

Engaging Teens in Dialogue on Potential Technological Futures with User Enactments

William Odom , John Zimmerman , and Jodi Forlizzi

Abstract Teens are a fascinating, dynamic population; they are on the vanguard of emerging technologies, often defining the behaviour and social mores of these products and services. At the same time, teens are still exploring and developing into the person they want to become, making them a terribly sensitive group to work with, and making it all the more crucial to critically and carefully consider how new technologies might shape their lives and practices. There is a clear need for a multiplicity of methods for working with teens in the HCI and interaction design communities. User Enactments has been developed as a design approach that aids design teams in more successfully investigating radical alterations to technologies' roles, forms, and behaviours in uncharted design spaces. In this chapter, we motivate and develop user enactments as a method for moving beyond studies of teen current practices and generatively engaging them in experiencing and making sense of possible technological futures. In this, we describe and reflect on our own experience of putting user enactments into practice through developing five different scenarios within a teen bedroom and, subsequently, conducting a study with 14 teens. Our goal is to surface and reflect on best practices and also potential pitfalls of using the User Enactments approach with teenagers. A higher-level goal of our work is to help better support future research and design practice aimed at engaging teenagers in critically playing a part in determining the roles that technology will play in their lives now and well into the future.

Final version published as:

Odom, W., Zimmerman, J., Forlizzi, J. (2016). Engaging Teens in Dialogue on Potential Technological Futures with User Enactments. In: Little, L., Fitton, D., Bell, B., Toth, N. (eds) *Perspectives on HCI Research with Teenagers*. Human-Computer Interaction Series. Springer, Cham. 151-178.

https://doi.org/10.1007/978-3-319-33450-9_7.

DOI 10.1007/978-3-319-33450-9_7

William Odom

School of Interactive Arts and Technology, Simon Fraser University, Surrey, BC,
Canada e-mail: wo@willodom.com

John Zimmerman and Jodi Forlizzi

Human-Computer Interaction Institute, Carnegie Mellon University, Pittsburgh, PA,
USA

1. Introduction

Most teenagers feel the greatest sense of place attachment—the emotional bond between a person and a place—to their bedroom (Chawla 1992). Here they live with their things, make sense of their lives, and experiment with whom they wish to become (Steele and Brown 1995). The bedroom provides moments for solitude and reflection, a social space to engage parents and peers, and a canvas to experiment with an evolving sense of self (Hodkinson and Lincoln 2008). Teens display and curate their precious material possessions in their bedrooms in order to explore their changing values and aspirations, and to project them to different audiences. Through this process, they construct value with their things, mentally reassigning an individualised sense of worth as they possess and repeatedly use their things over time (Belk 1988). The bedroom provides teens with their first opportunity to author a space, to create their own aesthetic and sense of style in negotiation with their parents (Steele and Brown 1995).

Digital devices and services have become an increasingly large part of teen life (Vetere et al. 2005; Taylor and Harper 2002) and teens commonly alternate their attention and interactions between their material and *virtual possessions* (Odom et al. 2014). Virtual possessions include things that are increasingly immaterial (e.g., books, music, and photos), things that never had a lasting material form (e.g., game avatars, electronic message archives, and social networking profiles), and metadata traces logged during interactions with various systems. In an earlier field-work project with teens (Odom et al. 2011), we investigated their value construction activities with material and virtual possessions in their rooms with an emphasis on how these different things shaped their identity construction processes. Observations and interviews from this formative study revealed that teens developed practices to make their virtual things more present, and that they draw on them as critical resources for self-reflection and self-presentation to different social groups.

Findings from this descriptive fieldwork project revealed design opportunities for transforming virtual possessions into more valuable and meaningful resources in teens' everyday lives. However, considering the largely unexplored and unstructured nature of the virtual possessions design space, it was unclear exactly how to proceed. Teen life presents a tricky and sensitive context for HCI and design researchers to operate in, and the potential unintended consequences that could result from new technologies need to be taken very seriously. One's teenage years represents a particularly impressionable time that have a profound impact on ensuing life stages. Additionally, the teen bedroom represents one of the most important, idiosyncratic, and profound places that teen life unfolds. Considering the many tensions and pitfalls that could arise from manifesting virtual possessions in teens' everyday lives, we needed to challenge and explore our fieldwork findings in a generative way to establish a more sensitized and developed understanding of the overall research and design space. We aimed to systematically investigate several possible futures to discover how technology might bring about one that is preferred over teens' present situation.



Fig.1 The messy Teen Bedroom created in our design studio that functioned as the scene for our user enactments study

Design, as a form of inquiry and reflective practice, works to intentionally transform current situations into more preferred future states (Nelson and Stolterman 2003; Simon 1996). One issue when designing new interactive products and systems is that they typically involve concepts and technologies with which target users are very unfamiliar (or have point of reference for at all). This makes pursuing new initiatives in emerging design spaces complex and risky; it is difficult to anticipate how people will react to radically new technologies and investigating a large amount of resources into a design direction that is not well understood can have disastrous consequences. We have developed the user enactments design approach to help support design teams in more successfully making this conceptual leap through investigating radical alterations to the forms and behaviours of technologies in new and uncharted design spaces (Odom et al. 2012b). User enactments are part of the broader speed dating methodology (Davidoff et al. 2007). At the end of each enactment, after experiencing a possible future through simulated content, participants reflect on what may have complicated or supported their desires, or led to unexpected experiences.

In order to generatively move from fieldwork findings with teens centering on their use of virtual possessions as resources to support self-reflection and self-presentation [see (Odom et al. 2011) for more details], we conducted a user enactments study where we prototyped a teen bedroom in our design research studio and iteratively developed five user enactment scenarios (see Fig. 7.1). On a high level, the study focused on investigating radically new forms and behaviours of virtual

possessions that might better support practices like curation, self-reflection, and presentation of self to different audiences. Specifically, we wanted to understand how making virtual possessions more present in the bedroom and giving them new forms and behaviours influence teens' perceived value for these things. To do this, we generated five design concepts: an auto-redecorating bedroom, a virtual possession 'status' quilt, postcards sent from a teen's digital past, an electronic gift giving application, and a system for curation of multiple digital presentations of self. We then conducted the user enactments study with 14 teens in the prototype bedroom. This approach provided a prism for investigating aspects of several potential futures that teens may or, crucially, may not want.

User enactment sessions revealed that teens desire to have their virtual possessions more present as long as they can control this presence, to curate multiple presentations of self while retaining a sense of authenticity, and to have new forms and behaviours that better support reflection on past self and on the relationship they have with another. These findings suggested significant opportunities for the HCI and interaction design communities to create new forms and behaviours for virtual things in order to modify people's perceived value of them, particularly in terms of *ability to investigate one-on-one relationships* and *supporting reflection on the past*. They also reveal an opportunity to develop richer forms of metadata, and the infrastructure required for its capture, storage, retrieval, and sensitive treatment.¹

While in this chapter we provide a synopsis of empirical findings, we aim to describe and unpack details and insights beyond the core research questions in the user enactment study itself. In line with the theme of this book, we want to reflect on how user enactments worked (and didn't work) to engage teens in experiencing glimpses of several potential futures and to relate phenomena they encountered back to their own lived experiences, values, and desires. While user enactments as a research method is growing in use and interest, to date only handful of publications illustrate its use, and there is a need for documentation and reflection on experiences of putting user enactments into practice to engage populations, like teenagers, in critical dialogue about the future.

In what immediately follows, we review related work that provided impetus and inspiration for the Teen User Enactments study itself. We then provide an in depth account of the process of designing and constructing the teen bedroom user enactments, which is followed by a synopsis of findings, a critical discussion of our user enactments process, and a conclusion with implications for future research and practice.

¹ See (Odom et al. 2012a) for in depth reporting and interpretation of empirical findings and discussion of suggested design opportunities for the HCI community.

