An Investigation into the Use of HERCULE for Facilitating Peer Help in a Large Organisation

Karen Renaud

Departtment of Computer Science and Information Systems, University of South Africa, P.O. Box 392, Pretoria, 0003.
Email: renaukv@unisa.ac.za

Abstract

The HERCULE system was developed to provide a tool to end-users and programmers to improve the feedback provided by component-based applications. This document will report on the results of an investigation into the extension of this system to allow users to help each other in their use of particular applications — in other words investigate the feasability of extending the functionality of HERCULE to being a peer-help system.

Keywords: HERCULE, peer-help, computer-mediated communication, online help.

1 Introduction

The HERCULE system was developed to augment the feedback provided to users in component-based systems (CBSs) [26]. HERCULE tracks the actions of a user, keeps track of calls to the middleware layer, links the two together and provides a console which allows the user to query past actions, get explanations for past system actions, and gives an indication of the performance of the system. The HERCULE console is dynamically extensible. It allows a programmer to identify a new user need, code a new HERCULE feedback component, and dynamically insert it into a particular user's HERCULE tool. With HERCULE one can also update explanations long after implementation of software, thus facilitating post-implementation tailoring of error-messages. HERCULE basically provides a visualisation of the user's interaction with a component-based application during a particular session.

HERCULE, in addition to being an end-user tool, is also a programmer and system-support tool — including special feedback components for each of these users. The programmer tool gives detailed imformation about calls to the middle tier, including parameter values, return values and time taken for the remote method invocation. The system support feedback component displays a histogram of system performance to assist system support persons in diagnosing an overloaded server or network.

Various extensions to the tool have been envisaged — including:

1. storing the history of a session so that a user can consult it later.
2. keeping track of user actions for security purposes.
3. using it to carry out usability tests — keeping track of places where users have difficulties with the interface.
4. linking up a group of HERCULE users together so that they can consult one another if they have problems with an application.

For the purposes of this study the latter was chosen for investigation — others will be pursued later.

2 Peer Help

Users generally get help from one or more of the following sources:

- paper manuals (Since the current trend is to provide most of the documentation online [25] instead of providing paper-based manuals, paper manuals are very seldom seen nowadays.);
- online documentation (including documentation published on the Internet);
- other users;
- system support.

Application developers seem to think that these sources of assistance will be consulted in the order given — hence their almost-exclusive reliance on online help to provide user assistance. This is a vain hope, since research into the use of paper-based manuals has already established that users tend *not* to read manuals, wanting rather to find out for themselves how the system works [8]. However, online help is certainly easier to consult than paper manuals because one can use search tools to find particular terms,

but in spite of this experience suggests that users still tend to prefer to find out for themselves than consult manuals.

It is obvious to anyone involved in system support that users often do not understand how to use their systems properly and how to recover from errors. This attests to the failure of online documentation in providing the *type of help* that the user needs. Online help systems tend to provide a *system index* of facilities, and this is often less than adequate. The users sometimes need help in extricating themselves from an undesirable application state and online help is not geared to this need — it takes no account of context. Fach *et al.* [12] argues for the improvement in online help by considering the user's *task* and *environment*.

Since the users cannot get the help they require from online documentation they will revert to asking other users or system support. In order to gauge the nature of the relationship between users and system support a survey was undertaken into the relationship between users and system support at the University of South Africa. A number of system support personnel were interviewed and the following perceptions were verbalised:

- Users were perceived to be lazy and unwilling to learn about systems themselves. They became overdependent on support software and contacted them for trivial problems that could have been solved by the use of online help systems. This caused an increased demand for their services for trivial problems, which meant they could not give the level of service they should have given for serious problems.

- Users needed to be trained in the use of various software but would not take the time to attend courses when these were offered.

- Users often became abusive and blamed support staff for their problems. Support groups took steps to protect themselves from such abuse by measures such as the recording of phone calls.

- Users often reported problems due to a lack of expertise.

- Users often forgot their passwords or were lax about choosing good passwords and about protecting them. This caused support staff a lot of extra work which they almost resented even though they were fairly resigned to the likelihood of such occurrences.

- Some users were never satisfied despite the best efforts of the support staff.

- There was an appreciable percentage of false alarms — problems reported that were not really problems. This wasted support staff time.

Users, on the other hand, had the following perceptions about support staff:

- They were perceived to be rude, unhelpful and supercilious.

- They often broke more than they fixed when they came to install or repair software. (One feels that the support staff often get the blame for the inherent instability of Windows since many of the people interviewed were not technophiles.)

