Will ETs Understand Us If They Make Contact?
An Analysis of Student Software Design Projects

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Abstract: In this paper, we explore how student software designers might attempt to construct a medium to increase communication and understanding between cultures and/or communities. More specifically, we ask the following questions: what would future IT professionals choose to construct as a facet of 'life on earth' for unknown others? How is the content of their interface related to spheres in which they have knowledge and/or authority and might therefore represent dominant power relations, especially those of gender? We conclude the paper with a discussion of the implications of our findings for software design and computer science education.

1.   INTRODUCTION

As writings on an 'Information Society' [10, 5] point out, more and more social relations are mediated by machines with networks like the Internet serving as global communications media. These media can overcome the constraints of time and space technically, but as the authors point out, there are tensions between the global and the local in computer mediated communications, and across what Massey [11] refers to as the power-geometry of time-space compression where different social groups and individuals have distinct relationships to the flows and interconnections of new technologies. She notes that while some people are in the flow and in a position of control, others, whether moving with it or not, have little if any control. Our interest in this paper is to explore how future software designers might attempt to construct a medium to increase communication and understanding between cultures and/or communities. Specifically, what

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would future IT professionals choose to construct as a facet of 'life on earth' for unknown others? How is the content of their interface related to spheres in which they have knowledge and/or authority? Is the information grounded in knowledges that are assumed to be, and presented as, universals? Does the content represent dominant power relations, especially those of gender? Finally, we hope to gain insights from how these future designers might conceptualise unknown others' needs that may be useful for the body of knowledge about systems design.

Here, we consider the work of students who were asked to prepare a prototype of a program for the "Ministry of Extraterrestrial Affairs". This software interface is intended to inform the visiting Extra-Terrestrials (ETs) of "one aspect of human life or activity that you consider important enough to become part of a large body of knowledge about human activities for visitors from other planets." The students were to portray any human activity of their choice. They were to reflect on human activities that they think might be appropriate to present to an unknown group and were expected to inform unknown others, rather than simply supply them with a tool.

The students are expected to familiarise a stranger with the local culture, but like other technological artefacts, the interfaces also offer a visible representation and stabilisation of a culture [12]. The software interface constructed to introduce an ET to local culture represents a set of meanings chosen by these students to assert a cultural identity. We want to explore whether these constructions also provide evidence that reflect aspects of this culture as gendered.

As the assessment asks students to introduce a new environment, culture or locality to someone from another place, we want to consider whether students attempt to convey the sense of the local through their interfaces. Nardi and O'Day define the concept of *information ecologies* as a system of technologies, people, practices and values in a particular local environment with the spotlight on human activities served by the technology [13, p.50]. We wish to explore whether the complexity of information ecologies is evident in student projects. We draw on the concept of information ecologies because we consider computers to be much more than tools for communication or devices that enable an individual to get something done [p.30] even though in this situation the technology can simply be interpreted as a tool which ETs use. Technologies are part of a larger picture yet they are also situated in particular and local, social and cultural contexts. We analyse whether these students make use of the technologies of both computer and programming language to reflect 'the local' as intended by the assessment or as tools to present decontextualized 'information'. We examine this strand of analysis within a framework of information ecologies

by categorising the students' reasons for choice of topic in relation to local practices, people and values.

The unit is offered by a university that serves a large area of London with a population of people from a variety of ethnic backgrounds and highly affected by unemployment. This module is a practical programming unit which attracts a large number of mature students who study IT because they believe it will improve their prospects of gaining employment. It is taught by a female member of staff and attracts higher numbers of women than some other technical computing units.

2. OUR APPROACH

We agree with Nardi and O'Day's analysis of the tool metaphor as used in relation to technology. They see this metaphor as privileging functionality and individual skill since tool use implies having control of the technology in order to use it effectively [13, p.32]. In the context of this project, the interface might be seen as a tool for those in control of its design, but for the purposes of this research, it is a text. There are a number of readings that can be made of this software in addition to ones related to its intended use, such as the culture that is being represented.

The students were told that the assessments would form part of a research project carried out by the tutor. As such, they were asked to fill in a questionnaire that asked them to explain the reason(s) for their choice of topic. Fifty-four percent of the students filled in the questionnaire (16 women, 18 men). We analysed the students' responses to the 'choice' question, and carried out a textual analysis of the interfaces of all the projects (additional 29 pieces of work).

3. EXPLANATIONS FOR CHOICE OF TOPIC

"Why have you chosen the topic for your project and why do you think it is important to introduce it to the Extraterrestrials?" In this section we discuss the students' responses to this question as falling within categories drawn from an 'information ecologies' framework, those related to *practices*, *people* and *values* within a context of the local. A fourth category represents responses that do not fall within the framework, but rather explain the choice of topic in terms of students' personal interests.

