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Rendezvousing at Familiar and Unfamiliar Places

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This paper reports a diary study of rendezvousing as performed by university students. The study compares students' performance when meeting at familiar and unfamiliar rendezvous points. It reports various findings that help to set goals for the development of personal navigation and related services at appropriate levels. For example, when meeting at novel rendezvous points, students: (i) fail to meet as initially agreed more frequently; (ii) report more stress and lost opportunity as a result of rendezvousing problems; (iii) change plan during the rendezvous more often; (iv) communicate more about the rendezvous, particularly using text messaging; (v) attribute rendezvousing problems to lack of geographic and travel information more often, and to additional, spontaneous tasks such as 'popping to the bank' less often. Meetings at novel rendezvous points are also more likely to include acquaintances and strangers.

KEY WORDS

1. rendezvousing.   2. location-based services.   3. user performance.

1. INTRODUCTION.   Personal navigation and related services for the general public are gradually being introduced. A basic package of services is provided by

GPS phones, which combine traditional Global Positioning and map displays with basic telephony, text messaging, Internet access via Wireless Application Protocol (WAP) and To Do lists, calendars and reminders. Additional services include:

- FriendFinder services, in which subscribers (who have been given the necessary permissions) use text messaging, WAP or the Internet to obtain the location of another mobile device, using the device's cell ID (the identity of the wireless network cell currently handling that phone);
- position-aware traffic information – dial a telephone number and receive a voice-recorded, up-to-date, traffic report for the cell-ID of the requesting phone;
- wireless route planning – plan your route on a remote server, and then download the map to your phone.

Other devices and services are currently under development, often in the form of electronic guides that combine navigational tools, with related, position-aware services, such as timetables and route information, local shops and landmarks, online booking and purchasing, and small group communication. PNT (Personal Navigation Tool) is for use over traditional GSM networks, and is enabled by WAP (Chincholle et al., 2002). LOL@ (Local Location Assistant) is for use over broader-band Universal Mobile Telecommunications Services (UMTS) (Poposchil et al., 2002).

When developing these services, it is often difficult to set user performance goals at appropriate levels. A user performance goal, here, states a desired trade off between the quality of outcomes that users achieve, for the physical and mental costs that they incur so doing i.e. 'user task effectiveness' (Newman & Taylor, 1999). For example, Burnett & Joyner's on-the-road assessment of an in-car, route guidance system measured user performance in terms of actual journey duration (outcome quality) and workload (user cost) (1997). However, user performance goals are often not set for electronic guides. For example, the goals for PNT were to make the service as simple and easy to use as possible, and the goals were measured in terms of user success at completing information retrieval and planning tasks, user attitude, and usefulness ratings (p. 211). However, since these measures concern 'simplicity' and 'ease of use' rather than 'outcomes for costs', these goals are usability goals, rather than user performance goals. The goals for LOL@ were 'to provide value to the user … … A market survey analysing user needs was out of the scope of our project' (p. 141) i.e. goals for user performance were not set.

The reason why it is difficult to set user performance goals is that it requires considerable time and effort to conduct the necessary empirical studies. These studies assess the user performance associated with *current* systems and services, and then use current performance as a baseline, or point of comparison, for setting goals for *future* services. However, studies of user performance relevant to personal navigation and related services, need to be conducted in the field, because a realistic context for use is difficult, if not impossible, to reconstruct in a laboratory. Also, to obtain a representative sample of even a subset of the general public, many users must take part in any field study. Many projects just do not have the resources to conduct a large scale field study.

User performance goals are necessary to focus and motivate development effort. They also support evaluation – goals must first be stated for evaluation to later assess how well goals have been achieved. Further, user performance goals must be set at appropriate levels – too high and the goal is unrealistic and unachievable, too low and the goal does not serve its purpose of focussing development.

2. AIM. The aim of this paper is to report an empirical study of user perform-ance, which provides the points of comparison necessary to set user performance goals for personal navigation and related services at appropriate levels. The study is a diary study of rendezvousing as performed by university students using mobile communication services (telephony and text messaging). It compares user perform-ance when students meet at familiar and unfamiliar (novel) rendezvous points. Meetings at *novel* rendezvous points are of particular interest, because they represent the kind of tasks for which navigation and related services are, presumably, most likely to be useful. The study compares the performance achieved under different conditions to provide more than one point of comparison – one for novel rendezvous points, and one for familiar rendezvous points. In the paper, the next Section presents some background about rendezvousing and rendezvousing performance. Section 4 presents the study method and Section 5 presents the results. The main discussion is in Section 6 and conclusions are in Section 7.