- They treated users as if they were stupid when they themselves did not understand what the user wanted.

- They did not keep up to date with the latest patches and virus software and users consequently had problems on their machines.

- They had no conception of the user's problems. They did not understand the urgency of deadlines or the need to maintain backups of user data before wiping hard drives and reinstalling software.

- Users were annoyed that a different person was often sent each time to deal with persistent problems so that each person did not benefit from the previous person's experience.

The prevailing complaint was that *"System Support are really useless"*. There is obviously a breakdown in communication and trust between users and the support staff, and such a breakdown is counter-productive in any organisation where two groups of people need to interact and cooperate for the common good. Users' inherent mistrust of support staff makes things difficult for both givers and the recipients of assistance.

Solving this problem is not going to be simple because people's attitudes are involved, and these do not change easily or quickly. One way to alleviate this problem seemed to be to reduce the number of unnecessary calls to system support which were caused by a lack of expertise. This could be made possible by enabling users to to ask another user — someone they know and trust — rather than a person from the system support section. There are obvious problems in locating someone to help with a specific problem — especially if you are working within a non-technical environment. Thus any tool which attempts to support peer-help in a large organisation should facilitate it across departments. If it works it could contribute to the overall health of the organisation because it could strengthen inter-departmental ties.

Even if one could provide users with such a tool, there is going to be an obvious difficulty in finding the one person with the knowledge and skills to assist you. McDonald and Ackerman [20] carried out a study of search and locate mechanisms used by people to locate expertise within an organisation. These

mechanisms are highly refined and successful and often involve someone within the department who has a good knowledge of everyone's skills and interests. Such mechanisms can be extremely time-consuming. One of the first challenges for such a tool would therefore be the recording and supplying of information about such skills and interests.

Hellman [15] discusses the needs of employees in organsations. She notes that one needs to consider the needs of the new employee. Any organisation is a mystery to the new employee and it takes time to understand structures and modes of operation. It can take days to find the right person to ask for specific services or information or to understand the division of labour even *within* a particular department. Even long-serving employees sometimes battle to keep track of changing dynamics in an organisation.

The purpose of this investigation is to determine whether users can be assisted by providing a computer-assisted peer-help system which would be used by users all over an organisation, and which would not necessarily be supported by the official system support team.

From a technical perspective it would be a relatively simply extension to the HERCULE system to allow users to communicate with each other to ask for assistance. Schemes for facilitating communication between computer users abound — including such software as NetMeeting and V-Chat [30]. The advantage of using HERCULE is that it would be possible for the person offering assistance to gain access to a history of the user's previous interaction with an application which would help him or her to gain context and thus ease the process.

The following section reports on the literature consulted to determine the viability of such a scheme.

3 Feasibility Study

The advent of the personal computer has tended to reduce social interaction in the office [31]. This is not surprising because although there is *potential* for many more people to interact with each other than was previously the case it tends to reduce rather than increase interaction. People tend to sit behind their computer screens and work, and find interruptions extremely disruptive. Computer users utilise their entire working memory to keep track of their interaction with a computer. They build up a mental model of any particular application's state. An interruption causes this mental model to collapse and resuming work after an interruption is costly in terms of time and possible errors made after the interruption [27]. The obvious result of this is that less informal interaction takes place between office workers.

Since workers no longer interact face-to-face, is it not possible that they will interact via the computer? The incredible popularity of email makes such interaction simple and accessible. However, one finds that email interaction is often misunderstood and people do not use it to its full potential for a variety of reasons [9]. One of the factors contributing to this difficulty with email could be that the mode of interaction is so impoverished. Face-to-face interaction is rich and intuitive whereas computer-based interaction currently takes place mostly by means of the typed word. In some cases an audio channel or a video channel is also used but this tends to be the exception rather than the rule.

The Internet is the ultimate information source and offers countless opportunities and unlimited potential for connecting people who would previously not ever meet [19, 33]. Schofield reports on a scheme whereby skilled computer users help less-skilled users — via email — without any fees being expected [29]. O'Neill and Gomez introduce the CompuMentor scheme where subject experts assist students with subject matter online [23]. These examples show that altruistic computer users will give of their time and skills to people they have never met — and that the Internet fosters this.

A big advantage of Computer-Mediated Communication (CMC) is that it has the potential for breaking down previously impervious barriers in society [32]. Wellman argues that one reason for this type of anonymous assistance could be that the giver of assistance does not feel personal risk in participating — unlike one would feel in inter-personal meetings. It seems that humans are prepared to assist others if their own well-being is not threatened.

