GENDERIZING HCI

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1 Introduction

In this chapter I'll discuss video games as an example of how a technology has been designed for a particular gender, and how this design process illustrates a particular relationship between gender and the design of human-computer interfaces, and technology in general. I'll label that relationship a *genderization* of IT, and I'm going to come back to that sarcastic wording a little later. The goal of this chapter is to problematize the endeavor of trying to figure out solutions to designing information technologies for girls and women. I'm going to make that look even harder than we already thought it was by showing some of the unintended consequences of some of our well-meaning solutions. I argue that girls were for a long time not taken into account in the design of computer games; however designing games "specially for girls" risks ghettoizing girls as a population that needs 'special help' in their relation to technology. In contrast to this stance, my own design philosophy, which I call "underdetermined design," encourages both boys and girls to express aspects of self-identity that transcend stereotyped gender categories. In the course of the chapter, I'll end up by questioning the following *a priori*: In designing technology, do we even want to talk about how and whether girls are different from boys? Who cares about those differences – about whether their *wetwear* is different? I believe that there *are* differences, and important ones at that. But, until we can get away from a kind of a *deficit model* of girls and technology, we may need to watch our step in designing explicitly with one gender in mind.

In fact, gender as an analytic category only emerged in the late twentieth-century. Earlier theorists referred to primary oppositions between men and women, or to the "woman question," but they did not employ gender as a way of talking about systems of sexual or social relations (Scott, 1986). Today, however, the binary opposition between the sexes carries much weight, and leads us to speculate about 'masculine' and 'feminine' qualities, likes and dislikes, and activities. We have become used to seeing 'masculine' and 'feminine' as natural dichotomies—a classification system that mirrors the natural world. The binary opposition between masculine and feminine is a purely cultural construct however -- and a construct that is conceived of differently in different cultures, historical periods, and contexts. Thus, in some cultures fishing is women's work, and in others it is exclusively the province of men. In medieval times, women were considered to be sexually insatiable; the Victorians considered them naturally frigid (Scott, 1986). The Malagasy of Madagascar attribute indirect, ornate, and respectful speech that avoids confrontation to men; women are held to be overly direct and incapable of repressing their excitability and anger

(Keenan, 1974, cited in Gal, 1991). In the U.S., however, men's speech is described as "aggressive," "forceful," "blunt," and "authoritarian," while women's speech is characterized as "gentle," "trivial," "correct," and "polite." (Kramarae, 1980, cited in Gal, 1991).

A lot of the dialogue about gender and technology mirrors this essentialist trend – girls, boys, can't, can -- and that's something we don't want to take for granted, and that may not be serving us well. The structure of this chapter is as follows:

- First, some statistics about who uses a computer, what they do with the computer, and what they believe about the computer.
- Then an extended example from video games, illustrating how these statistics were used to launch an entrepreneurial movement to build video games for girls.
- The course of the girl games movement, and what some of the consequences were.
- Three different design strategies within that girls game movement
- Finally, some conclusions and some applications of that work to other information technology design domains, for example, Women on the Web.

2 Background

In this section I'll talk about the background that led to the girls' game movement – that is, the statistics about differential use of the computer – and how those statistics led to different design philosophies

2.1 Boys' and Girls' Differential Use of Computers

First some data on who uses the computer, and who the computer is perceived as belonging to. Both girls and boys in kindergarten judge the computer to be a boy's toy (Wilder, Mackie, & Cooper, 1985), and children of that age already demonstrate a gender gap in use, with boys spending more time than girls at the computer – a gap that increases between the ages of two and seven years (Huston, Wright, Marquis, & Green, 1999). The magnitude of this difference between boys and girls continues to increase with age; thus, among fourth through sixth grade students "heavy users" of computers are overwhelmingly boys—the ratio of boys to girls is 4 to 1 (Sakamoto, 1994). Among secondary-school aged children (eleven to eighteen years), boys are at least three times more likely than girls to use a computer at home, participate in computer-related clubs or activities at school, or attend a computer camp. In 1982, only 5% of high school girls, as opposed to 60% of boys, enrolled in computer classes or used the computer outside of class time (Lockheed, 1982). More recent statistics come from a 1998 survey that demonstrated that high school boys predominate in all kinds of computer classes (design and technology, programming desktop publishing, artificial intelligence) except for word processing, where girls predominate (AAUW Educational Foundation Commission on Technology, 2000). Teachers appear to depend on similar gender stereotypes in their assessment of students. Culley (1993) found that teachers attributed secondary school girls' high computer exam scores to hard work and diligence, while boys – even those who did less well on exams – were thought to have intuitive interest, and a

"flair" for computers. And despite the increasing prevalence of computers in schools and homes, these statistics have not changed significantly since the early 1980s (AAUW Educational Foundation Commission on Technology, 2000). While the majority of studies have examined the state of affairs in North America, the same situation is found internationally (Janssen Reinen & Tjeed, 1993; Makrakis, 1993).