2 Background and Related Work

2.1 *Technology Use in and Around the Home*

The ways in which technology affects the social and moral order of the home, and how it might be better designed to improve domestic life continues to be major areas of concern in HCI. Edwards and Grinter (Edwards and Grinter 2001) discuss how even relatively simple technologies can disrupt domestic routines and practices. Subsequent work has emphasised developing technologies that make people feel more in control of their lives, rather than focusing on control of devices and services (Davidoff et al. 2006). Building on the issue of control, Woodruff et al. (2007) illustrated how ceding control to a smart home can help families focus on building social relationships. More generally, Vetere et al. (2005) describe the complex ways technologies mediate intimate relationships and the need to make new designs more rich, nuanced and expressive.

Teenagers and their domestic places have received less attention in the HCI community. March and Fleuriot (2006) explored how technology mediates teens' need for private space within their parents' home. Durrant et al. (2009) proposed ways that teenagers' curation of digital photos opens up opportunities for intergenerational interaction and identity construction. Hodkinson and Lincoln (2008) suggest teens increasingly use social media technologies to extend boundaries beyond the bedroom. Additional research has investigated how teens maintain offline relationships through interactive technology (Taylor and Harper 2002) and their capacity to define new social mores through their use and appropriation of social computing technologies (Boyd Danah 2007). On a broader level, teens present an important population for the HCI community to engage with—they are deeply occupied in the process of constructing their identities (Steele and Brown 1995) and often on the vanguard of digital media and interactive technologies (Ito et al. 2009). While research on teens is beginning to gain purchase in HCI (Fitton et al. 2013; Read et al. 2013b), this audience presents different kinds of challenges to engage with compared to older generations, and there is a clear need for a multiplicity of methods to engage with them (Read et al. 2013a).

2.2 *Privacy and Self-Disclosure*

As everyday technologies have become networked, a wealth of literature has emerged concerning privacy and unwanted disclosure. Palen and Dourish (2003) unpack the multi-dimensional nature of privacy practices, drawing attention to how they are not limited to tensions between people, but also involve a person's internal conflicts over how disclosure shapes their self-concept. Many important works too numerous to mention here have since built on this seminal article, working to reduce unwanted disclosure across mobile platforms and networked services (see

(Ackerman and Mainwaring 2005) for an in depth review). Outside of HCI, Goffman's (1959) sociological work reveals a range of performative practices people engage in to manage self-impression and disclosure to different social audiences. Giddens (1991) later argues that the act of managing presentations of self across different settings can lead to an integrated, holistic life narrative.

Additionally, within HCI there is growing interest in how to support designers in considering user values, such as privacy, throughout the design process (Friedman 2006). Much of this work helps illustrate how designing technologies reflective of users' values can productively open the space for people to construct a deeper sense of value or 'worth' with these things (Cockton 2006).

2.3 Personal Digital Content and Archives

Recently, researchers have begun to explore the implications surrounding the design of meaningful and worthwhile interactions with digital artifacts, such as photos (Kirk et al. 2006), music (Vaida et al. 2005), and familial possessions (Kirk and Sellen 2010). More generally, the issue of how to design digital artifacts largely characterised by immaterial qualities has been an area of ongoing interest in HCI (Hallnas and Redstrom 2001; Wright et al. 2008). There is also emerging HCI research describing how people develop sentimental attachments to digital artifacts.

Kirk and others (2010) present a values-oriented approach to designing tools to support archiving of cherished digital artifacts. Kaye et al. (2006) describe how digital archives can function as rich resources for identity construction and presentation. Van House (2009) details how digital photos presented online can support curation of identity to different groups. Others have explored how physical mementos can inform the design of systems aimed at creating digital mementos capable of triggering reflection on past experience (Nunes et al. 2008; Petrelli et al. 2008). Finally, Pessapati et al. (2010) designed and implemented a system re-presenting social networking content back to users specifically to evoke reminiscences.

2.4 Design-Oriented HCI Methods for Exploring Potential Technological Futures

User enactments builds on several existing HCI design methods, including scenario-based design (Carroll 2000) and experience prototyping (Buchenau and Suri 2000), in addition to the range of methods that embrace role-playing and performance as a critical means to engage users in exploration of potential technological futures (Burns et al. 1994; Iacucci et al. 2000; Kurvinen et al. 2008; Mancini et al. 2010). Similar to these methods, User enactments aim to tap into users' felt experiences of

the present and past to open up critical dialogues about what the future could, or should, be. User Enactments shares similar ambitions to other methods like Wizard-of-Oz (Hartmann et al. 2006) and video sketches (Zimmerman 2005) that aim to understand the promise and potential pitfalls of technology in an uncertain future.

On a broader level, there has been an ongoing interest in developing effective methods to support designers in understanding and empathising with user values throughout the design process. The Scandinavian tradition of participatory design has long been invested in engaging potential users in the design of new systems and technologies in the service of supporting their practices, desires and values (Iversen et al. 2010; Kensing and Blomberg 1998). User enactments share some of the same ambitions and interests in that it aims to surface where value tensions may exist around future technologies and embrace them in moving from ideation to iteration. However, it differs by requiring design teams to first create concepts embedded in scenarios, and then asking users to enact them to explore tensions and opportunities around potential near future technologies.

A final important difference is that methods such as experience prototyping (Buchenau and Suri 2000) or technology probes (Hutchinson et al. 2003) tend to focus on developing one concept, whereas user enactments emphasise bringing several visions of the future forward to develop a better overall understanding of a design space. This approach is parallel to ongoing work describing the benefits of variety in ideation (Buxton 2007; Tohidi et al. 2006).

Collectively, our work picks up on these four threads of domestic technology use, privacy and self-disclosure, personal digital content, and design-oriented HCI methods for investigating potential technological futures. The user enactments study we describe in this chapter aimed to advance the HCI community's understanding of how teens currently control and might better control technologies within their bedroom. Our study investigated various ways virtual possession could potentially be manifested in teens' everyday lives in the future and how forms of new technology might better support intimate experiences tied to the development of social relationships and one's self-concept. The user enactments we developed are intended to probe and open up dialog with teens on issues around privacy, disclosure, self-presentation, and self-reflection. On a higher level, our work offers a case example of how user enactments can work to investigate potential technological futures with teenagers.

3 The Teen Bedroom: Constructing the Scene and Setting the Stage

Previously we conducted ethnographic interviews with 21 teens in their bedrooms to investigate their perceived value of virtual and material possessions, and how these materials shaped teens' identity construction practices (Odom et al. 2011). Our teen participants in this study were aged between 12 and 17 years old and

consisted of 9 female and 12 male. This fieldwork study was conducted in the Pittsburgh, Pennsylvania geographic area in the United States. Our findings detailed design opportunities for value construction activities with immaterial things. These include:

Value in presence—Teens worked to make their virtual possessions more present.

We observed teens constantly changing backgrounds on personal devices, printing status updates and comments from friends to display in their rooms, and maintaining a persistent, online connection in order to monitor the virtual world.

Value in self-reflection—Teens used their virtual possessions to reflect on their past.

We found teens investigated how many times they listened to a song in their music collection, stored printed status updates, and reflected on popular culture and other images featured on their computer previously. They used both system logs and human constructed metadata to understand and reflect on their past experiences.

Value in curation of multiple presentations of self—Teens used virtual possessions to ‘curate’ different selves to different audiences. These actions included applying interface ‘skins’ on gaming consoles, encoding photos of a shared experience into the metadata of songs in playlists given as gifts, and tagging or un-tagging of photos as well as restricting/granting access to photos and other social media content.