One distinguishing feature of many examples of the successful use of CMC is that they take place outside of organisations, often between people who have never met, where people are not in a competitive relationship and where such assistance is completely voluntary. One wonders whether such supportive relationships can be fostered within organisations.

Some successful uses of CMC within groups have been reported. Bikson and Eveland [4] find that work groups using CMC have a higher level of communication but that it tends to reduce face-to-face and telephonic communication. Wellman [32] also reports positive results of the use of CMC between densely-knit on-line groups and finds that such communication between members of groups can provide mutual support, with members helping one another. Darses *et al.* [10] gives details of a CMC system developed to facilitate assistance by a group leader to other members of a group. This is evidently beneficial to the recipients of the assistance, as well as to the giver, since the giver in this case is the supervisor and thus responsible for the work being done properly.

However, it might be necessary for participants to have a pre-established relationship before they can reap the advantages of CMC. Carley and Wendt [6]

note that scientific collaboration can often only prosper when preceded by an initial period of physical proximity. Pickering and King [24] did research into the role of CMC in maintaining weak and strong ties between researchers. They report that CMC assists the maintenance of weak ties, but that strong interpersonal ties generally need frequent and emotionally intense communication. Such ties are unlikely to be fostered by CMC.

These successful examples of the use of CMC report on the use thereof within groups of users who work together on a particular project. They would communicate anyway — the computer tool merely adds another asynchronous communication channel. However, the purpose of my research is to facilitate communication between members of a large organisation who would not ordinarily have anything to do with each other for the purpose of mutual assistance. The examples cited in the previous paragraphs do not extrapolate to this application of CMC.

Some researchers are not as sanguine about the potential of CMC for enriching inter-group communication. Alhström *et al.* [3] find that people prefer to collaborate in meetings and that CMC between groups of more than six people were not very successful. Users tended to rely on audio rather than textual communication — using the telephone rather than email. Adding audio to conventional CMC may not be a panacea. An experiment carried out by Kraut *et al.* [18] contrasting communication via *audio* versus communication with *audio and video* found no difference between the two mechanisms with respect to the success of the communication. They did note that the *manner* of communication was affected by the mechanism used.

Some means of augmenting CMC communication channels have been attempted. Karsenty [17] discusses a scheme for making users aware of other users by displaying photos of the currently present users. A similar argument for making users aware of each other is reported by Ackerman and Starr [1]. Brave *et al.* [5] report on the development of a shared physical space between users which seems to be promising — providing a sort of tangible telephone to enable haptic interpersonal communication. The slowness of the uptake of such innovative schemes suggests that the impoverishment of CMC with respect to communication channels is not the primary reason for its apparent inability to realise its obvious potential.

When inter-organisational peer-help systems are considered one has to consider not only the above-mentioned generic CMC problems, but also problems specific to peer-help facilitated by CMC. Whereas I have already mentioned some examples of assistance offered via email it should be noted that these cannot be considered to be *peer*-help. Successful cases tend to involve a mentor and a "student" — participants are not at the same level, and not in the same organisation. Rogers [28] finds that organisations with an inherently competitive culture did not engender cooperation amongst employees. Introducing a computer-based tool to engender peer-help systems will hardly change such competitive attitudes within an organisation.

The cost to the users providing help to peers could be too great and, especially in a competitive culture, the help given could damage their own career. The purveyors of computer-supported peer-help systems sometimes forget about pervasive organisational processes, such as those which sustain power [21]. For such a peer-help system to work, one would have to overcome organisational and managerial problems, and not be concerned about the technological issues until such issues have been resolved [16]. It is no good providing a technological solution to a social and organisational problem.

Perhaps a reason for the failure of peer-help systems could be found in a paper published by Grudin [14] which looked at the issue of technologies in which one person did work for which another person would reap the benefits. This was coined by Norman [21] as *Grudin's Law*:

> "When those who benefit are not those who do the work, then the technology is likely to fail, or, at least, be subverted."