What are children using the computer for, both boys and girls? Giacquintta, Bauer, and Levin (1993) found that by third grade, boys conceptualize computers differently than girls. Boys are more likely to play games, to program, and to see the computer as a playful recreational toy. Girls tend to view the computer as a tool, a means to accomplish a task, such as word processing or other clerical duties (Ogletree & Williams, 1990); (Culley, 1993). In an informal study of an inner city after-school computer program, I asked boys and girls why they were there. The boys tended to find the question ridiculous. One said, for example, "it's fun. I mean, there are all these computers for me to play with." The girls tended to be far more serious in their answers. One said, "well, I really think this is a good opportunity for me to better my situation in life and I believe that I can get a better job if I know how to use a computer." Adult women are also more likely than men to report that they see the computer as a tool rather than as an interesting artifact in its own right (Bennett & Honey, 1998). That difference in how the girls and boys see their involvement with computers turns out to be mirrored by how designers see boys and girls. When educators with software design experience were asked to design software specifically for boys or for girls, they tended to design learning tools for the girls and games for the boys. When they were asked to design software for generic "students," they again designed games—the type of software that they had designed for boys (Huff & Cooper, 1987). If this seems difficult to comprehend, an illuminating parallel can be drawn from cooking. Before James Beard began to host a television cooking show in 1946, home cooking in America was a woman's domain, and it was thought to be unmanly to cook at home[1]. James Beard explicitly addressed the notion that men could cook, and he said it was fun. What was the result? Once men could cook and it was fun, domestic devices for the kitchen were no longer called "appliances" but "gadgets." Think of the electric rotisserie, the bread machine, the coffee maker – when men took over kitchen technology, cooking began to resemble a game.

2.2 Men' and Women's Differential Involvement in Information Technology

Let's look at what happens when these kids grow up. Men report more interest in computers than women do (Giacquinta et al., 1993); (Morlock, Yando, & Nigolean, 1985), and men are more likely to work in computer-related fields. In 1990, approximately 70% of all employed computer specialists were men, a figure which had not changed throughout the 1980s, despite the fact that the computer fields were growing rapidly. In addition, the 30% of women in these fields were concentrated in lower-paid, less prestigious jobs (Kramer & Lehman, 1990). Although the computer industry continues to grow and to diversify, the statistics are still dismally weighted towards men. According to the most recent CRA Taulbee Survey (*2000 CRA Taulbee Survey*

[1] It was unmanly even to *enjoy* food too much. As a 1937 self-help book advised "when the waitress puts the dinner on the table, the old men look at the dinner. The young men look at the waitress" (Burgess 1937 cited in Stern & Stern, 1991).

Results, 2001), only 19% of the Bachelors degrees in Computer Science or Computer Engineering were awarded to women. Women received 26% of the Masters degrees, 15% of the Ph.D.s, and constituted 18% of currently enrolled Ph.D. students. In addition, 14% of assistant professors, 13% of associate professors, and 8% of full CS professors were female among the 214 universities surveyed. Unpleasantly enough, those statistics are getting worse and not better, and in fact, over the last decade there's been an overall 24% decrease in the number of women getting degrees in computer science.

But why worry, one might ask? What's the big deal? Who wants children to spend their time face-to-face with a computer? Some parents say, "So, my little girl doesn't want to play with a video game? Shouldn't I be happy? I mean, shouldn't I say, I've got a daughter who is getting outside? So, maybe it's disposition, maybe it's just a different way of seeing the world, a different thing that girls and boys like. Like, girls don't play with lawnmowers as much as boys do either, and no one's getting all upset about it." The response is that there are a couple of reasons to worry. One is that in today's job market, computer literacy is important, and it's only getting more important. In fact, the National Science Foundation has predicted that, by 2010, one in four jobs in America will require computational literacy. Not just computational literacy, but the higher paying the job is, the more technical fluency is required. Computer games constitute the most frequent use of computers for children aged 2 to 18 years (Roberts, Foehr, Rideout, & Brodie, 1999). And, computer and video games bootstrap computer literacy (Greenfield, 1996; Kiesler, Sproull, & Eccles, 1985), and so that means that if girls are playing fewer computer games, they may be getting less technical fluency than boys; boys are then getting higher paid jobs that require that fluency, and girls aren't having access to those jobs.

We should also worry because there is evidence that the problem is not one of inherent interest or ability but of access (Kinnear, 1995). Kiesler et al (1985) report:

> Even in preschool, males dominate the school computers. In one preschool, the boys literally took over the computer, creating a computer club and refusing to let the girls either join the computer club or have access to the computer. As a result, the girls spent very little time on the computer. When the teachers intervened and set up a time schedule for sharing computer access, the girls spent as much time on the computer as the boys.... Apparently, girls can enjoy the computer and do like to use it, but not if they have to fight with boys in order to get a turn. (p. 254)

In another study, first grade girls working on the computer in mixed-gender groups were more likely to be laughed at, criticized and have their competence questioned than when they were working alone or in all-girl groups. In addition, the girls were frequently interrupted by male students, whereas the reverse was not true (Nicholson, Gelpi, Young, & Sulzby, 1998).

In fact, continued exposure to computer games decreases pre-existing gender differences (Greenfield, 1996), and when educators really make an effort to ensure that girls have equal time to spend on the computer, girls show equal ability in programming (Linn, 1985) and in technology-enhanced science classes (Mayer-Smith, Pedretti, & Woodrow, 2000). And Woodrow (1994) found that boys' greater experience and more positive attitude towards computers did not actually result in higher performance with computers.