The goal of our user enactments study was to advance our understanding of how the design of virtual possessions that were intended to support identity construction activities might influence teens’ perceptions of value and meaning, and also where possible tensions or complications might emerge. We chose to conduct speed-dating sessions with user enactments (Davidoff et al. 2007; Odom et al. 2012b) to help better understand our target audience as well as potential opportunities and risks in the design space. In real-life speed dating, people have dating props such as a wine glass, café table and candle. They go on many very short dates in a single evening. At the end, they know very little about any of the people they have met. However, they have developed a much better and more realistic vision of what they want in a partner.

Speed dating with user enactments follows the same approach. Design teams create provocative scenes of possible futures; scenes meant to stimulate discussion on futures people desire or fear. Teams bring in representative participants, place them in a familiar situation, and then provide them with a “sip” of what the future might be like. This allows participants to connect with their felt-life experience as they reflect on what the future might be. Prior to each enactment, participants reflect on their current practices and desires for the future. At the conclusion of an enactment, they reflect on how the technology may have complicated or supported these desires, or led to unexpected experiences. By combining wide exploration across multiple structured engagements, user enactments provide a broad perspective for discovering new design opportunities and for revealing invisible social tensions around potential new technologies.

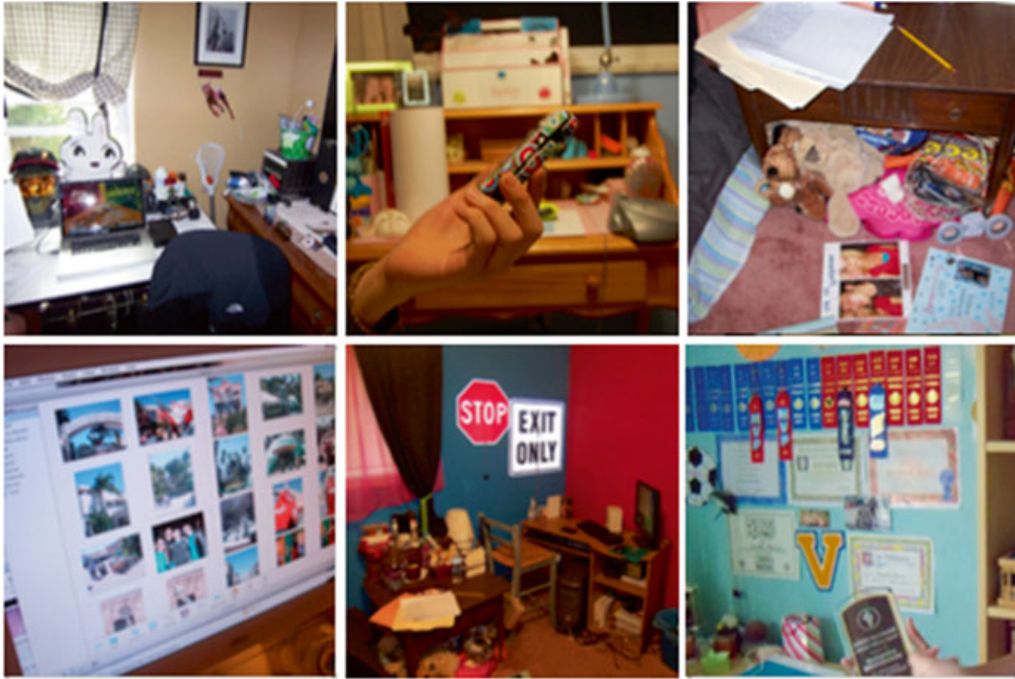


Fig.2 We printed and hung over 50 images in our studio from our prior fieldwork in teen bedrooms (a sample shown above). These images helped us isolate key details of teen bedrooms and develop a sensibility for when we had gotten the UE bedroom to the ‘right’ level of fidelity. We also sketched, clustered, and hung 94 design concept sketches, which helped better structure the design space and get a sense of what the bedroom would spatially and practically have to look like

Our process in the teen bedroom user enactment study followed a series of steps. First, we began with in-depth review sessions of our field data, related research and design opportunity areas (i.e. the three main value construction activities emerging from our fieldwork study summarised above). During these sessions we made affinity diagrams and free form diagrams to gain a perspective on the overall design space. We then held several concept generation sessions, resulting in 94 concepts. We clustered these thematically to further refine our understanding of the overall design space and to more clearly articulate visions of preferred and undesirable futures. We iteratively filtered these clusters based on their fit to three main criteria: (i) the extent to which the enactment builds on the aforementioned design opportunity areas, (ii) the importance of the issue probed by the concept, and (iii) the feasibility of realising the concept through a user enactment. We then more fully realised 12 remaining concepts by making detailed scenarios and through body storming (Buchenau and Suri 2000). Again, we filtered these concepts resulting in the final set we developed into user enactments.

Our scenarios required us to create a ‘teenager’s bedroom’ within our studio that could effectively function as the set for the user enactments study. Our design process for this began with printing photos of teen rooms we collected in our previous study and placing them on the wall (see Fig. 7.2). We wanted to explore design patterns, exemplars, and outliers to develop a rough design aesthetic and language for



Fig.3 The messy teen bedroom featured a 12-screen overlapping display constructed from foamcore and blackboard. An HD projector was used to populate the display screens with high-fidelity interfaces controlled via an Adobe Flash application we custom designed

a place as idiosyncratic as a teen bedroom. Using these images as a resource, we then constructed a bedroom space, where we continually tweaked and augmented it until it “felt” like the rooms we had visited. A major addition to the room included 12 overlapping displays that filled the wall above the teen’s desk. These were made from black and white foam-core, and we used a high definition projector to create the illusion that they functioned as independent screens (see Fig. 7.3). We intentionally created a set of displays that could be easily integrated into the bedroom, while at the same time might be perceived as overwhelming. We hoped this tension might provoke teens to critically reflect on the amplified presence of technology in their personal space.

Through repeated meetings to critique scenarios, we iteratively refined the user enactments, often increasing the fidelity by using props and acting out scenes in order to develop a consistent narrative flow. We then repeatedly piloted the enactments. Piloting helped refine our design of the physical bedroom. It also revealed unanticipated narrative problems, which we addressed by developing a specific order for enactments. Finally, piloting helped to find the harmony between giving participants too much freedom and making the scenario mostly exposition. During the piloting stages, we first began with graduate and undergraduate students at our university to obtain a very general sense of where major problems were emerging in the flow, sequencing, and narrative structure of the enactments. We then moved on to using teens during piloting; these sessions helped us better understand not only how to engage with teens within the enactment, they also enabled to probe teens on

different material choices in constructing the bedroom. A key finding from this is that some of our teen popular culture references had become outdated in the time that had elapsed (approximately 1 year) since conducting our formative fieldwork project. We made updated bedroom materials such as music and movie posters within the bedroom based on this feedback.

We crafted the scenarios around a fixed set of digital content provided by two teenagers (male and female, respectively). While we were informed by extensive, first-hand experience of teens' lives through our prior fieldwork and we aimed to bring a high degree of sensitivity to constructing the set and user enactments. Clearly this decision is not without its limitations. Yet, we chose to use stock content for two reasons. First, participants have different sets of virtual possessions (e.g., some have large music collections, while some listen to music online; some archive text messages, while others are less meticulous; etc.). Reliance on participants' personal collections would have removed an important control: making sure participants' reactions were based on the same stimuli. Additionally, it would make the enactments only as rich as the collections teens keep *now*. Second, acquiring teens' personal collections and building personalised versions of the room would have significantly increased our efforts. One of the key challenges with designing new technology is to reduce the risk of development for things people do not ultimately desire. Thus, we aimed to ground our intuitions and avoid making an over commitment to a specific design direction. We needed to conduct user enactments to help reduce the risk associated with taking a conceptual leap to an emerging design space that has few existing conventions to draw on. Next, we turn to describing each of the five enactments to unpack factors shaping how effective they were in engaging teens in dialog about potential technological futures.

