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Human-Computer Interaction Closes the Digital Divide:
A multicultural, intergenerational ICT case study

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Abstract

Ethnic and racial tensions are aggravated by social inequities. The media unwittingly feeds this dilema. Look at how often we are directed to the internet for further information. While exploring the internet may be easier for some computer users, others demonstrate a complete avoidance for this type of knowledge exchange. Misunderstandings that occur between cultural communities may be exacerbated by the digital divide through lack of access, for whatever reason, causing a meaningful gap in cultural differences, and henceforth leading to serious communication breakdowns. This paper argues for more research on measuring the effectiveness of increased opportunities for Web-mediated cross-cultural/intergenerational knowledge sharing that is designed to overcome the ever widening digital divide.

Keywords: cross-cultural communication, human-computer interaction (HCI), computer supported collaborative learning (CSCL).

1 Introduction

Australia faces significant socio-economic challenges this decade. Our nation is one of the most multicultural countries in the world (Tsang, 1995), weaving cultural diversity and associated tensions into the social fabric. Furthermore, census statistics show us that Australia is fast becoming an aging nation. These two demographic features may give rise to communication problems associated with cultural and intergeneration discord (Sternberg, 1997). Unfortunately, current research appears to be ignoring the importance of the relationship between socio-cultural interaction and Web-mediated knowledge exchange (Schank, 1990). Moreover, there is an unrealistic expectation that the Web will facilitate the engagement of people sharing information through collaborative team work (Kearsley and Shneiderman, 1999).

Consequently, research projects that involve information and communications technologies (ICT) and collaborative information sharing programmes need to deal with the complexity of the interactivity between humans and technology (Sims, 2000). Unfortunately there is a distinct gap between theory and practice that exists within the Australian population for opportunities to utilize ICTs to promote multicultural interaction, and knowledge sharing. This disparity can be seen in terms of the unequal access to Web-mediated educational technology for: enhancing multicultural sharing, promoting knowledge transfer between generations, and facilitating quality outcomes in special education (Stephanidis, 2001). The aim of this paper is to identify how ICTs can provide a useful set of tools to reduce some of the problems associated with socio-cultural isolation, including lowered motivation of disadvantaged users.

To orient the reader, this paper discusses how the literature deals with the key issues concerning multicultural/intergenerational research, which impact upon ICT applications for government and the community. As one of the means to overcome current difficulties, a theoretical framework is proposed for ICT's positive impact on closing the digital divide. Next there is an overview of a research project that is currently underway, which has the potential for eliminating cross cultural/intergenerational problems. To complete this paper, a short discussion follows on the analytic methods; to explain how this research project assesses the effectiveness of computer supported collaborative learning (CSCL) environments.

2 Literature

According to Henry Tsang OAM, the success of cultural diversity depends on the spirit of sharing (Tsang, 1995). One common vehicle for cross cultural sharing is through the abundant courses available for learning a second language (including ESL). According to the second language acquisition (SLA) theories, oral interaction is necessary for enhancing inter-language development (Pica, 1994); (Swain, 1993). Since (electronic) chat communication is considered similar to oral interaction, the potential benefits of network-based communication for SLA and learning are often advocated by many researchers. Because text chat communication is considered to be an excellent tool to enhance abilities (Nishihori et al., 2001), research also needs to explore and evaluate the effectiveness of text-chat as a means to bridge the digital divide, across cultural boundaries.

Nevertheless, there are difficulties in understanding the trigger negotiations of meaning amongst ethnic groupings. While there is evidence in the literature of this type of research (Kitsuregawa et al., 2002), it is generally concerned with the grammatical items, and although an inter-cultural communication gap is referred to, it is not

explained. It is therefore valuable to focus on this inter-cultural communication gap.

There is an increasing interest in utilizing ICTs to simulate the real world. Once again, it is early days for this type of technological breakthrough to be commonplace. Instead researchers have been focussing on finding effective ways to capture Web-mediated collaboration interactivity. While there are projects currently underway in the educational technologist paradigm, progress is slow. More work is required to extend the principles of a Generative Virtual Classroom (Schaverien, 2000), and Schank's Sickle Cell Counselor (Bell et al., 1994). This is impressive work that combines social interaction through linguistics in a communicative collaborative model (Cecez-Kecmanovic and Webb, 2000).