Even if the organisational and social problems could be overcome, there are some tricky technical problems which also need to be overcome. The following have been identified [13, 2, 11, 22]:

1. How does one enable users to share context?
2. How can a shared understanding of information be facilitated?
3. Users have different roles and goals. Ackerman notes that conflict can be as important as cooperation in resolving issues. How does one resolve and handle conflict situations?
4. How can we facilitate awareness of another person's queries, how can users indicate a willingness to assist others?
5. What are the incentives? On the one hand people may be prepared to help if they form part of a group but on the other hand people's natural competitiveness may prevent them from assisting others. There may be trade-offs or the possiblility of future reciprocity — how does one make this explicit or make users aware of the possibilities? Managers and workers often do not share incentives and reward structures.
6. How do we form a critical mass of participants? CSCW requires an initial buy-in from a group of people. One has to overcome initial cynicism and mistrust.

7. How do you cope with coordination breakdowns?
8. How does one allow the group to adapt the system to their particular needs?
9. How does one ensure ease of use?
10. How does one handle large amounts of information?

Upon due consideration of all the published literature and the findings of eminent researchers it was decided not to pursue the use of HERCULE to foster peer help. Using HERCULE for this purpose would be like using a spanner to hammer in a nail. It is simply not the right tool for the job. The helpful and successful peer-help system would have to be tailor-made for the purpose and not be an optional extra of an existing system, the way it would be with HERCULE.

4 Conclusion

The conclusion reached by this report is that the extension of the HERCULE system to incoporating peer help facilites would be a fruitless exercise. It is disappointing to publish a report which concludes that an idea is untenable. It is, however, far better to reach this conclusion based on the findings of other researchers than to duplicate their work by developing software which is doomed to failure.

Acknowledgement

This research was supported by a grant from the Royal Society.

References

[1] M Ackerman and B Starr. Social activity indicators: interface components for cscw systems. In *Eighth Annual Symposium in User Interface Software and technology. UIST'95. Proceedings of the ACM symposium in User Interface Software and technoogy*, pages 159–68, Pittsburgh, PA, USA, 14–17 Nov 1995. ACM.

[2] M S Ackerman. The Intellectual Challenge of CSCW: The Gap Between Social Requirements and Technical Feasability. *Human-Computer Interaction*, 2001.

[3] B Alhström, H Marmolin, and T Marmolin. Ongoing evaluation studies of collaborative work within the Swedish Multig Research Program. In *INTERACT '93 and CHI'93 conference companion on Human factors n computing systems*, pages 191–192, Amsterdam, The Netherlands, April 24–29 1993. ACM.

[4] T Bikson and J D Eveland. The Interplay of Work Group Structures in Computer Support. In J Galagher, R Kraut, and C Egido, editors, *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work*, pages 245–290. Hillsdale, NJ. Lawrence Erlbaum, 1990.

[5] S Brave, H Ishii, and A Dahley. Tangible interfaces for remote collaboration and communication. In *Proceedings of the 1998 ACM Conference on Computer Supported Cooperative Work (CSCW '98)*, pages 169–178, Seattle, USA, 14–18 November 1998. ACM.

[6] K Carley and K Wendt. Electronic Mail and Scientific Collaboration. *Knowledge*, 12(4):406–440, 1991.

[7] J M Carroll, editor. *Interfacing Thought: Cognitive Aspects of Human-Computer Interaction*. MIT Press, Cambridge, MA, 1987.

[8] J M Carroll and M B Rosson. The Paradox of the Active User. In *[7]*, chapter 5, pages 80–111. MIT Press, 1987.

[9] A Cockburn and H Thimbleby. Reducing user effort in collaboration support. In *Proceedings of the international worjshop on Intelligent User Interfaces*, pages 215–218, Orlando, FL, USA, January 4–7 1993.

[10] F Darses, P Falzon, and J M Robert. Cooperating partners: investigating natural assistance. In *Proceedings of the Fifth International Conference on Human-Computer Interaction*, volume 2, pages 997–1002, 1993.

[11] S Easterbrook. Coordination breakdowns: Why groupware is so difficult to design. In *IEE Colloquium on CSCW*, pages 8/1–8/4, London, UK, 20 February 1995.

[12] P W Fach, M Bannert, and K Kunkel. From Conflict to Dialogue; On Attack and Defence in On-line Assistance. In Thomas Grechenig and M Tscheligi, editors, *Lecture Notes in Computer Science*, volume 733, pages 103–113, 1993.

[13] J Greer, G McCalla, J Cooke, J Collins, V Kumar, A Bishop, and J Vassileva. The Intelligent Helpdesk: Supporting Peer-Help in a University Course. *International Journal of Artificial Intelligence*, 9:159–177, 1998. http://julita.utask.ca/Texte/Jim-html/I-Help.htm.