4 Unpacking the User Enactments Teen Bedroom Study

For the teen bedroom project we recruited 14 teenagers ranging in age from 14 to 17 (eight female, six male) through word of mouth and through flyers posted in several different areas in and around the city of Pittsburgh, Pennsylvania, USA. Before the user enactments began, we would give participants a tour of 'their' bedroom, introducing them to 'their' digital and physical belongings. Interestingly, upon first entering our bedroom, many teens noted similarities between it and their own room in terms of objects and messiness (Fig. 7.4). During this time, we primed participants with brief explanations of unfamiliar elements in the room (e.g., the 12 screen display) and also made them aware that they would be asked to play the role of 'themselves' during short scenarios. We also noted that for each scenario, there would be a simple task that they will be asked to do (e.g., finishing reading a chapter in a schoolbook), but that there is no 'right' or 'wrong' way of doing this. Participants were also asked to reflect on their own everyday activities and experiences in and outside of their own actual bedroom. This proved to be an important technique in helping us surface additional insights about participants' lives and practices. It also



Fig.4 Domestic objects and teen high school materials were acquired from thrift stores for the set. We decorated the room to be messy to reflect the composition of many rooms we had observed in the field

helped further prime teens for drawing connections between their own lives and the possible future presented in each enactment.

Another technique that contributed to the viability and success of our enactments centered on playing popular contemporary music in the background throughout nearly the entire session with each participant. While on the surface this may seem trivial, this subtle tweak was highly effective at dissipating tensions emerging from teens being in an unfamiliar and somewhat contrived environment. It enabled the teens and our research team to relax and engage with the user enactments. Importantly, playing background music was highly effective at drawing attention away from the fact that we were in our studio and re-focusing attention on the narratives and dialogues we aimed to open up with our participants. We developed our background playlist after consulting several teens that the research team had personal contact with about their own contemporary musical tastes and listening habits.

Following each enactment we conducted semi-structured interviews, asking participants to reflect on their experience. We began by asking about their everyday practices or activities touched on themes or experiences in the enactment. We then transitioned to talking about the specific enactment. This technique appeared to help participants fluidly make connections between their daily experience and the potential futures; again, supporting this perceptual bridge is essential to conducting a successful user enactments study. Sessions with each participant lasted between 75 and 90 min. We video recorded these sessions, in addition to taking notes. These notes were reviewed immediately following each interview, and tentative insights

were logged in reflective memos (Glaser and Strauss 1967). Analysis of the data was an ongoing process. The research team then met weekly over the course of 4 months to repeatedly review the video and notes in order to draw out underlying themes (Miles and Huberman 1994). Affinity diagrams were also created to reveal connections across participants and across enactments. Textual documents were then coded using themes. Data were then organised into concrete themes.

5 User Enactment 1: The Socially Reactive Bedroom

In the first user enactment, the teen enters the bedroom after dinner to read an Act from *Romeo & Juliet* to prepare for an upcoming exam (see Fig. 7.5). 12-displays show various collections, including: a visualisation of messages exchanged with friends over the last 2 weeks, favourite music, photos of a wild party with comments, provocative pop-culture images, and personal photos related to sports and family. A confederate of the same gender plays the participant's friend. She or he shows up and enters the room, triggering five of the screens to automatically re-decorate; presenting new information of shared activities and interests between the two friends. The screens highlight events both had attended—images from parties, a visualisation of communication patterns, and images of the two friends in Halloween costumes from a time *before* they knew each other. The confederate alludes to the meaning and function of the displays through a semi-structured conversation. After a few minutes of discussion, another confederate, in the role of a parent, knocks. The participant presses a remote to change the displays to “parent approved,” masking the provocative image and party photos. The participant then allows the parent to enter and drop off folded laundry.

This enactment explored issues surrounding the control of virtual possession displays against the backdrop of different social audiences entering and exiting the room. We wanted to explore questions including, do teens value a system that automatically presents digital content relevant to particular people in the room? Will virtual possessions from a teen's past (i.e. Halloween photos) conflict with their current perception of self?

The socially reactive bedroom was one of the most complex user enactments in our study. It involved two confederates and a researcher triggering the screen transitions—all of which helped collectively guide the enactment's narrative flow. Despite its complexity, we found that the choice to have this enactment come first in the serial order of all enacted scenarios was widely effective at supporting our teen participants in suspending belief and becoming comfortable with engaging with what was immediately happening in the narrative. As we continued to run sessions with participants, it became clear that the combination of a relatively structured initial scenario with free-form spaces for dialog with multiple confederates was effective in leading teens to react in visceral and embodied ways. Our experiences with this enactment and user enactment 3 both illustrated that using confederates to help probe particular aspects of the scenario can be very useful if their role is crafted



Fig.5 The teen encounters a visual breakdown of different virtual possessions on the displays, from phone call logs to facebook photos to social ratings of current music tastes (*top row*). When a friend arrives, the screens automatically change to depict representations of information exchanged between the two over time (*middle row*). A parent arrives and the screens change to show a 'parental friendly' digital representation of self (*bottom row*)

to loosely guide the flow of the scenario with planned points for participant engagement. These points need to be fluid enough to move on immediately if needed. In other words, we crafted a situation where a space was opened to elicit reactions from teens without forcing an answer, which appeared to engender a sense of comfort and familiarity with performing the enactments.

Interestingly, teens' reactions to this enactment led to a range of insights. It revealed that teens did not desire bedroom technology that was socially reactive and would curate their virtual possessions depending on who was present (even if it was the teen by her or himself). Teens often viscerally reacted to the simulated experience of having their self-presentation activities regulated or even superseded by a computational system, even if well-intentioned. When confronted with this kind of technology, they felt like it generated contrived, inauthentic representations of who they might be at any given moment, no matter the people present or absent in their

bedroom. Even though their virtual possessions are immaterial, out of sight, and, thus, may have less of a capacity for causal or serendipitous encounters, teens wanted to have direct control over what was present and when. From a design perspective, this was an interesting finding as social reactivity presents a behaviour that material possessions could never exhibit. Nonetheless, with this novelty clearly comes huge potential for complications and unintended consequences.

This enactment did unexpectedly lead to several teens remarking on how materials taken down from their bedroom walls are rarely captured and they expressed desires to ‘save’ the state of their virtual possession wall displays. Here, teens commonly remarked on how revisiting the spatial layout of virtual possessions decorating their bedroom from different eras of their adolescence could stimulate different kinds of memory experiences—experiences tied to how these virtual compositions offer a holistic representation of self from a particular time period in the life than they currently have access to now. Additionally, we anticipated that the Halloween pictures would trigger a range of negative reactions. However, this aspect of the enactment often led teens to describe desires to go even further back into their pasts to explore what was happening in their life during times they were too young to remember; a theme that continued to emerge in reactions to later enactments.

6 User Enactment 2: Waking up Under Your Online Updates

The second user enactment was considerably shorter and less complex compared to the socially reactive bedroom. Here, the teen arrives home late in the evening on a school night and goes to bed. The bed that the teen gets into is covered in a ‘status quilt.’ The bars of the ‘status quilt’ indicate that the teen has no new or unchecked digital content (which is displayed on the bed quilt via an overhead projector). As the teen lies in bed ‘overnight’ (which lasts about 30 s as the background music and lights are dimmed), the information on their quilt changes, indicating they have an assortment of new wall posts, photos and emails to check. The enactment concludes as a parent knocks on the door to let the teen know that their school bus will be arriving soon and they must get up and prepare to leave.