A final reason to worry about these findings comes from girls' own perception of the correlation between gender and computer use. Many girls do not believe that they're good at math or at computer science (Busch, 1996), but those who **are** good at computers may not believe that they are good at being girls. An example comes from responses that I received several years ago to an advertisement looking for research assistants to work on the topic of gender and computer games. I received many many responses. And many of the responses from the young women went along the lines of: "please, please, please hire me. All my life I've been waiting for this, I really have to look at this issue, this is so important to me. It's not important to me personally because I wasn't raised like a girl, but my younger sister isn't good at the computer." Similar comments were reported by (Huber & Schofield, 1998). What those girls are saying is that they are technically fluent, but that's because they are not real girls, and that to me is the saddest thing of all. That one should find one's gender to be incompatible with one's abilities, and that one should have to deny one's gender in order to accept one's abilities.

3 Hey! Let's Design Computer Games for Girls!

In the mid 1990s unprecedented numbers of women were becoming entrepreneurs, starting new businesses, at twice the rate of men in fact, and many of these women were thinking that these businesses could do some kind of good in the world (Moore & Buttner, 1997). Many of these women saw their entrepreneurial enterprises as explicit sites to undermine conventional and stereotypical notions about 'woman's place', and to explicitly help the next generation of women to feel empowered (Goffee & Scase, 1985). Having looked at the same statistics we discussed above, some of these entrepreneurs started companies to equalize the playing field for girls in technology.

At this point in time, until around 1996, fewer than 25% of game purchasers were girls. In terms of use, as well (counting the fact that girls sometimes went to boys' houses to play with games) statistics were still in the 20%. When girls did play videogames, they found little to welcome them. In a study of 100 arcade games (cited in Provenzo, 1991), 92% contained no female roles whatsoever. Of the remaining 8%, the majority (6%) had females playing the "damsel in distress," and 2% had females playing active roles. More recently, in 1998, *Next Generation* magazine concluded that despite dramatic increases in the number of female game characters, "they all seem to be constructed around very simple aesthetic stereotypes. In the East, it's all giggling schoolgirls and sailor uniforms, but in the West the recipe appears to be bee-sting lips, a micro-thin waist, and voluminous, pneumatic breasts" ("Girl Trouble," 1998).

Of course, not all of the companies reading statistics about how few girls played videogames had feminist goals. Thus, some of these entrepreneurs, and some other established companies, regardless of the good that they could do in the world, looked at these statistics and realized that there was a whole unexploited market out there to develop. The net result was that, in the mid 1990s, a number of companies began to build computer games or video games for girls. In what follows, the terms "computer game" and "video game" will be used interchangeably. Of course, they aren't strictly interchangeable, originally video games were games that were played on a console, like Nintendo or Sega, but today, most of these games have been translated into home

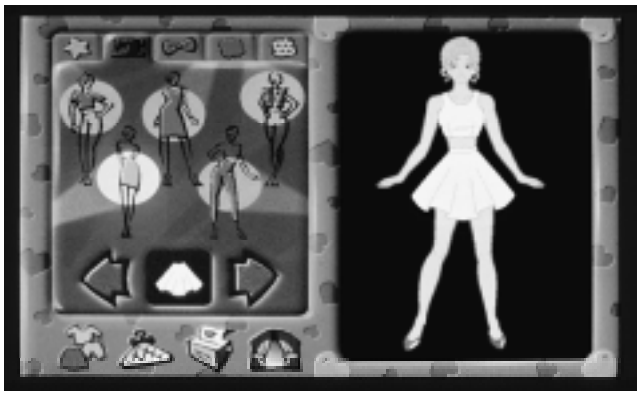

Figure 1: Barbie Fashion Designer Software
Barbie(tm) Fashion Designer(tm) image courtesy of Mattel, Inc.

computer use and many of the consoles – for example, the new Sony play station with its internet capability -- are starting to look more like computers.

3.1 Barbie Fashion Designer: Designing for "the Girl"

Thus, these companies began to build video games for girls. So many small software companies opened, and so many of the larger companies joined the bandwagon, that the phenomenon acquired the name of the "girl's game movement." But the game that initiated the trend, and that led the other companies to think that there was a niche, was Barbie Fashion Designer.

Barbie Fashioner Designer allows players to design clothes for a Barbie doll, and then put them on a virtual Barbie doll and have that Barbie doll walk down the runway; likewise, the designs can be printed on special fabric that comes with the kit, cut out and sewn into clothes for a physical Barbie doll. One of the interesting things about Barbie Fashioner Designer, as Subrahmanyarn & Greenfield (1998) have argued, is that it's not a game *qua* game, it's a game as accessory for doll play. This means that as software it still fits into girls' existent Barbie play. BFD did extraordinarily well on the market: 500,000 copies sold during its first two months, which is more than the industry expected – more than any other children's software title in history. From the angle of genderizing IT, one of the interesting aspects of this Mattel game is that, while relying on stereotypical doll play, it confounds stereotypes by inviting girls to build, to construct, to imagine. In fact, when I invited some MIT undergraduates to play with a whole series of girl games, many of the students said that the game they preferred was Barbie Fashion Designer. In fact, one young man said, more honest than many in the class, "yeah, this was like totally the kind of game that when I was a kid I would have said, eeww, that's for girls . . . make the skirt red!"