3. BACKGROUND.
3.1. *Rendezvousing.* A rendezvous, here, is the informal co-ordination of a small group of friends and family. The purpose of a rendezvous is for individuals to come together to participate in a subsequent activity, such as 'to watch a movie', or 'to give the kids a lift home'. Rendezvousers have personal relationships – they are not em-bodiments of organisational roles. Consequently, rendezvous do not include: formal, or anonymous attendance at institutions, such as 'reporting to the Tax Office for interview' and 'going to my Electronics lecture; business fora, such as Annual General Meetings; or receipts of service, such as 'pizza delivery'. Rendezvous are also physical encounters, and not virtual ones, such as international telephone calls, and internet chats.

Rendezvousing has not been widely studied in user-centred research. The most closely related work is, perhaps, ergonomic transit studies of user movement within interior spaces (Grandjean, 1973) and time-geographic studies of daily travel routines (Carlstien *et al.*, 1978). Ethnographic studies of the behaviour of mobile telephone users, some of whom were, incidentally, rendezvousing have also been conducted (Tamminen *et al.*, 2003; Grinter and Eldridge, 2001; Frohlich *et al.*, 1997). However, these 'practice' studies tend to say more about the behaviour that is observed when users communicate in certain contexts, rather than the task performance that is achieved.

3.2. *Rendezvousing Behaviour.* The following scenarios illustrate rendezvousing behaviour. They are based upon diary entries obtained during the study reported here.

- *Scenario 1.* Rashid and his girlfriend, Urshana, have agreed to meet in the evening to talk about coursework and other things. That afternoon, Rashid happens to be passing close to Urshana's house, and decides to drop in. As he thought, Urshana is at home, so they talk about the coursework, and make other arrangements for the evening.
- *Scenario 2.* Margaret and Jim are old friends. As first year undergraduates, they used to work together, but now they are taking different courses at different sites. It is Jim's first visit to Margaret's new site, and Margaret is due to collect him from the train station. Margaret is a bit early, and there is no information about the arrival of Jim's train, so she makes a short visit to the shops, rather

than wait around. Unfortunately, Margaret gets caught in a checkout queue. When she returns to the station, Jim is waiting at the entrance. Luckily, it is the entrance that Margaret uses.

- *Scenario 3.*   Sue leaves her husband Bob a telephone message, asking him to collect their daughter Rita from school, because Sue's workshop is late starting, so Sue is no longer sure to make the collection. Sue emerges from the workshop to find that Bob hasn't confirmed the new arrangement. There is no answer from Bob's mobile phone (he is driving), so Sue rushes to the school. She arrives just as Rita's class is emptying, only to find Bob at the gates.

3.3.   *Rendezvousing Performance*.   Rendezvousing performance, here, is a trade off between the quality of outcome achieved for costs incurred. Rendezvousing outcomes comprise:

- *success* – meeting up at the time and place initially agreed;
- *stress* – worrying about how well a group will meet up, and the consequences of this; and
- *lost opportunity* – what rendezvousers would otherwise have done, had they met up well.

Stress and lost opportunity are used in addition to success, because a pilot study revealed that approximately 25% of students' rendezvous do not take place as initially agreed, but are nevertheless not regarded as problematic. For example, three male friends may have arranged to meet at about 8 pm in the local pub, but if one friend arrives 30 minutes late, it is not necessarily of concern for any of them (Colbert, 2001).

'Costs incurred by users' comprise various aspects of the user experience[1] associated with using wireless services to ensure a rendezvous is successful, namely satisfaction, convenience, social acceptability, disruption, frustration, and mental effort. These aspects of user experience are relevant to current and future services – not only communication, but also navigation and related information services.

3.4.   *Related Tasks*.   When setting user performance goals, it is important to consider related tasks, because the character of related tasks may change as users react to the introduction of new services, and these changes may obscure effects on rendezvousing that would otherwise have been perceived. For example, if a new navigation aid leads rendezvousers to plan less before the rendezvous, because they are now over-confident of their ability to make a better plan once they are already en route to a rendezvous, the new navigation aid may actually increase stress levels, rather than reduce it. Consequently, the study also measured some aspects of related tasks, both before and during[2] rendezvous, namely: (i) the number of times the plan changed; (ii) the number of times communication occurred (wireless services were used); and (iii) the channel of communication that was adopted. These measures appeared to capture key characteristics of the most important related tasks – it is impossible to measure everything.

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[1] For practical purposes, wireless services are currently communication services (voice telephony and text messaging) so 'user costs' are here referred to as 'user experience of communication' for clarity. Only a few participants reported using e-mail, voice mail, WAP or pagers during a rendezvous, so the results are not reported here.