During the field study with teens, teens expressed a desire for a persistent connection to their online lives. For example, we often found that they left their personal computers and personal devices perpetually logged in to social networking sites like Facebook, even when engaging in other activities in the bedroom (e.g., reading, playing video games, doing homework). We wanted to push this idea, to see how far they might go. We wanted to force them across a social barrier in order to discover where this barrier might be. So we designed an enactment where teens literally wake up lying under the Internet; where their virtual possessions immediately vie for their attention. As featured in Fig. 7.6, we used a projector mounted above the bed to visualise a changing interface as the core design material in this



Fig.6 The teen returns to her bedroom late at night and gets into bed to go to sleep (*top row*). An overhead projector mounted in the bedroom ceiling projected onto the bed to create the ‘status quilt’ (*middle row*). An illustration of the teen’s unchecked virtual possessions that grow while they sleep (*bottom row*)

concept. Our aim in using this technique was to amplify the presence of this potentially unsettling technology and engage teens in exploring what might be a more viable future approach to balancing technology use in the increasingly always-on and connected world they are growing up in.

However, this often produced tepid reactions from teens, and strongly contrasted the visceral engagement participants typically exhibited with the socially reactive bedroom enactment. Teens went through the motions of the status quilt enactment, but were largely ambivalent about their experience and, when prompted, rarely found the quilt to be subtle or peripheral. We expected teens to react strongly against the presence of the quilt, particularly after “waking up” in the updated statuses of their virtual things. Yet, teens were typically unsure of what they were supposed to take away from the scenario, and quickly went through the motions to complete it. Here, having the enactment grounded in an ambient technology that teens were not supposed to focus their full attention on at any key point made it difficult to have enough focus and structure necessary to run an effective enactment. The ambiguity

over the structure and flow of the enactment that resulted ultimately complicated our ability to generate an experience that teen participants could relate to.

Despite these issues, brief interviews following this enactment did commonly result in useful dialogues with teens about the creeping distractive potential that digital notifications and nudges to check one's virtual possessions. This supported the broader theme we saw emerging across enactments that centered on teens desire to have more control over the presence (and absence) of their virtual possessions. Nonetheless, after several rounds of iterative piloting and attempting to make changes to this enactment, it still seemed to fall short of generating compelling experiences when compared to the other four enactments in our study. This made clear how complex it is to explore the potential role of ambient technology in teen life through the form of a user enactment. While status quilt enactment did not live up to its expected potential, it offers a useful example of how delicate it can be to strike the balance between exerting enough constraints to effectively guide teens and the ability to improvise freely within an enactment.

7 User Enactment 3: The Gift of an Experience-Oriented Assemblage

The third user enactment begins with the teen sitting in the bedroom listening to music, while waiting for a friend to arrive. The song she or he is listening to is from a playlist given as a gift to them by their significant other. A 12-screen display presents machine and human-produced metadata for the current song as well as a collection of annotated photographs assembled by the girl/boyfriend from visit to an amusement park together (see Fig. 7.7). Metadata for the photos lists the time, day, and weather information as well as a topographical map. Other screens display a set of gifted playlists, information about listening habits between girl/boyfriend and participant, and wordclouds of lyrics. After spending a few minutes in the room, a confederate friend arrives, notices the screens, and engages the teen in a semi-structured conversation exploring and prompting reflection on the meaning and function of the displayed information.

In the material world, people commonly craft unique, personalised gifts for loved ones. As an example, for many years teens exchanged personalised mix tapes and CDs, and digital playlists they can currently exchange lack the rich expressiveness and the uniqueness found in these disappearing artifacts. We designed this enactment's interfaces to explore how different kinds of digital materials related to a shared social experience could be combined into an assemblage of multiple kinds of virtual possessions. We wanted to explore how teens might react to this new form of a virtual possession. If teens had the tools to enable this kind of interaction, would it be a viable future design space to explore? To what extent could social or machine-logged metadata help support the work of crafting a digital thing expressive of a social relationship between two people?



Fig.7 The 12-screen display visualising human and machine-produced metadata related to a gifted playlist from the teen's significant other. The *top left* quadrant depicts album art associated with the songs; *top right* is a word cloud of song lyrics; *bottom right* is the current song being played that is mapped to annotated images of shared experiences associated with the song; *bottom left* is a visualisation of various gifted playlists and stats of favorite songs shared and listened to

In this enactment we returned to using a confederate to introduce social interaction directly within the scenario itself and also to help effectively manage its flow (Fig. 7.8). Our choice to include another enactment with a confederate in the middle of the serial order of all five enactments proved to be an important decision for two reasons. First, as noted, in the preceding status quilt enactment we continually struggled with developing compelling experiences due to the lack of focus that came with introducing an ambient technology as the central point of the scenario. The gifted assemblage enactment was more structured but also had clear open-ended points for teens to improvise. Additionally, we had carefully scripted points where the confederate could speed up or slow down the tempo of the social interaction based on the reaction of each particular teen participant. This helped teens maintain their willing suspension of disbelief needed to be present in the narrative scene, and it helped teens participate in the improvisation in embodied and visceral ways. Second, on a broader level, it provided a turning point in the dramatic arc across all five enactments. The renewed comfort and familiarity that emerged across teen participants in this scenario constructed an important foundation for transitioning to the final two enactments, which were shorter, did not involve confederates, and had primary activities that involved teens simply contemplating phenomena they encountered during the enactments themselves.

Teens' reactions to this enactment both reaffirmed growing themes across the enactments and also led to new insights. Similar to many aspects of the design of the socially reactive bedroom displays, the gift assemblage even more explicitly projects new forms of virtual possessions that represent 'evidence of action' that reinforce a social relationship. This came in the form of a detailed, annotated music



Fig.8 The third enactment returned to the use of a confederate to help guide the flow, structure, and points of open-endedness in the scenario. This proved to be a viable technique that set the stage for making teens comfortable with more the open-ended and less structured enactments that followed

playlist and also information about the number of times a song has been listened to collectively among teens in a relationship. We found the gifted playlist strongly resonated with teens and in many cases they remarked on how different kinds of metadata could be used to explicitly convey the work that went into crafting a unique digital thing that could be symbolic of a valued relationship. Across these instances, teens commonly speculated on the value in self expression that a digital assemblage in the future could offer when compared to the much less expressive qualities of current digital gifts they had experiences with (e.g., the most common being e-cards).

These discussions helped us better understand that a common factor that shaped teens' perceived value of virtual possessions centered on how they could provide resources for investigating *one-on-one* relationships with a friend. While social computing systems and social network visualisation tools typically emphasise a view of a person's complete network, teens' reactions highly resonated with virtual possessions that provided windows into individual relationships. Teens reacted positively to the digital assemblage and aspects of the socially reactive bedroom displays, and often described how these new kinds of virtual possessions could become aesthetically integrated into their bedroom practices and provide mechanisms for actively expressing the social bond shared with another person. Teens communicated strong desires to see the evidence of the actions taken by themselves and others as a way of understanding who they are with that person and possibly

where their future social relationship will go with them. These findings made clear that there is a need for new interactive tools, applications, and services to support teens in crafting new kinds of virtual possessions to explore, nurture, and support the social processes of developing and sustaining intimate relationships—a crucial part of teen life and one’s development into young adulthood.

8 User Enactment 4: Postcards from Your Past Self

In this relatively brief user enactment, the teen simply sits in the bedroom when a parent arrives with two postcards mailed to her or him (see the top row in Fig. 7.9). The postcards present information and metadata scraped from a teen’s social networking account from 2 years ago. One summarises personal stats, including the number of: friends on Facebook, people they most frequently tagged in photos, un-taggings of self in photos, etc. (bottom right in Fig. 7.9). The other (bottom left in Fig. 7.9) shows an amusement park trip shared with friends, including both social information (e.g. friends that attended, comments about the event) as well as other metadata (e.g. weather and temperature, other events happening that day, celebrities visiting the park that year). After a few minutes, the parent confederate returns to say dinner is ready and the enactment comes to a close.