3.2 Other Games for "the Girl"

Many of the girls games that arrived on the market around the same time as Barbie Fashion Designer also involved stereotypical girl play. Purple Moon's first game was called "Rocket's First Day at School". A press release for Purple Moon describes its products as "guided by the complete and unique understanding of girls and girls' play motivations" which emerged from "thousands of hours" Purple Moon's Brenda Laurel told *Wired* (Beato, 1997), "I agreed that

whatever solution the research suggested, I'd go along with. Even if it meant shipping products in pink boxes." of research. Rockett games involved social relationships, and are described as "friendship adventures for girls." Players can decide what Rocket's next step will be during the day. Thus, for example, on Rockett's first day, she arrives at the front door of her school to find another girl wearing exactly the same outfit. Players can decide: Does she make friends with the person, does she go home and change or does she stomp into school?

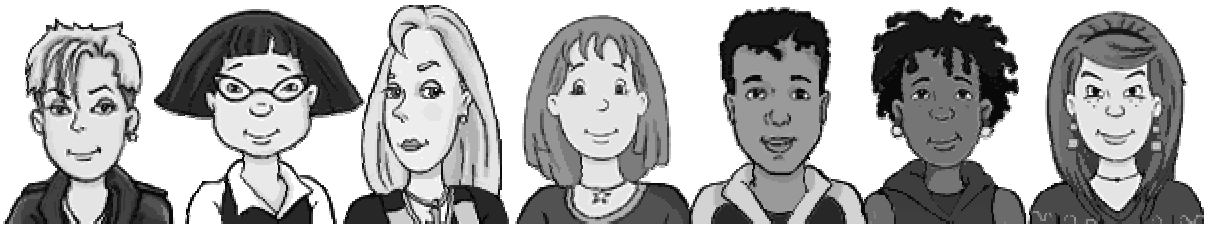

Figure 2: Characters in the Rockett Software
Purple Moon® image courtesy of Mattel, Inc.

Another game from the same era that also relied on research about girls' stereotypical interests, was called Talk About Me. The heroine of this game is the player herself who can look up horoscopes, answer quizzes about romance, read interviews with potential role models who talk about how they mix family and work, and test out clothing mixes and matches. The software also has a space for the girl to keep a diary.

Figure 3: Let's Talk about Me Software

These three games, representative of the others as well, demonstrate that the software put out during this initial phase of the girls game movement was designed for *the* girl. That is, in the toy industry, boys' toys are divided by type of boy. Thus, there are toys designed for jock boys, and geek boys, the action-oriented boy and the simulation game boy. In computer games, likewise, software game companies market action games, adventure games, fighting games, physical skill

games, sports, role playing, simulation – and each of these targets a different segment of the population. The software we've just reviewed, however, demonstrates a rather unidimensional and stereotypical view of girlhood. And software for boys, although more varied, still conveys stereotypical notions of what it means to be a boy. The situation can be compared to 1960s and 1970s feminism, which sought to break down the fixed ascription of gender roles, promoting a ideal where everyone was free to choose identities and activities they found most comfortable. Marlo Thomas's *Free to Be...You and Me* (1974) for example, as a book, record, and television special, encouraged boys to explore their feelings and to play with dolls, and sought to encourage more competitive attitudes in girls. As Sherry Turkle explained during a *Nightline* (Nightline, 1997) discussion of the girls' games movement, "If you market to girls and boys according to just the old stereotypes and don't try to create a computer culture that's really more inclusive for everyone, you're going to just reinforce the old stereotypes....We have an opportunity here to use this technology, which is so powerful, to make of ourselves something different and better."

3.3 Isn't Traditional Femininity a Viable Option?

The games for girls depended on traditional and stereotypical visions of girlhood. But, what's wrong with fostering a space that's girl only? Can't traditional femininity be good, be a viable choice for girls and women? And, what's so great about these other "boy games" anyway? They can encourage violence, certain kinds of competition. Why not foster different social and cultural values than those which dominate the boys game market? So, highlighting traditional femininity and demonstrating that it's okay is one very good thing about these girls games. Girl Games' Laura Groppe argues, "I want girls to know that it's OK to be a girl!" (Russo, 1997). Seiter (1993) calls on us to value girls' cultural tastes and interests, even as we push towards more empowering fantasies, since there are so many other forces in society that belittle and demean girls. As Seiter notes:

> Something was gained and lost when marketers and video producers began exploiting little girls as a separate market. Little girls found themselves in a ghettoized culture that no self-respecting boy would take an interest in, but for once, girls were not required to cross over, to take on an ambiguous identification with a group of male characters.... The choice is not made out of identification with an insipid and powerless femininity but out of identification with the limited sources of power and fantasy that are available in the commercial culture of femininity.