However, success for this type of research will only occur through management of the complexity that deals with the diverse nature of the participants' cultural and socio contexts by adopting three distinct experiential environments. It is proposed that the first, can involve senior citizens in recalling traditional stories and games. The second can define youth (teenagers) interaction in a multicultural setting. While the third, relates to young children's propensity for playful sharing of experiential learning materials. This notion of bringing about such interaction between the generations is not new. Nevertheless, much of this previous work is carried out within, not across the disparate age groups. At the younger end of the age scale new works are coming forward to describe early childhood development and ICT (Carlson and White, 1998). More evidence is available for the youth with a rapidly growing interest in mobile technology for the school aged group (Friedlander, 2004). While at the upper end of the age scale, there is a more limited number of successful projects that can describe intergenerational knowledge sharing (Kolodinsky et al., 2002). To bring about a positive change in this rather blinkered approach to reducing the negative effects of the so called digital divide, this paper suggests there is a real possibility of making positive inroads drawing on the strengths of HCI.

The prospect of HCI was first adopted during the 1980's as a reasonable way to describe an emerging field of study (Preece, 1994). In recent times there has been a push to consider the effects of how computer usage impacts on everyday lives. Therefore using the notions of HCI as the conduit for this discussion on closing the digital divide; there are many interacting components. Figure 1 shows some of the interacting variables involved in bringing together young children, youths, and elderly citizens within a common type of collaborative Web-based learning network. The core of this framework identifies some of the human variables that would initiate and monitor Web-based interaction. Moreover, in an effective online system these components are not necessarily humanoid; they may be purely electronic in essence (Moreno, 2001); (Pankratius and Vossen, 2003). The left side of the model shows the key players having input into the model. While the right side of Figure 1 represents the more mechanistic components (computer applications,

collaborative memory/database repositories, and the administrative login/security issues).
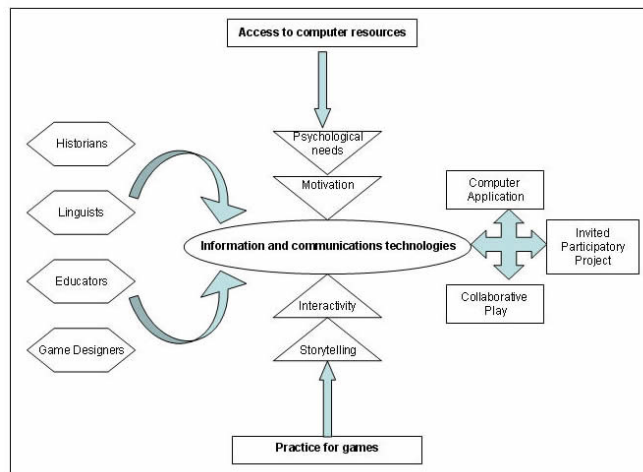
Figure 1: A Theoretical Framework – Towards ICT Closing of the Digital Divide

Far too often the concentration in the literature appears to locate the machine-view or the computer-end of HCI phenomenon. These days, system's design should innovate and differentiate the age scale better than it currently does and reflect a more accurate human dimension of the HCI equation. Of course attention must be given to providing effective examples of things that work as described by (Merrill, 2002). Still within the human dimension of HCI, Figure 1 depicts the range of facilitation that is available in the case study described later on in this paper.

3   Purpose and Methodology

3.1   Purpose of the study and research questions

In the issue of cross generational communications breakdown: Difficulties that arise through intergenerational perspectives (Thomas, 1998) can be witnessed in many parts of the community: at home with parents and siblings, in work-place reporting networks with age differences of employees, and at school between staff and students. This research project investigates the quality of the Web-mediated environment as a conduit, linking the vast knowledge/memories of elderly citizens with the inquisitive minds of the young.

In the issue of accessing educational technology for special education: Special education is defined here in a broad sense, as pedagogical practice especially designed as assistive technology for people with learning disabilities (Atkinson and Walmsley, 2003). While a special education literature on computerized learning programmes has emerged in the last decade, mapping the collaborative interaction in terms of knowledge transfer has not been achieved anywhere in the world, much less than for special educational needs. This research monitors how children engage in cognitive and scientific knowledge development, drawing on HCI in a manner akin to the revolutions in conceptual change (Thargard, 1992).

3.2   Research design and data collection

The purpose of this project is to engage young children, with access to a computer, with older people in sharing traditional stories and games. Implementing this interactive collaborative knowledge sharing tool, promotes cross cultural and intergenerational interaction. For some, the quest for new knowledge is an inherent pastime. Previously, much of what humans learnt was handed down by previous generations. The tools by which this knowledge transfer took place were limited to a human-to-human context; where speech and drawings provided the transmission of ideas.

The primary aim of this research project is to investigate the socio-cultural effects of computerized collaborative experiential learning environments, in the light of providing a learning resource tool for young children (Kindergarten to Year 3). It has been noted that access to educational technology should be through a ubiquitous design that respects the values and requirements of the broadest end-user community possible. The goals for this project are ambitious, achieved through activities involving these 3 key HCI components:

(a) contribution of games and stories from elderly citizens from various cultures.