[14] J Grudin. Social Evaluation of the user interface: Who does the work and who gets the benefit. In H-J Bullinger and B Shackel, editors, *INTERACT 1987. IFIP Conference on Human-Computer Interaction.*, pages 805–811, Stuttgart,

Germany, 1987. IFIP, Elsevier Science Publishers B.V.

[15] R Hellman. Combining CSCW and use support techniques to design collaborative user interfaces. *Interacting with Computers*, 4(1):41–67, 1992.

[16] J Hughes, D Randall, and D Shapiro. CSCW: Discipline or Paradigm? In L Bannon, M Robinson, and K Schmidt, editors, *Proceedings Second European Conference on Computer-Supported Cooperative Work. (ECSCW'91)*, pages 309–23, Amsterdam, The Netherlands, 24–27 September 1991.

[17] A Karsenty. Easing interaction through user-awareness. In J Moore, E Edmonds, and A Puerta, editors, *IUI97. 1997 International Conference on Intelligent User Interfaces*, pages 225–8, Orlando, FL, USA, 6–9 January 1997. ACM.

[18] R E Kraut, M D Miller, and J Siegel. Collaboration in performance of physical tasksl effects on outcomes and communication. In *Proceedings of the ACM 1996 conference on Computer Supported Cooperative Work.*, pages 57–66, Boston, USA, Nov 16–20 1996. ACM.

[19] P H Lewis. Strangers, Not Their Computers, Build a Network in Time of Grief. New York Times, 8 March 1994. A1, D2.

[20] D W McDonald and M S Ackerman. Just Talk to Me: A Field Study of Expertise Location. In *Proceedings of the 1998 ACM Conference on Computer Supported Cooperative Work (CSCW '98)*, Seattle, USA, 14–18 November 1998. ACM.

[21] D Norman. Collaborative computing: collaboration first, computing second. *Communications of the ACM*, 34(12):83–90, 1991.

[22] J F Nunamaker. Future research in group support systems: needs, some questions and possible directions. *International Journal of Human-Computer Studies*, 47:357–385, 1997.

[23] D K O'Neill and L M Gomez. Sustaining mentoring relationships on-line. In *ACM 1998 Conference on Computer Supported Collaborative Work. Proceedings CSCW 98*, pages 325–34, Seattle, USA, 14–18 November 1998. ACM.

[24] J M Pickering and J L King. Hardwiring Weak Ties: Individual and Institutional Issues in Computer Mediated Communication. In *Proceedings of the ACM Computer Supported Collaborative Work Conference. CSCW '92*, pages 356–361. ACM, November 1992.

[25] J A Pratt. Where is the instruction in Online Help Systems? *Technical Communication: Journal of the Society for Technical Communication*, 45(1):33–37, First Quarter 1998.

[26] Karen Renaud. *A Generic Feedback Mechanism for Component-Based Systems.* PhD thesis, University of Glasgow, 17 Lilybank Gardens, Glasgow, G12 8RZ, June 2000.

[27] Karen Renaud and Richard Cooper. Considering possible outcomes and the user's environment in designing user interfaces to data intensive systems. In *User Interfaces to Data Intensive Systems. UIDIS'01*, ETH, Zurich, 31 May - 1 June 2001.

[28] Y Rogers. Exploring Obstacles: integrating CSCW in evolving organisations. In *Transcending boundaries, CSCW '94. Proceedings of the Conference on Computer Supported Cooperative Work*, pages 67–77, Chapel Hill, NC, USA, 22-23 October 1994. ACM.

[29] M Schofield and D Ben-Horin. CompuMentor. People Helping Computers Help People. In *Proceedings of the ACM CHI'95 Conference. Mosaic of Creativity*, volume 2, pages 153–4, Map 7–11 1995.

[30] M A Smith, S D Farnham, and S M Drucker. The Social life of Small Graphical Chat Spaces. In *Proceedings CHI'2000*, volume 2, pages 462–469, 1–6 April 2000.

[31] M M Weil and L D Rosen. *Technostress: Coping with Technology @ Work @ Home @ Play.* Wiley, USA, 1997.

[32] B Wellman. For a social network analysis of computer networks: a socialogical perspective on collaborative work and virtual community. In *Proceedings of the 1996 conference on ACM SIGCPR/SIGMIS conference.*, pages 1–11, Denver, USA, 11–13 April 1996. ACM.

[33] A Whitaker and E Hill. Current Conversations. *Action in Teacher Education*, XVII(4):79–82, Winter 1996.