4 No! Let's Appropriate Games for Boys

Historically, gender was an unexploited category in video game design, with male designers developing games based on their own tastes and cultural assumptions without considering how these approaches might be anything other than gender-neutral. *Nightline* (Nightline, 1997) quoted Id's Todd Hollenshead, "What we try to do is make games that we think are fun and they're not targeted to any specific gender." Yet, we live in a culture where the male or the masculine remains the invisible norm. Women may dress in male clothing, but not vice-versa. Girls play with boys'

toys, but boys are ridiculed for playing with girls' toys. As long as the male choice is the norm, unselfconscious efforts are likely to simply perpetuate male dominance. And, this does seem to have been the case with videogame design--remember Huff & Cooper's finding that when game designers designed for "children," they designed products identical to those they designed for boys (and different than those they designed for girls).

Thus, when faced with an unexplored market, some software companies dealt with the issue of designing for girls quite differently – rather than shifting the content, they added new characters to existant games, and gave those characters female bodies (in some parallel universe of wasp-waisted females). This character was not always a draw for girls, but it was a nod in the direction of the female audience. As one 12- year-old girl said after switching from the single female character in the game "Odyssey" to one of the male characters, "I don't like the way she dies. The male characters scream when they're slaughtered. The female character whimpers." An example of this strategy comes from Sega, who introduced female protagonists into many of its fighting games, giving them strengths and capabilities that are attractive to both male and female players, and then giving them supermodel bodies. As Lee McEnany Caraher, corporate spokesperson for Sega in North America, said

> The girls are babes in our game; they're babes. You know, they have big breasts and they wear scanty clothes. But the clothes don't fly off and that kind of stuff. I don't have a problem with representing women as babes, because when I go to the gym that's what they look like. They're not "gorgeous-gorgeous" but they're built. And if you were a real martial arts contender, you'd be built too (Glos & Goldin, 1998).

Figure 4: Female Fighter from Soul Caliber (released Sept. 1999)

There are women and girls who are passionate about playing these computer games that have traditionally been geared towards men. Many of these women, who call themselves "game grrrls,"

see video games as highly competitive and that competitiveness as being key for the acquiring the kind of skills needed in the real world. They see combat games as essential places for men and women to compete w in an arena where physical strength doesn't play a role. They reject what they see as a very traditional and old-fashioned view of femininity from the girls games movement, all the while criticizing the characters that they find in boys games as being the product of male erotic fantasies.

4.1 Isn't Appropriation a Viable Option? The Case of Lara Croft

Let's look at Lara Croft as an example of differing views on the appropriation of traditionally male games. Laura Croft TombRaider was introduced in 1997, around the same time as Barbie Fashion Designer. In the marketing of the game, Core Designs said that this was a game that was targeted equally towards men and women, that Laura Croft was a strong independent woman. One of the designers, Toby Gard, said

"Laura was designed to be a tough self-reliant, intelligent woman."

Which is great, because it's good to have strong role models for girls in computer games. And, then he continued,

> "she confounds all the sexist clichés, apart from the fact that she's got an unbelievable figure, strong independent women are the perfect fantasy girls, the untouchable is always the most desirable." (Whitta, 1997)

This is no longer a comment about girl players. Who are we designing for here? As Cal Jones said in *PC Gaming World*

> the problem with Laura is that she was designed by men for men. How do I know this, because if you genetically engineered a Laura shaped woman she would die within around 15 seconds, since there's no way her abdomen could house all her vital organs (Jones, 1997).

Figure 5: Lara Croft, Tomb Raider

Female gamers have also objected to many of the company's efforts to promote the game to male players, including their hiring of a scantily clad female model to impersonate Crofts at computer trade shows, or the development of an ad campaign based on the theme "Where the Boys Are" and showing lusty boys abandoning strip clubs in search of Lara (Brown, 1997). An underground industry in home-developed nude shots of Lara Crofts, including a Nude Raider website, suggest the dangers in linking female empowerment to images couched in terms of traditional sex appeal (Whitta, 1997). And game magazine coverage of Lara Crofts and the attempts of other game companies to imitate "Tomb Raider"'s success explain the phenomenon almost entirely in terms of her erotic appeal to young male players. Corrosive Software's Kate Roberts asks, "Would Tomb Raider have sold as many copies if Lara had been wearing a nice warm sweater and sweatpants" ("Girl Trouble," 1998).

This is the other side of the coin. To use the computer do girls have to be girly-girls, or tomboys? Aren't other options open? That is, many of these games are leading to -- undoubtedly unintentional -- increased gender stereotypicity. That is, increased gender stereotypicity may be one unintended outcome of this attempt to give girls increased access to technology. When one reads designers's comments, one can see how that happens. "Barbie may not be your favorite role model, but this is what girls want, we just give girls what they want." They want Barbie, we give them Barbie. "We wanted to give the girls game cooties so boys wouldn't want to play with it." "Boys and girls are just different, boys like competition and violence and girls just like intricate, narrative and exploring social relationships."