A number of responses (four women, four men) can be categorised as giving the ET some sense of the local in terms of information about *practices* on earth. One woman writes: "I have chosen different sports as I

think this shows something about our culture...." Another woman attempts to put herself in an ET's shoes: "I have chosen HUMAN BODY project because if I was to come to their planet that would be the first thing I would like to know about them." One of the men writes: "To introduce to them how human travel from one place to another by using various type of transport." We identified a subcategory under information, with one woman and two men choosing topics that enable communication, for instance, one man wrote: "I chose music because it is the communicative medium that is not limited like language."

Another grouping (six women, five men) can be categorised as explicitly declaring a concern about what the local needs of ET *people* might be. One man writes: "I think for ETs the basic concept of [being] human is needed for them." Another says: "This topic [life in different cultures] will give a much wider view and understanding to the ETs rather than focus on one area." One of the women wrote: "I chose my topic [emotions of love, hate, fear and panic] after considering the ETs needs." Another said: "Society and communication play an important role in the evolution of our civilisation ... extraterrestrials need to know this in order to understand us." And one addressed a very local concern: "Because they have to wash their hair (I hope they got some)." Her project, entitled 'Wash and go' was about hair and shampooing.

In these responses, equivalent numbers of women and men demonstrated an awareness of the need to provide relevant information about local practices and for the people participating. Differences are notable, however, when we look at the next two categories of analysis, those related to values and to the students' interests.

Nardi and O'Day note that technologies are not neutral and those values, as negotiated processes, are brought to bear in designing and using technology [13 p.60]. For our analysis, we interpret students' responses that express a concern with the *values* of the local society as a negotiation with ETs within an information ecology that takes values into account. Three of the women students directly address local values, while only one of the men does so indirectly. One woman writes, "It would be interesting for them to know the other gentle [species] on earth. It will give them an expression that human have some sense of caring towards some animals." Another says, "I think the environmental problems we face are very important and to prevent further destruction we need to widen our knowledge and teach others." The third woman writes, "I am worried about the way [humans] live." Her project subject is 'Four Horsemen of the Apocalypse'. The one man writes about his choice of 'sport': "In the future if ETs know this activity we can do this activity with them and we may become more friendly." We have

interpreted his response as implicitly concerned with values since he shows concern with the value of working towards friendship among diverse groups.

The fourth category, choice of topic related to students' personal interests, shows the most significant gender difference. Seven of the men and three of the women explained their choices with reference to their own interests, plans, experience, and/or expertise. The women wrote about plans to travel, expertise in changing a diaper and interest in geography as explanations for their choice of topic. Five men indicated the topic, sports, was an interest and/or a subject they liked. One man notes "I like cooking, and I know how to cook very well." Unlike the woman, the men don't, however, note that this expertise may help in their developing higher quality interfaces. The two remaining men explain their choices with relation to previous life experience.

4.   ANALYSIS OF THE INTERFACES

4.1   Topics

Many of the topics are rooted locally in gender-appropriate everyday life activities and concerns; for women, emotions, food, changing diapers, washing of hair, and art. For men, projects include sports, weaponry, energy production, computers, and a hi-fi system. For both men and women there were other, less stereotypical topics: for women those connected with the environment--pollution, the butterfly, gardening; for men, how to wallpaper a house, the university Student Hardship fund, and two CAL-type packages-- to teach people a programming language and a maths package for children. Both women and men did a number of projects on transport and the human body.

4.2   Language

In a project by a woman, about office work, she illustrates a man as serviced by a woman secretary "waiting outside the office for his orders--for example making tea, filing, or typing important letters." A woman writes of "the need of humans to show feelings for other creatures" calls her project 'Man's Pets.' While a man states he wants to design a project "to demonstrate to these creatures the essentials of human body activities..." entitles his project 'How My Body Works'. While the woman working on humans' needs in relation to other creatures chose 'Man' as a point of reference for human, the man representing the essentials of the human body

refers to 'my body' assuming *his* body as universally representative of humanity. There are exceptions to this masculine domination. In one man's representation of a computer, he does not confine it to a masculine domain, but rather described it as "the most common and essential tool used by humankind."

4.3   Visual appearance

Women make greater use of pictures. The difference between use of language and that of picture image might be related to that of the abstract and concrete, assumptions of universality linked to the abstract, an idea rooted in feminist analyses of modern western science [8, 14] and practised in computer science teaching [15]. While the men's interfaces favour the abstract, the women's attempt to provide diversity in means of communication.

