My dissertation project extended our wiki engine to support personal home pages in academia, a prominent setting where personal home pages have a vocational purpose. I designed the AniAniWeb system to better support the composition process and enable collaborative contributions. Others began adopting AniAniWeb in September 2003. For the research, I conducted a case study of six of these adopters, understanding their use with three analytic frameworks: media theory, communities of practice, and core identity theory. One larger emergent theme was the importance of the multiple-audience problem—the same home page is seen by many different audiences (colleagues, friends, family, potential employers, etc.) with different needs and expectations. This problem was particularly pertinent to this context as AniAniWeb adopters created three times more content than a comparison group using conventional technology [13]. Most found the system convenient enough to add information that was intended for themselves, such as a “to do” list. Thus, both the amount of information and the number of audience categories was increased. Adopters who wanted to separate content and audiences found it difficult; as a medium for broadcasting identity to oneself and others, personal home pages encourage an integrating self epistemology [13]. One defense against the multiple-audience problem is access control. Based on observed usage and interviews with users, I was able to implement a useful and usable system of access control that addressed many of the discovered needs [12].

In November 2007, I began a three-year postdoc working with Yvonne Rogers on the ShareIT project. ShareIT is an interdisciplinary collaboration between Rogers’s Pervasive Interaction Lab (Computer Science, Open University) and Nicola Yuill’s Children and Technology Lab (Psychology, University of Sussex) to investigate how new shareable technologies can support colocated collaboration between both children and adults. As lead technologist, my main role is to develop innovative applications for shareable technologies, often working closely together with others to design and refine applications. My work has concentrated on interactive tabletops, which allow multiple users to interact concurrently with the same device through touch input. While interactive tabletops have been around for nearly a decade, we are only starting to realize their potential to support collaboration and collaborative learning.

Understanding the potential of new technology requires concrete experiences. As a first foray into interactive tabletops, I ported Lamberty’s DigiQuilt [9] to the DiamondTouch tabletop [3], terming my version DigiTile to distinguish it from the original. I was familiar with DigiQuilt, having contributed code to polish the application, and felt that it might support collaborative learning. By adapting an existing design, rather than starting anew, I was able to save significant design / development time [19]. I was pleasantly surprised at how well children worked together with DigiTile. So far, DigiTile has been used in three classroom studies. Pairs were able to work together to accomplish difficult fraction challenges and showed significant gains in
post-test evaluation [20].

One central mission of ShareIT is to understand the difference between how adults and children use these technologies. As previous work had already investigated how adults work together on a planning task [11], we next developed a desk arrangement and seating allocation task for children. Unlike with DigiTile, I did not carry out the prototype phase for OurSpace; my contribution was to transform the paper-based prototype into usable software. In the attendant study, we compared how groups of three worked together in two modes, one that allowed concurrent interaction and one that enforced turn taking. This allowed us to investigate the value of concurrent input for collaboration [8]. Because interactive tabletops can log user activity, we were able to investigate how the position of the children at the tabletop affected the parts of the design space that children accessed [17]. We have also been able to use this work to characterize how children collaborate on a design task [4] and how they deal with design conflicts [10].

Building on my previous research on collaborative games [21], we are currently developing a collaborative game where groups of three work together to solve a mystery. Every round, each detective travels to a location on the game board to receive an individual clue on their handheld device (iPod Touch). To share clues and manage the large amounts of information, we provide a simple mind-map application on the interactive tabletop (DiamondTouch). We are nearing the end of the design phase, having created a game that is challenging, engaging, and requires working together. In the research phase, we will investigate how the composition of groups (e.g., all adults, all children, families) affects collaboration at the tabletop.

These projects demonstrate three characteristics of my research. First, the research investigates the potential of new media before they gain wide acceptance. While Wikipedia is now a household name, that project was not even conceived when we began our work on wikis. When I began research on interactive tabletops, no commercial hardware was available; now, these are starting to become available, though the dearth of quality software is still a significant barrier to widespread adoption.

Second, it is design-based research. As Alan Kay famously surmised, “the best way to predict the future is to invent it.” Early work can have a great impact on how technology is adopted [1]. I aim to provide that early work. For me, the quality of such research is dependent on the quality of the design; therefore, I place a high value on creating robust, elegant, and powerful designs [18], even if achieving this requires numerous design iterations and a commitment to revisit design decisions that have proven to be mediocre. At last count, over 300 classes at GT have use CoWebs in architecture, English composition, engineering, mathematics, CS, etc. Even now, five years since the research has ceased, CoWebs are still being actively used at Georgia Tech. AniAniWebs are also still being used, although I intentionally tried to limit adoption as I could not count on the service being supported long after I graduated Georgia Tech. DigiTile is robust enough that a teacher was able to administrate the tabletop independently for a two-week study.

Third, the work is interdisciplinary, relying on insights from education, psychology, and human-computer interaction. While I am knowledgeable in these areas, I have enjoyed working with others whose expertise complement my own. In the future, I aim to continue seeking such partnerships in education and psychology. I have also found it useful to work closely with teachers and users in both the design and study phase of the research.

In the near-term future, I plan to continue my work on supporting co-located collaborative learning with interactive tabletops and other shareable technologies. In the last two years, my development framework for tabletop applications has matured, making me more productive as a developer and making it easier for others (e.g., fellow researchers, teachers) to configure and run the applications without my support. I have created useful widgets, such as a unified menu system and a sophisticated virtual keyboard that supports shape writing. As a result, it is now much easier for me to create new, sophisticated applications. In total, I have created six different tabletop applications and am well set to create further ones in the future. One research direction I hope to address is how multiple technologies (handhelds, tabletops, whiteboards, etc.) can work in concert to support classroom learning [14].

Given the early nature of my research, it is imperative for me to take a leadership role in introducing and supporting new researchers to the field as it expands beyond technologists. For interactive tabletops, I have taken several concrete steps in that direction. I am submitting a workshop on using interactive tabletops to support collaborative learning to ICLS 2010. Based on the significant research interest, I organized a mailing list for Children and Interactive Surfaces, UK. That mailing list has thirty subscribers and we are currently planning our third face-to-face meeting for early 2010.

As my research is on new media, the exact focus will invariably change as new technologies become available. While the technology will change, my aim will continue to be supporting collaboration and collaborative learning; therefore, I view computer-supported collaborative learning as my primary research field. As a computer scientist, I need to be aware of work in the field of human-computer interaction / ubiquitous computing and thus plan to submit to CHI and related conferences. I have enjoyed developing software for children and aim to continue that line of research in the future, targeting the IDC (Interaction Design and Children) conference.
References