A core part of teens’ lives is the struggle to find out who they are and who they want to become. We wanted teens to confront the material reality of receiving information from their ‘past’ and probe whether this would be seen as a resource for reflection or a tense reminder of who they once were. In parallel to the unseen record keeping of online interactions (Khovanskaya et al. 2013), we also wanted to probe teens’ perceptions of their online personal information being collected. We aimed to provoke discussion on teens’ technological practices, issues of self-disclosure, and the need to keep these concerns in mind when creating technologies for self-reflection that incorporate new digital materials. We wanted to explore the question of would receiving a physical postcard constructed from old metadata be perceived to support or conflict with self-reflection? And, how far is ‘too far’ for teens to look into their past?

This form, content, and duration of this enactment departed substantially from the one preceding it. There were no confederates involved, the main ‘task’ was to encounter and make sense of postcards from the teen’s past, and, as such, it was a much less structured enactment. Our decision to migrate from the 12-screen display at this point in the study was helped provoke teens to think critically about not only the presence of bedroom technology, but also about their more general technological practices and the potential for unintended consequences to emerge over time (e.g., such as unwanted self-disclosure). Additionally, by the fourth enactment, teen participants were making connections across all of the enactments that they had experienced during the post-enactment interview. These kinds of discussions were particularly valuable as they illustrated teens’ ability to exercise critical judgment in making sense of the distinct yet related potential technological futures they had

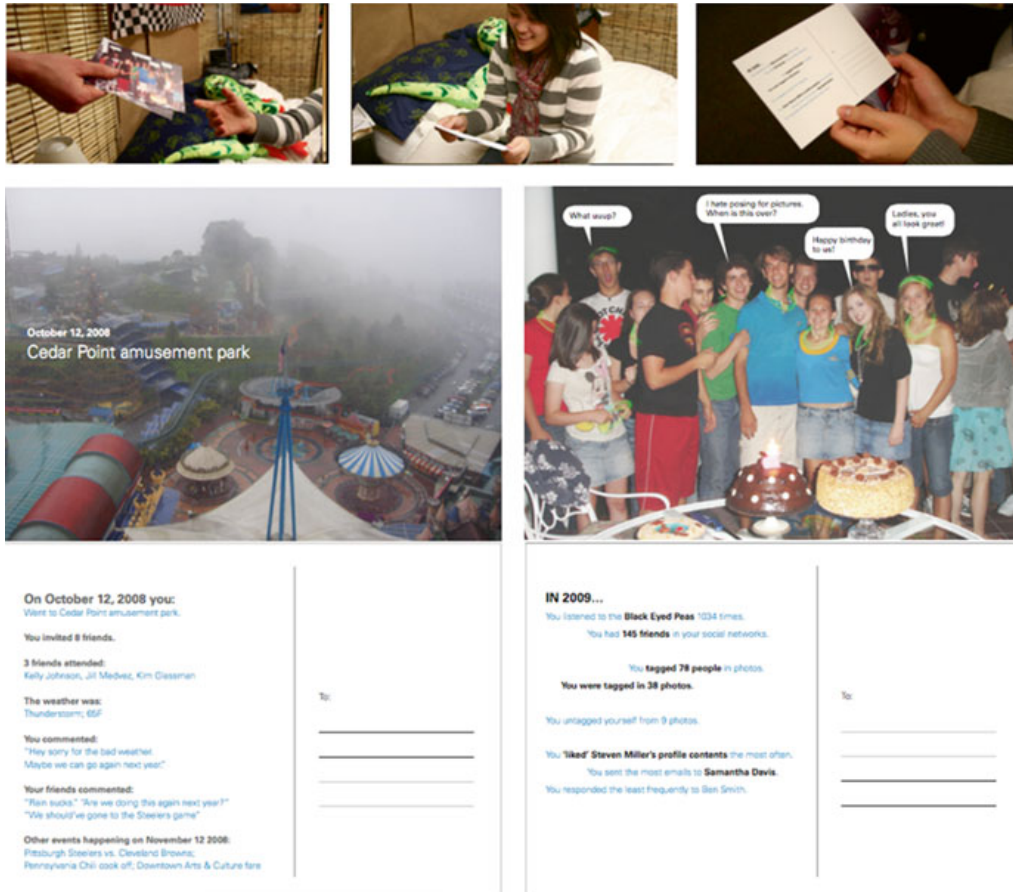


Fig.9 The teen receives two postcards from the past while sitting on her bed in the bedroom (*top row of three images*). Each postcard image has the corresponding information on its back directly below it in the figure. The *left* postcard column depicts information related to an amusement park trip 2 years earlier; The *right* column depicts information on a postcard that summarizes personal stats collected and summarized from the teen's usage of social media services from 2 years ago

experienced. The slower pacing and time for personal meaning-making directly in the enactment, where the participant's attention wasn't heavily structured, emerged as being highly effective at setting the tone for these more in depth and nuanced discussions with teens to emerge.

Despite its simplicity, the postcards from the past enactment was successful at provoking teens to consider how technical systems keep traces of their interactions as metadata and how access to this data could shape their perceptions of virtual possessions. While teens frequently brought up the desire to have more transparency over when traces of their digital interactions are recorded and where they are stored, the content itself on the postcard was largely not regarded as overly contentious. We suspected the personal behaviour summary postcard, which presented machine-captured metadata summarising a teen's behavior from 2 years ago, would cause conflicts by prying 'too far back' into the past to their 'pre-teen' days. Surprisingly, this was often not the case and most teens desired to go much deeper

into their past to understand and explore times in their lives in which they were too young to remember. Somewhat echoing unexpected findings from the first enactment in which participants discussed the Halloween photos from deep in a teen's past, some teens perceived the postcards could stimulate valued ways for co-exploring the past with friends and family members. Importantly, while in the minority, a handful of teens brought up the concern over whether a system like postcards from the past might also introduce the potential to be reminded of fights with parents and friends, which could unsettle events that had been resolved or forgotten. Collectively, these findings suggested teens have a critical need for more sophisticated and value-sensitive tools that could support activities of reflections and reminiscence on the past through new digital materials.

9 User Enactment 5: Managing Your Multiple Digital Selves

In our final user enactment, the teen is sitting in the bedroom after school and viewing four different versions of their social networking profile targeted at four different audiences: family, school friends, sports team, and church (see Fig. 7.10). These are linked to incoming and outgoing digital communication. They enable the teen to post status updates, comments and other content to each group individually. After a few moments she or he receives a text message from a member of the sports team, and this quadrant highlights. She or he reads the text message (on a phone provided to them). A few moments later a different quadrant indicates another text message has arrived from a school friend. The corresponding quadrant highlights and she or he reads that message. The enactment concludes when a parent knocks and asks the teen to get ready for sports practice.

Across our fieldwork, we found teens had developed sophisticated practices for managing multiple digital presentations of self. We tailored the design of this interface to explore how teens would react when confronted with an application that would directly support these behaviours. This interface leveraged the segmented design of the layered panel displays to provoke discussion on the tension teens experience in resolving fragmented identities over time and the role technologies will play in supporting or complicating these practices. We wanted to understand how teens would perceive the ability to explicitly manage different presentations of self to different groups valuable. Are teens disturbed by the explicit fragmentations of their social groups, and the presence of this information in their room?

While its form and content migrated back to focus on the 12-screen display, this enactment exhibited similar overall qualities to postcards from the past. We wanted it to similarly be less structured and place emphasis on teens making sense of phenomena they encountered, and then bring it to a close. Again, this technique was effective at opening a productive space for teens to make connections across enactments and nearly always led to extended post-enactment interviews where teens



Fig.10 The teen receives a text message from a sports team member, which associated with the top right quadrant of the 12-screen display and then checks the text message on their simulated foamcore mobile phone (*top row of images*); The 12-screen display with depicting four different versions of their social networking profile targeted at four different social audiences

commented at length on their encounters in this specific scenario and more broadly on connected experiences and reflection across enactments. This proved to be an ideal way of drawing the dramatic arc across all five enactments to a close.