(b) translation of contributions into English by secondary level ESL students.

(c) play within a safe and secure environment for young children: both mainstream and special education groups.

4   Data Analysis and Discussion

The research project team plan to facilitate a User Trial by a small group (~20) young children and special education participants. Their playtime will be observed by their teachers and the appropriate researcher. Upon completion of their playtime, they will be asked a few simple questions regarding enjoyment and knowledge transfer.

Due to the concentration on capturing Web-mediated collaboration interactivity, this research project extends the principles of a Generative Virtual Classroom (Schaverien, 2000), and Schank's Sickle Cell Counselor (Bell et al., 1994), by combining social interaction through linguistics in a communicative collaborative model (Cecez-Kecmanovic and Webb, 2000). It is anticipated that this research project will succeed because it manages the complexity of dealing with diverse subjects by adopting three distinct experiential environments. The first, involves senior citizens recalling traditional stories and games. The second will define undergraduate interaction in a multicultural setting. While the third, relates to young children's propensity for playful sharing of experiential learning materials.

Testing for the interactive effects of the internal/external exchange process has been shown to be complex (McKay, 2002). Attention must be given in Web-based material development to allow for the many different ways people perceive their information. It is known that people *think about the information* they receive in certain ways (pictorial/verbal). While at the same time, people also *process* (or internalize) *this information* in certain ways (wholistic/analytic) (Riding and Cheema, 1991). For instance: Experiential learning using a group learning research network may, paradoxically, permit the conditions-of-the-learner to be investigated from multiple perspectives, including longitudinal studies, thereby increasing confidence in the combined evaluation process.

The proposed analytical methods include:
- Conducting various statistical designs/methods utilizing the QUEST Interactive Analysis System (Adams and Khoo, 1996), and statistical power analysis (Cohen, 1977). In addition, Bayesian models will be used to further analyse the data.

- Evaluation against an appropriate reference model for cultural factors.

- Case-based reasoning for knowledge/process certification purposes.

- Context/Event mining.

The facilitation of this work is unique. The innovation of this research lies in the data that will be captured during the experimentation between humans and technology (Sims, 2000), within a Web-mediated context. So far this technique has not been reported. The expected collaborative interactions within such an online knowledge sharing entity are not just computerised collections of traditional games and stories, but an opportunity for the capture and reuse of the interactive play with embedded instructional strategies.

While there are Web-sites that purport to recognise and address racism in the learning environment (Anon, 2000), with others that offer games for children to play (Anon, 2004); there are none that facilitate for interaction between the source program and multiple concurrent users. Moreover, in storing shared Web-mediated interaction, it is anticipated that the data gathered will enable analysis of hands-on collections of stories and games in the user's traditional context. The tracking of the collaborative nature of the involvement with the project will enhance the knowledge of interaction between generations, creating a capacity for emergent innovative global legends. Furthermore this type of research will study the effectiveness of the translation of the traditional games into a common language (English) for global use as an English language study tool for Foreign Language (EFL) classroom activities. In this way, it is proposed that willing people such as university students can volunteer to support senior citizens whose memories are a magnificent resource of traditional stories and games (Nishihori, 2000), but whose expressive skills and computer literacy may not be good enough for this kind of activity.

5   Conclusions

Spin-offs from this type of research project will provide an understanding of new ways to unite members of the community in ways that are enjoyable, playful and

encourage lifelong learning. There is a real chance to discover ways to engage a diverse cross-cultural user network, including elderly citizens and younger family members to benefit from the collaborative story telling activities. The findings from this research will be of benefit to the government's quest to strengthen family relationships. Breaking down barriers to the digital divide will guarantee Australia's place as a leading innovator for educational technology in the Asia/Pacific region. Equitable access to information technology will ensure each person has the choice to partake in the richness of 21st century communications technologies.

It is proposed that Web-mediated knowledge sharing opportunities will nurture and cultivate individual creativity in both children and adult learners of English (Schank, 1988), by offering them an abundant supply of traditional games and stories. Children can be invited to a tightly monitored Web-mediated playing system, which includes specially designed playing environments where they can participate in a virtual exhibition room to enjoy collaborative play with other children. This type of research project pioneers Web-mediated processes for capturing and analysing this cross-cultural and inter-generational interaction (Nishihori et al., 2002).

The research team are confident their findings will show positive results. Otherwise, the gap between theory and practice will continue to widen. Lost will be the understanding of the benefits that semiotic/discovery activities may elucidate for cross-cultural sharing. Lost too will be an important opportunity to discover how assistive technologies may benefit special education pedagogy.

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