5 What are "Boys" and "Girls" Anyway?

These statements may be true for many girls and many boys, but they are not true for all girls and boys. And, they are certainly not accurate depictions of girlness and boyness, which are quite context dependent. Because gender is a context dependent notion. Meanings for the opposition between male and female differ by historical period and by culture, and described above. They also differ in particular contexts within one historical period and one culture. Kafai asked children to build video games to teach math. It turned out that there were real differences between the video games the girl built and the video games that the boys built to teach math. The girls' games were a lot about relationships among people, a drama or a plotline, and the boys games were a lot about achieving intermediate goals on the way to a final goal (Kafai, 1996). A couple of years later, Kafai ran a very similar study: she once again asked boys and girls to build video games, but this time to teach science. And this time she found no differences between boys and girls (Kafai, 1998). Teach math, big differences, teach science, no differences. We don't know why the context of science elicits fewer differences between boys and girls than the context of math does, but it does. Likewise, Hertig (Hurtig, Kail, & Rouch, 1991) showed that when asked to categorize the people in a photograph of "successful executives," viewers named the photo as being of "men and women." When different viewers were asked to categorize the people in the same photograph, this time called a photograph of "a group of friends," the categories of male and female did not come into play. Hurtig concludes that sex is only a variable when gender is at issue--that is, only when socially constructed categories are evoked having to do with what we expect of men and women. The context that we believe we're seeing affects our understanding of gender.

5.1.1 A Short Note about Methodology

At this point a methodological remark is in order. A CEO of one of the games for girls company is fond of describing her research strategy as follows: "I hire women who look like they could still be teenagers and I send them around America to throw slumber parties, and everybody wears feet-y pajamas and they eat popcorn, and they watch videos and they tell scary stories, and they talk about what they'd like from technology." At one point, in 1997, I shared a panel with this CEO, and she described her company's new product, which happened to be a kind of technologically enhanced nail polish. At the same panel I happened to be talking about a project that I was directing for 3,062 children in 139 different countries that invited children to think through how to use technology to make the world a better place for children, and then invited them to implement those ideas (Cassell, forthcoming). We flew around the world and handed out computers and Internet connections and hooked up kids; we built an online website that allowed the kids to communicate with one another using five different languages. Interestingly, although we hadn't planned it this way, roughly 60% of the participants were girls, and when the children themselves voted to send 100 children to Cambridge in November 1998 for a summit with world leaders, they elected 60% girls to come to Cambridge. I spent a lot of time with these children listening to them talk about what they wanted to use technology for, and amazingly not a single one said nail polish. They said things like eradicate poverty. Not to be too flippant, methods are important and the context is important.

Willis (1991) concludes that "It matters little that many nursery schools now mix the dolls and trucks on their play-area shelves if everyone--children in particular--perceives toys as originating in a boy-versus-girl context." The color-coding of products, the narrow casting of children's programs, and the targeting of advertisements for specific genders results in a culture which gives children very clear signals about gender appropriate fantasies and desires (Fleming, 1996). It is perhaps not surprisingly, then, that the market research which supports the growth of the girls' game movement has located fairly stereotypical conceptions of feminine taste. Desires are manufactured by the toy industry itself long before researchers get a chance to talk with the girls and find out "what girls really want from technology." Appeals to such empirical research as a justification for design and development decisions run the risk of reinforcing (and naturalizing) this gender-polarized play culture rather than offering girls an escape from its limitations on their choices.

6 Another Option: Underdetermined Design for *Me* (Whoever I am)

So far we've seen a split between designing for *the girl* and challenging the benefits of designing for any girls at all. In my own work I've tried to find a third position. My students and I have depended on theories that see gender as dynamic, performative and context dependent (Butler, 1990). We didn't see that it was our place to design a game for girls or a game for boys. We didn't see that it was our place to claim to know what girl was or what boy was, because there's too much diversity. So, we decided to design computer games that in their very use would allow children to decide who they were, and to discover who they were in the richest way that we could. I call this design philosophy *undetermined design* (Cassell, 1998). That is, design that allows users

to engender themselves, to attribute to themselves a gendered identity of any one of a number of sorts, to create or perform themselves through using technology. We chose to express these notions through narrative games because, as Ochs and Taylor write (Ochs & Taylor, 1995), "[G]ender identities are constituted through actions and demeanors. . . among other routes, children come to understand family and gender roles through differential modes of acting and expressing feelings in narrative activity."

Many of the insights that we relied on came from feminist pedagogy, which radically changed educational practice years before. For example, value subjective experience, value how people see themselves and their own experiential knowledge. Transfer authority from the front of the classroom to the whole room. In our case, transfer authority from the software designer to the user. Allow a multiplicity of viewpoints and privilege *voice* -- speaking out -- with everything that *voice* entails (Cassell & Ryokai, 2001). The term 'voice' in narrative theory has referred to whether an author speaks through a narrator or a character, or speaks as him- or herself -- it is the taking of different perspectives on a story. But, popular books on adolescence, and much feminist theory, use the terms "voice," "words," and "language" metaphorically,

> to denote the public expression of a particular perspective on self and social life, the effort to represent one's own experience, rather than accepting the representations of more powerful others (Gal, 1991: 172).

In this perspective, we understand the kinds of activities that have been described as "what girls really do" not as neutral or isolated acts but instead as involving the person becoming and acting in the world as part of the construction of a complex identity. In this case, designing 'games for girls' misses the point. We should, rather, expand the range of activities we can perform on a computer so as to encourage identity formation as a part of the game.