5.   GENDER: THE SAME AND DIFFERENT

There were equivalent numbers of women and men whose focus could be seen in terms of people and practices within a local information ecology. There was some difference in representation of values that are constructed within the interface. Three women directly dealt with value concerns, such as humans' relationship to the environment, caring for other creatures and the destructive practices of inhabitants of earth, while only one man can be linked to values in that he addressed the possibility of constructing friendly relations with ETs. A significant difference was identified in the numbers of men and women who stated that personal interests were the principal reason for choosing a topic.

Feminist researchers [e.g. 17] have shown that many texts representing the social relations of computer-based applications reproduce stereotypical roles. The texts of these students show that while gender may sometimes be constructed in stereotypical ways, there is an attempt by both men and women to keep the potential users in mind when choosing what information or activity to represent as relevant (13 of 16 women; 10 of 18 men). The small core of men (7 of 18) who based their choice on personal interests could have either decided not to cooperate with the spirit of the assessment, misunderstood the question, or demonstrated what has been identified as a key problem in computer-based systems development: focus on aspects within the designers' domain rather than those of the user groups. Feminist research has noted this focus intersects with male domination in the domain of computing [e.g. 7].

Though the students were told they have to assume that their user group will not know anything about 'life on earth', their assumptions of the user's knowledge and understanding of topic areas were great and wide. Gender can be identified in relation to explicit naming of universals within the questionnaire responses. One woman identifies reading as a universal for communication while four men identify universals: two name music as a universal language, one driving as a necessity for everyone, and one cricket as something everyone around the world is interested in. These explicit assumptions of universals demonstrate the influence of the implicit values and culture of designers. More women than men attempted to include locally situated explanations in their projects and one woman explicitly stated that her familiarity with the topic might enable a better design. Most students assumed a universality of understanding of what they presented. While the local might have been taken into account in explanations for topic choice, the topics themselves were represented with little attention to context for the ET user.

6. IMPLICATIONS FOR DESIGN

There is a body of literature in systems design that explores designers' approaches to the construction of new systems. Researchers, some speaking from an explicit feminist perspective, have argued that the subjectivity and identity of the developer(s) inform the design [1, 2, 4] as does the culture in which IT development is embedded [9, 18]. In this piece of research we have identified these power relations as informing software construction.

We can see a strong orientation towards aspects of everyday life. Women's subjects could be classed in their local domains of responsibilities, such as diapers, and food, and men's in their local domains of interests and/or leisure pursuits: music, sport, cooking. In their exploration of systems development practices, some researchers [6, 16] have found that certain practices are taken-for-granted, undervalued and sometimes invisible in descriptions of office practices, and that this is especially the case for work done by women. In these projects, we identified attempts by women to make visible some of the taken-for-granted aspects of 'human activity' usually embedded in gender relations, for instance the basics of food preparation. The tutor was a woman, and this may have helped constitute a more amenable situation in which these representations could be made.

Overall, we interpret these constructions as potentially neglecting the needs of the intended users, the ETs. In relation to systems development, knowledge of local fine-grained practices informs effective design [3]. On the whole, these interfaces are lacking in attention about locality. A number

of student-designers made clear that they had detailed knowledge of the practices they were representing, but they presented decontextualized, static descriptions. The separation of designer and user-participant is inherent in this design project, and significantly, little attempt has been made to move beyond static description to bridge the gap. Instead, the students explicitly and implicitly, made assumptions of universality. It supports arguments that while the potential for information dissemination may be high with ICTs, the usefulness and relevance of contents and representation is a problematic.

7.   CONCLUSION

We hope that, through our analysis, we have laid bare some aspects of the design process as practised by those learning software design and programming. Most students, when questioned about their reasons for choosing a topic, considered the local with relation to people and practices, and a minority demonstrated consideration of values. The content of the interfaces themselves, however, showed little consideration of the local, that is people as they used the technology in a situation that might constitute an information ecology. Students' work shows that many assumptions are made and much is taken for granted. There are two things we recognise as significant for the future development of curricula. One is the recognition that the students project their own experiences into universally acceptable knowledges; the second is the students' portrayal of descriptive knowledge as activity without attempting to contextualise the activities connected to the knowledge. This unit aims at teaching the students a programming language, but we believe these findings need to be fed back into a range of teaching materials, so that students can be made aware of the complexities of an *information ecology*. By doing so we hope that future software designers may become more aware of assumptions they might make and their applicability in other locations. In this programming unit, gender stereotyping and cultural assumptions as well as differences in representation can be demonstrated and discussed with the students before they start work on their own projects.

A positive aspect of this analysis is that women consider their own experiences important enough to want to share them with an unknown 'reader'. That women could feel free to express their own feelings and experiences using technological means rather than, as is so often the case, being asked to solve a decontextualised technical problem while learning how to program, could in itself be encouraging to women computing students.

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