We expected that, similar to the socially reactive bedroom, teens would find the multiple digital selves application to be contentious, particularly in terms of its explicit segmentation and mediation of their digital presentations of self. During our iterative piloting of this enactment during our prototyping phase prior to the study, we used university graduate students as stand-ins for teens. These students often reacted negatively to the idea of displaying different representations of self to different social groups. Interestingly, when we eventually ran our study with teens, they had entirely different reactions. Teens did have concerns over unwanted self-disclosure (e.g., if someone were to walk into the room and see the displays). However, to our surprise, most teens were entirely comfortable with having multiple digital presentations of self clearly segmented and manageable; they felt like this fragmentation could somehow make their lives seem more manageable. In some cases, they even envisioned how saved records of these fragmentations could provide resources for reflecting on personal growth across life transitions and stages.

One reason for this could be that teens have more segmented lives than other people. They move between their home and bedroom, partially controlled by their parents, and their high school, controlled by both peers and school rules. As they work to construct a self-identity, they have the experience of being at least two people much more than young adults who create a separate life when they leave their parents' home and begin to control their own space. This finding helped us better understand and empathise with how this surface-level fragmentation can be crucial to teens' work to construct a unified life narrative and, in essence, develop a concrete sense of self. These issues also further brought into focus just how different the teen world is from other populations, and that designing for teenagers brings the added complexity of supporting practices, desires, and values that are shifting and evolving at accelerated and unpredictable rates.

10 Discussion and Reflection

User enactments provided a generative research method for co-exploring with teens how a future teenager's bedroom might support (or complicate) their identity construction practices. However, running a user enactments study can be a complex process that requires careful attention to several factors through iterations of prototyping and piloting—particularly when working with a population as sensitive, dynamic, and unpredictable as teens. In line with the goals of this book, the core contribution of this chapter is to articulate our experiences of putting this method to use with teens in the service of surfacing best practices and potential pitfalls. In what follows, we turn attention towards details outside of our direct application of user enactments in summarising what teens reported about participating in this study and reflecting on our studio as the site for conducting the user enactments study.

While teens can be an unpredictable and diverse population to study, our approach was successful at providing a setting for them to draw on their own experiences in making sense of the phenomena they encountered. We followed the last post-enactment interview by posing a final open-ended question to teens about their overall experience of being a study participant. In many cases, teens reported that the moments transpiring just after their parents had dropped them off in our studio at times felt foreign and awkward, if not uncomfortable. However, after the enactments study started, most teens exhibited a sense of relief upon realising they had a private, open forum to convey their frustrations, emotions, insights and speculations on the future-oriented scenarios they encountered. While moments in over the course of the user enactments could at times falter (e.g., the confusing ambiguities often arising from the status quilt enactment), in general the method created a constructive forum for us to invite teens to explore and critically consider their perspectives about what technology ought to be in their lives in the face of an uncertain future.

Interestingly, the candidness that teens exhibited in our studio at times contrasted our prior experiences of conducting qualitative fieldwork in teenagers' actual bedrooms. In our fieldwork there were instances where the looming presence (or potential presence) of another family member prevented teens from feeling fully comfortable with disclosing certain kinds of personal or sensitive information to us. It became clear that the combination of our study engaging with issues that teens could relate to, while occurring within a setting that operated outside of the social structures of their domestic environment created a context where they felt comfortable with openly expressing themselves.

This finding suggests interesting implications for the use of methods like user enactments with teens, which take place within a studio or lab setting. Clearly, conducting a user enactment study is not aimed at achieving ecological validity in that it operates outside of teens' lived-in domestic spaces. Rather, user enactments ask teens to creatively engage with speculative technologies that could exist in a possible future. On the surface, it seems like this more speculative approach could help avoid or reduce ethical issues associated with recording teen behaviors in their homes and being held accountable for unintended disclosure information from these very sensitive settings. Yet, we found teens often exhibited a greater sense of openness in describing their current and past experiences and, especially, their desires, aspirations, and anxieties bound to their undetermined next steps into the future and the role technology might play in this journey. This makes clear that whether in the field or, perhaps especially in contexts in which teens are invited to engage in generative explorations of the future, it is of paramount importance that the data, observations, and insights collected from teens are treated in sensitive and ethical ways.

11 Conclusion

Teens are a fascinating, dynamic population; they are on the vanguard of emerging technologies, often defining the behaviour and social mores of these products and services. At the same time, teens are still exploring and developing into the person they want to become, making them a terribly sensitive group to work with, and making it all the more crucial to critically and carefully consider how new technologies might shape their lives and practices. We need a multiplicity of methods for working with teens in the HCI and interaction design communities. The core contribution of this chapter is to motivate and develop user enactments as a method for moving beyond studies of teens' current practices and generatively engaging them in experiencing and making sense of possible technological futures. In this, we have described and reflected on our own experience of putting user enactments into practice with teens in the service of surfacing best practices and potential pitfalls. Ultimately, we hope this chapter will help better support future research and design practice aimed at engaging teenagers in critically playing a part in determining the roles that technology will play in their lives now and well into the future.

Acknowledgments This work was supported by NSF grant IIS-1017429 and by Google. We thank the teens (and their parents) that took part in the study. We also thank Hajin Choi, Stephanie Meier, Angela Park, and Alena Tesone for their help in developing the teen bedroom user enactments, Pablo Bariola and Haakon Faste for their photographic assistance, and Scott Davidoff for his foundational work on the Speed Dating methodology.

References

- Ackerman M, Mainwaring S (2005) Privacy issues and human-computer interaction. In: Garfinkel S, Cranor L (eds) *Security and usability*. O'Reilly, Beijing/Farnham/Sebastopol, pp 381–400
- Belk R (1988) Possessions and the extended self. *J Consum Res* 15(2):139–168
- Boyd Danah (2007) Why youth (heart) social network sites: the role of networked publics in teenage social life. *Youth, Identity, and Digital Media Volume*, pp 1–26
- Buchenau M, Suri JF (2000) Experience prototyping. In *Proceedings of the DIS, (2000)*, ACM Press, pp 424–433
- Burns C, Dishman E, Verplank W, Lassiter B (1994) Actors, hairdos & videotape—informance design. In *Conference companion of CHI'94*, pp 119–120
- Buxton B (2007) *Sketching user experiences: getting the design right and the right design*. Morgan Kaufmann, Amsterdam/Boston
- Carroll J (2000) *Making use: scenario-based design of human-computer interaction*. MIT Press, Cambridge
- Chawla L (1992) Childhood place attachments. In: Altman I (ed) *Place attachment*. Plenum, New York, pp 63–86
- Cockton G (2006) Designing worth is worth designing. In: *Proceedings of the NordiCHI'06*, pp 165–174
- Davidoff S, Lee M, Yui C, Zimmerman J, Dey A (2006) Principles of smart home control. *Proceedings of the UbiComp '06*, pp 19–34.
- Davidoff S, Lee M, Dey A, Zimmerman J 2007 Rapidly exploring application design through speed dating. In *Proceedings of the 9th international conference on Ubiquitous computing (UbiComp'07)*, pp 429–446
- Durrant A, Frohlich D, Sellen A, Lyons E (2009) Home curation versus teenage photography: photo displays in the family home. *Int J Hum-Comput Stud* 67(12):1005–1023
- Edwards K, Grinter R (2001) At home with Ubiquitous computing: seven challenges. *UbiComp'01*, pp 256–272
- Fitton D, Read J, Horton M (2013) The challenge of working with teens as participants in interaction design. In *CHI '13 Extended Abstracts on Human Factors in Computing Systems (CHI EA'13)*. ACM, New York, pp 205–210
- Friedman B (2006) Value sensitive design. *Interactions* 3(6):16–23. ACM Press
- Giddens A (1991) *Modernity and self-identity: self and society in the late modern Age*. Stanford University Press, Stanford, pp 187–201
- Glaser B, Strauss A (1967) *Discovery of grounded theory: strategies for qualitative research*. Sociology press, Mill Valley
- Goffman E (1959) *The Presentation of self in everyday life*. Double Day, New York
- Hallnas L, Redstrom J (2001) Slow technology: designing for reflection. *Pers Ubiquit Comput* 5(3):201–212
- Hartmann B, Doorley S, Kim S, Vora P (2006) Wizard of Oz sketch animation for experience prototyping. *Adjunct proceedings of the UbiComp 2006*
- Hodkinson P, Lincoln S (2008) Online journals as virtual bedrooms? young people, identity, and personal space. *Young* 16(1):27–46