One example is Rosebud (Glos & Cassell, 1997), a system that makes stuffed animals into children's allies and partners, facilitating the use of technology with which children may not be familiar, and making the computer not a tool but one voice in a multi-party conversation. The stuffed animal is unique in a number of ways that are important for the different kinds of narratives that children (and adults) tell: (a) since it represents a sentient being, the child can attribute to the stuffed animal social goals, thus giving the child an imaginary partner to share in his/her experiences; (b) the stuffed animal plays an early role in the child's narrative life: the listener for the child's early stories to him/herself, the subject of other stories, and the hero of plays put on by groups of children; (c) stuffed animals are solidly gender-neutral toys until pre-adolescence (at which point boys deny liking them anymore, but often refuse to throw them out); (d) stuffed animals become keepsake objects that continue to play a role in the people's memories of their lives throughout the lifespan.

In the Rosebud system the computer recognizes children's stuffed animals (via an infrared transmitter in the toy, and receiver in the computer) and asks the child to tell about the stuffed animal or, in a subsequent interaction, calls the stuffed animal by name and recalls what it has heard. The child is asked to tell a story about the stuffed animal, any story at all, with prompts along the way. The computer is an encouraging listener, as well as a teacher, pushing the child to write, write more, edit, improve. The child is in charge of the interaction, deciding which stuffed animal(s) to play with and what story to tell.

Figure 5: the Rosebud System

The collaboration between child, computer and stuffed animal ends with the child recording the story in her own voice--the story is saved into the stuffed animal and the child can then ask the stuffed animal to repeat the story back to her. Rosebud supports storytelling by one child and one stuffed animal, but also by multiple children each with his/her own stuffed animal, working together. In this literal sense of 'voice' and in the metaphoric sense, Rosebud encourages the establishing of voice through an open-ended storytelling framework for the child. It promotes collaborative learning, not only among several users and through peer review, but through presenting the computer as a supportive learner partner rather than as an authoritative viewpoint. Rosebud focuses on collaboration by allowing multiple-toy use and multiple-author storybooks, so that several children can write a story together about all of their stuffed animals. Likewise, since the toy serves as a storage device, children can trade their stories by lending their stuffed animals to a friend.

Our work, then, provides children with very undetermined toys. There's no explicit mention of gender in any of these. But, in our testing with children we discover that both boys and girls are equally likely to play with these toys. And, the children tell whatever story they have in their head. The computer doesn't correct, edit, encourage in a particular direction. The computer listens, and stores, and that very act of having your story heard is extremely important for all children, but perhaps, particularly for girls who can often not feel heard.

7 What about "just good design?"

Underdetermined design is in many ways similar to user-centered, or participatory design (Muller, forthcoming). Participatory design is not a single theory or technique for accomplishing software design. Rather, it is a set of perspectives that share concern for a "more humane, creative and effective relationship between those involved in technology's design and its use" (Suchman, 1993). The goal of the participatory design movement is to encourage active participation in the design process by people using computer systems, and to make this participation empowering

(Greenbaum & Kyng, 1991). In practical terms, this stance translates into conceiving of users as an essential part of the design team, and therefore bringing them in early during the design phase of new technology. The points of contact between participatory design and underdetermined design are not surprising given their political commonalities--both raise questions about democracy, power, and control in the workplace (Balka, 1997).

However, while advocates of participatory design do bring users into the lab early in the product development cycle, the product itself is still static, constructed in the absence of the users, and no commitment is expressed to making a product that allows different kinds of uses by different users at different moments. Underdetermined design, on the other hand, makes the system about design, so that the design and construction cycle continues into the use of the system itself.

Also similar to the philosophy of underdetermined design is what has been called "gender fair." One mathematical game that has received a lot of attention for its gender fairness is the Logical Journey of the Zoombinis (published by Broderbund software), which features small blue creatures that can be personalized with one of five kinds of hair styles, eyes or eye wear, nose colors, and feet or footwear. Rubin and colleagues (1997) have shown that both boys and girls were equally engaged with this software. Some children were more interested in building the characters (in general, the girls) and some were more interested in solving the logical puzzles that led the Zoombinis to their destination (in general, the boys), but all of the children were eager to play the game. Unfortunately, as pointed out by Castell and Bryson (1998), engagement is not sufficient. Since it is the logical puzzles that carry educational value, those children that become caught up in character development may be missing the point of the software. Underdetermined design, on the other hand, integrates the design and construction cycle into the goals of the software.

Some of the goals of underdetermined design are also similar to the principles of "learning with understanding" (Bransford, Brown, & Cocking, 1999). This educational philosophy relies on four features: that learning environments be learner-centered (anchor learning in meaningful, authentic problems to help learners make connections), knowledge-centered (foster symbolization and abstraction of underlying principles), assessment-centered (opportunities for feedback, reflection, and revision), and community-centered (enable guided inquiry in a collaborative community). Interestingly, learning environments that meet these criteria appear to demonstrate fewer gender differences than non-situated, traditional textbook-based learning (Boaler, 1994). In order for girls to profit, however, these features must be implemented for all learners, and not just girls. In this context, Boaler highlights an interesting tension in the discourse around how to change mathematics education, a tension that also arises in speaking of designing technology for women. It has been posited that girls need more real-life contexts for their learning; that their learning needs to involve intuition, creativity, emotion, relativism. Some have interpreted this to mean that girls are less able to think abstractly, and this has led to programs to train girls to think in similar ways to boys. Or, alternatively, special mathematics units have been devised for girls to link math to girls' interests – calculating the geometry of dress hems, counting Beanie Babies™. However, as was described for computer games above, setting girls up as a "problem-space" in mathematics risks attributing to girls special (less capable) needs that need to be specially helped. One cannot simply graft "girls' interests" on to an existent lesson. A design philosophy such as underdetermined design makes the interests of the user integral to the working of the system. In

fact, in educational applications, students participate in the design of their own learning environments, with no weakening of underlying learning potential.

