]. But what does this mean for next generation IoT innovators, whose connected devices both generate vast amounts of potentially valuable data, while posing extensive concerns for privacy and surveillance? The ethical decision making about what is "good behavior" in the design of connected things does not have real precedents or much pre-existing experience to guide it. This is evident in the foreboding and anxious tone of the various statements and manifestos that have proliferated throughout this sector [2].

The VIRT-EU project works to engage the European IoT community in discussions about ethics, focusing in particular on the challenges faced by designers and developers of IoT devices in practice. As developers and designers of IoT devices face systemic challenges, many realize that they have little practice or training for dealing with ethical questions that they encounter. There is a need for tools that can help integrate the practice, training and understanding of ethical decision-making and reflection into the design process. We conceptualize ethics as values in action, drawing on the basic idea that ethics is a process of the application of values in human conduct and this process guides understanding and decision-making. Going beyond the Aristotelian conception of the importance of doing the right thing in service of living a good life [7], we focus on the practical side of how sometimes complementary and occasionally competing values are expressed and enacted and negotiated. In this we draw on prior work in reflexive design [5] and values in design [1], and propose a novel approach to engaging with values in practice. We use a combination of virtue ethics [7], care ethics [3] and the capabilities approach [4] to frame the particular encounters that our participants are asked to negotiate. Bear & Co. is a demonstration for how we might integrate ethical thinking into the process of creating connected devices through simulation of potential problems and rehearsals of decision-making in search of solutions.



**Figure 2:** New employees are asked to indicate up to four most deeply held values prior to beginning their work.



**Figure 3:** The operator station.



**Figure 4:** Card Reader slot in the operator's station.

## 2 DESIGN OF BEAR & CO.

We invite visitors to take on the role of working at a semi-fictitious company "Bear & Co" with a welcoming letter (Figure 1). In order to start work, they first have to record their values - by punching **up to 4** holes in a card they will have received in their welcome envelope (Figure 2). This punch card moment is tied to the concept of virtue ethics [7] in that each punch that the individual makes represents their commitment to aim at that higher virtue or goal as they do their work.

Once they punch their card, they will continue to the Operator's Station (Figure 3). Here they will see a small screen with instructions for them to follow. It starts with "*Please insert your punchcard.*" They insert their punchcard of values in the left-most slot titled "Card Reader" (Figure 4). This is their "sign in" to the company experience.

After they insert their punchcard, the screen prompts them to go to Page X. They should go to this page in their Operator's Manual (Figure 5) - the black binder in front of them. On that page, there is a dilemma for them to consider and choose an option (A or B). They should choose this option with the switch (Figure 6). Here we are bringing them into a structured speculation process of imagining possible situations they might have to consider while working at Bear & Co. We consider system-level pressures as well as on-the-ground stories related to the choices they might have to make. The dilemmas in the manual were developed drawing on the capabilities approach [4] where participants will experience how their ability to make a decision is to some extent limited by their internal capabilities and external structural constraints.

When the tree of dilemmas is completed, the printer will print a receipt detailing their work. This is represented as A or B and the number of the dilemma, such as 1A2B3B. The receipt will also indicate any "misalignment" between their decisions and their values that might have happened (Figure 7).

If the visitor had a misalignment between their values and their decisions, they will have a message to go see The Manager. The Manager will review their work and the values that have been listed as in "tension" based on their decisions. Then, they can have a discussion about why this misalignment might have happened. The discussion will:

- evaluate the particular decisions taken and why these decisions were taken.
- consider how things could go differently and why.
- inquire whether participants have ever confronted anything like this before.
- invite participants to help make the operator's manual better and to share their experiences with the researchers.



Figure 5: Bear & Co operator's manual



Figure 6: The work receipt



Figure 7: Value misalignment

In the end, The Manager will ask the participant to “keep an eye on that value misalignment when they come back tomorrow.” The concept behind this part of the script is that while people may not be able to accomplish their goal of perfect virtue, they must take action towards that goal but where the lack of achievement is not a failure. Rather it is an opportunity to discuss and learn from the experience. This concept - to try again - as opposed to a punitive nature of guilt and failure, for example - is best described by the care ethics approach [3]. At the end, the visitor is invited to attach their card to the corkboard to punch out. The nearby posters will explain how their experience connects to the three ethical approaches that VIRT-EU considers as we work towards the goal of integrating ethics into the design process. What they will see is our interpretation of the approaches and our “slice” of how they can relate to the design of connected devices.

### 3 IMPLICATIONS

Bear & Co. is a way to rehearse, to practice ethical thinking and decision-making for a product, a kind of simulation or role-play. It is intended to engage researchers, designers and developers so that when they confront actual major and systemic problems, while working on their own products or projects, they might be better equipped to solve the issue - or at least to try to solve, and then try again. The novel contribution of this approach is in making evident the contingent and inevitable nature of value misalignments, produced as a result of decisions in technology design, through a material interface. The artifacts produced through this process can serve as objects of discussion, situating the abstractions of philosophical discussions of ethics and connecting these with the realities of technology development in new ways.

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