- Hutchinson H, Mackay W, Westerlund B, Bederson B, Druin A, Plaisant C, Beaudouin-Lafon, Conversy S, Evans H, Hansen H, Roussel N, Eiderbäck B (2003) Technology probes: inspiring design for and with families. In: Proceedings of the SIGCHI conference on human factors in computing systems (CHI '03). ACM, New York, pp 17–24
- Iacucci G, Kuutti K, Ranta M (2000) On the move with a magic thing: role playing in concept design of mobile services and devices. In: Proceedings of the 3rd conference on designing interactive systems: processes, practices, methods, and techniques (DIS '00), pp 193–202
- Ito M, Antin J, Finn M, Law A, Manion A, Mitnick S, Horst HA (2009) Hanging out, messing around, and geeking out: kids living and learning with new media. MIT Press, Cambridge, MA
- Iversen O, Halskov K, Leong T (2010) Rekindling values in participatory design. In: Proceedings of the PDC'10, pp 91–100.
- Kaye J, et al. (2006) To have and to hold: exploring the personal archive. In: Proceedings of the CHI '06, pp 275–284.
- Kensing F, Blomberg J (1998) Participatory design: issues and concerns. *Computer Support Collaborative Work* 7:167–185. Kluwer Press
- Khovanskaya V, Baumer E, Cosley D, Volda S, Gay G (2013) “Everybody knows what you’re doing”: a critical design approach to personal informatics. In: Proceedings of the SIGCHI conference on human factors in computing systems (CHI '13). ACM, New York, pp 3403–3412
- Kirk DS, Sellen A (2010) On human remains: values and practice in the home archiving of cherished objects. *ACM Trans Comput-Hum Interact (TOCHI)* 17(3):10
- Kirk D, Sellen A, Rother C, Wood K (2006) Understanding photowork. In: Proceedings of the SIGCHI conference on human factors in computing systems pp 761–770, ACM
- Kirk D, Izadi S, Sellen A, et al. (2010) Opening up the family archive. In: Proceedings of the CSCW '10, pp 261–270.
- Kurvinen E, Koskinen I, Battarbee K (2008) Prototyping social interaction. *Des Issues* 24:46–57
- Mancini C, Rogers Y, Bandara A, Coe T, Jedrzejczyk L, et al. (2010) Contravision: exploring users’ reactions to futuristic technology. In: Proceedings of the CHI '10, pp 153–162
- March W, Fleuriot C (2006) Girls, technology and privacy: “is my mother listening?” In: Proceedings of the CHI'06
- Miles MB, Huberman AM (1994) *Qualitative data analysis*. Sage, Thousand Oaks
- Nelson HG, Stolterman E (2003) *The design way: intentional change in an unpredictable world: foundations and fundamentals of design competence*. Educational Technology, Englewood Cliffs
- Nunes M, Greenberg S, Neustaedter C (2008) Sharing digital photographs in the home through physical mementos, souvenirs, and keepsakes. In: Proceedings of the 7th ACM conference on designing interactive systems, pp 250–260, ACM
- Odom W, Zimmerman J, Forlizzi J (2011) Teenagers and their virtual possessions: design opportunities and issues. In: Proceedings of the SIGCHI conference on human factors in computing systems (CHI '11). ACM, New York, pp 1491–1500
- Odom W, Zimmerman J, Forlizzi J, Choi H, Meier S, Park A (2012) Investigating the presence, form and behavior of virtual possessions in the context of a teen bedroom. In: Proceedings of the SIGCHI conference on human factors in computing systems (CHI '12). ACM, New York, pp 327–336
- Odom W, Zimmerman J, Davidoff S, Forlizzi J, Dey A, Lee M (2012) A fieldwork of the future with user enactments. In: Proceedings of the designing interactive systems conference (DIS '12). ACM, New York, pp 338–347
- Odom W, Zimmerman J, Forlizzi J (2014) Placelessness, spacelessness, and formlessness: experiential qualities of virtual possessions. In: Proceedings of the 2014 conference on designing interactive systems (DIS '14). ACM, New York, pp 985–994
- Palen L, Dourish P (2003) Unpacking “privacy” for a networked world. In: Proceedings of the CHI'03, pp 129–136

- Peesapati S, Schwanda V, Schultz J, Lepage M, Jeong S, Cosley D (2010) Pensive: supporting everyday reminiscence. In: Proceedings of the CHI '10, pp 2027–2036
- Petrelli D, Whittaker S, Brockmeier J (2008) AutoTopography: what can physical mementos tell us about digital memories? In: Proceedings of the SIGCHI conference on human factors in computing systems (CHI '08). ACM, New York, pp 53–62.
- Read J, Horton M, Iversen O, Fitton D, Little L (2013) Methods of working with teenagers in interaction design. In: Proceedings of the CHI '13 extended abstracts on human factors in computing systems (CHI EA '13). ACM, New York, pp 3243–3246
- Read J, Horton M, Fitton D, Little L, Beale R, Toth N (2013) On being cool: exploring interaction design for teenagers. In: Proceedings of the 27th international BCS human computer interaction conference (BCS-HCI '13), Steve Love, Kate Hone, Tom McEwan (eds) British Computer Society, Swinton, Article 10, 10 p
- Simon HA (1996) The sciences of the artificial. MIT Press, Cambridge, MA
- Steele J, Brown J (1995) Adolescent room culture: studying media in the context of everyday life. *J Youth Adolesc* 24(5):551–576
- Taylor A, Harper R (2002) Age-old practices in the ‘new world’: a study of gift-giving between teenage mobile phone users. In: Proceedings of the CHI '02, pp 439–446
- Tohidi M, Buxton W, Baecker R, Sellen A (2006) Getting the right design and the design right: testing many is better than one. In: Proceedings of the CHI'06
- Van House N (2009) Collocated photo sharing, storytelling, and the performance of self. *Int. J. Hum.- Comput. Stud.* 67(12):1073–1086. Vetere F et al. 2005 Mediating intimacy: designing technologies to support strong-tie relationships. In: Proceedings of the CHI '05, pp 471–480
- Vetere F, Gibbs M, Kjeldskov J, Howard S, Mueller F, Pedell S, Mecoles K, Bunyan M (2005) Mediating intimacy: designing technologies to support strong-tie relationships. In Proceedings of the SIGCHI conference on human factors in computing systems (CHI '05). ACM, New York, pp 471–480
- Voida A, Grinter RE, Ducheneaut N, Edwards WK, Newman MW (2005) Listening in: practices surrounding iTunes music sharing. In Proceedings of the SIGCHI conference on human factors in computing systems, pp 191–200. ACM Press
- Woodruff A, Augustin S, Foucault B (2007) Sabbath day home automation: “it’s like mixing technology and religion”. In Proceedings of the CHI'07, pp 527–536
- Wright P, Wallace J, McCarthy J (2008) Aesthetics and experience-centered design. *ACM Trans Comput Hum Interact* 15(4):Article 18
- Zimmerman J (2005) Video sketches: exploring pervasive computing interaction designs. *IEEE Comput* 4:91–94