8 Lessons Learned: Designing for Women

McIntosh (1983) posits five interactive phases of change that occur when new perspectives on gender are brought to the attention of curriculum designers. In her example, the field of History traverses the following 5 stages:

1. Womanless History
2. Women in History
3. Women as a Problem, Anomaly, or Absence in History
4. Women as History
5. History Redefined or Reconstructed to Include Us All

As we move in this article from the example of videogames for girls to other aspects of designing technology for women, it is instructive to apply McIntosh's model to the design of technology. We have left phase one behind: no longer is it possible to build womanless technology. Currently, there is widespread recognition of the importance of taking gender into account in interface design (witness the presence of this chapter in a handbook on HCI). And we have passed through phase two: public perception of the role of women in technology has changed radically, due to the efforts of activist computer scientists and historians who have highlighted, among others, Ada Lovelace's seminal role in the birth of the computer, and Grace Hopper's essential contribution to computing. Now, however, we find ourselves at a stage where women seem to pose some kind of problem for the design of technology. Tech companies pay consultants to help them figure out how to design for women. One gender and technology consulting firm refers to its ability to help companies succeed at "the notoriously selective and lucrative demographic of teenage girls." A consultant for online businesses advertises its knowledge of "what makes women click": a six-step program from initiating the relationship through subtle tactics of banner and home page design, through deepening the relationship by asking motivating survey questions. The goal is "the inside tract to get inside women's minds and keep them inside" the website. In fact, many websites for women have sprung up, but the majority treat the same topics as women's magazines that have been around for hundreds of years (the banner on one women's website invites readers to learn about "Making your home a haven for your family").

How do we progress, then, from phase three to phase four – from the *problem* of women in the interface, to women as central to the design of the interface? Perhaps paradoxically, I believe that we will reach this phase when we consider the diversity of men as well as women in our design of the human-computer interface. That is, the users of technology must come to have many faces: men and women, young and old, American and Bangladeshi. Women are central to technology when all users are central to technology, when all users are diverse. Women are central when technology is designed for human needs. No longer will women be conceived of as having special needs . . . any more than any other group. "Different folks, different strokes" might be the motto of

stage four. When only one population is seen as needing specially designed technology, it is almost inevitably seen as external to the normal practice of technology. The marked is almost always perceived as the lesser. When only one population is special, one risks ghettoizing it. I asked a young boy what he thought of a new videogame. He responded, "that is so stupid, not even a girl would like that."

Phase four is a net advance over what we see today. But, could we imagine a world where phase five is possible – where the notion of interface design is radically reconstructed so as to, and because of including us all. This does follow from phase four: it is not just users of technology that benefit when the preferences and needs of all are taken into account: technology itself changes for the better. When we attempt to put ourselves in multiple perspectives during the design process, we are more likely to solve intractable problems. It is in phase five that I believe underdetermined design becomes most important. Whereas phase four may rely on a multiplicity of viewpoints, a multiplication of interfaces, phase five relies on no viewpoint, and only one barely-designed interface. Such a development in the field of human-computer interface would truly change the nature of the field. Interfaces might be more intrinsic to the internal working of the system, rather than applied afterwards as a "skin." Interfaces might be constructed on the fly according to user specifications, or constructed by users themselves. Note that these interfaces are not "gender-free." If the example of videogames for girls has taught us anything, it is that there is no such thing as "gender-free" software. Since this is the case, we can only integrate the dynamic nature of gender construction – of self-construction – into the software itself.

9 Conclusion: Focus Groups are Okay, but Implementing is Power

Currently there's a lot of gendering going on in IT, in information technology. But, that gendering takes a very narrow notion of what it means to be a particular gender. To conclude, I'm going to evoke the concept of the "common divide," (Snitow, 1990). Ann Snitow describes this feminist form of the reassertion of sexual difference as one side of " . . . a common divide [that] keeps forming in both feminist thought and action between the need to build the identity 'woman' and give it solid political meaning and the need to tear down the very category 'woman' and dismantle its all-too-solid history." I believe it's become as common in interface design as elsewhere. What that means is that when we try and do something to equalize opportunities for women, there have always been two approaches, to value traditional femininity or to deny differences between men and women. And, we're seeing exactly the same thing in technology. Do we encourage girls to beat boys at their own game, or do we construct a girl-only space? The problem is that both sides, ultimately, start from the assumption that computers are boys' own toys, and thus both scenarios can result in the pejorativization of girl's interests. What can we do? We can ensure that there are an awful lot of applications, games, websites because that ensures innovation. The proliferation of technologies ensures a proliferation of designers to design those technologies, both men and women, to be attractive to girls and women of all sorts. And finally, to be designed for can be dangerous. To be stuck in a room for focus groups is okay, but implementing things yourself is power.

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