[2] 'During the rendezvous' begins when the first person departs for the rendezvous point, and ends when the rendezvousers decide to start, or abandon, the subsequent group activity.

4. DIARY STUDY.

4.1. *Participants.* The participants in the study were 22 male and 22 female students from the School of Computing and Information Systems, Kingston University. The aim of selecting participants was to obtain a sample that was balanced in terms of sex, and also large in size, despite the fact that the vast majority of students in the School were male. Between January 2001 and April 2002, students who took a module in Human-Computer Interaction completed a diary as a minor part of coursework exercises. 22 female students completed a diary and consented to its anonymous use here – 4 undergraduates in 2001, 6 undergraduates in 2002 and 12 post-graduates in 2002. The diaries of 22 male students were then selected from the appropriate course module year, to match the female participants as closely as possible in terms of age, ethnic background, marital status, number of children, and mobile phone ownership.

The diary keepers had a mean age of 25 years and 11 months. 66% were single, 23% had been with the same partner for more than one year, and 11% were married. 14% had children. 40% of participants were White in ethnic origin, 40% were Asian, 9% were Afro-Caribbean, 5% were Far-Eastern and 7% were 'Other'. All diary keepers were registered as full-time students, and 33% did more than 10 hours per week paid work in addition to their University studies. 89% owned a mobile telephone, 89% had access to a fixed line telephone, and 98% had a private e-mail account in addition to their University account. Only 4·5% owned a pager. If they owned a mobile phone, 51% used it more than 10 times per week, and, if they had access to a fixed-line phone, 33% used that more than 10 times per week. All participants lived within commuting distance of Kingston-upon-Thames, a suburb of southwest London, UK. 82% owned a map of Greater London. One student owned a GPS unit.

4.2. *Diaries.* A diary method was used, because rendezvous events are too rare, private and geographically dispersed for direct observation, and users too easily forget important details of their behaviour to report them accurately long afterwards. Diaries have long been used in user-centred development (see, for example, Rieman, 1993). The diary used here also generated qualitative data about the nature of rendezvousing, plus quantitative data about users, the tasks and performance.

Postgraduates kept diaries about their own rendezvousing behaviour for a one-week period in January. Undergraduates kept diaries for two, one-week periods, the first week in February, the second week in April. To be consistent with the post-graduates, only February entries for undergraduates are used here. This sample of the student year is of interest, because it approximates to the term-time routine, and so accounts for most of the year. However, it does not include vacations (when students may be working, or have returned to their parental home) and only collects data during the winter (which is not suitable for some activities, modes of travel, clothing etc).

Participants made one diary entry for each rendezvous event they attended. Each entry comprised: (i) an open-ended, narrative description in the diary keeper's own words of what happened, and why; and (ii) the diary keeper's responses to a questionnaire, which asked for specific details of each rendezvous event. This questionnaire comprised 37 questions in total and breaks down as:

- Questions 1–6: the event (the "who, when, where, why" of the rendezvous);
- Questions 7–11: outcomes (the additional stress and lost opportunity associated with attempts to meet at the time and place initially agreed);

- Questions 12–24: usage and user experience of communication *before* the rendezvous;
- Questions 25–37: usage and user experience of communication *during* the rendezvous.

4.3. *Procedure*. At the outset of the study, all students were given an overview of future position-aware, computing and communications for mobile devices, and were introduced to the aims of the study and the obligations of diary keeping. To illustrate the kind of services that could be developed, participants examined fixed-access Web sites that provide map, transport and venue information, such as www.multimap. com, and londontransport.co.uk. A possible future service was also described, which enabled each member of a small group to display on their mobile telephone the positions of other group members, superimposed upon an annotated map. At the end of the diary keeping period, diary keepers also completed a further form, which summarised their diary and its completeness.

Questionnaire responses were processed automatically by an Occular Reading Machine. This machine generated a text file of responses, which was checked manually before being read into statistical analysis software.

5. RESULTS. Diary keepers took part in a total of 248 rendezvous. 65% of rendezvous occurred at familiar locations (points at which diary keepers had rendezvoused before), and 35% occurred at unfamiliar, 'novel' locations (points at which diary keepers had not rendezvoused before).

5.1. *Outcomes and User Experience*. When meeting at novel rendezvous points, rendezvousers met as initially agreed less frequently than when meeting at familiar rendezvous points. They also reported stress more frequently, but reported lost opportunity equally frequently (see Figures 1 and 2). When meeting at novel rendezvous points, mean levels of reported stress and lost opportunity are both higher (see Figure 3). However, when meeting at novel rendezvous points, rendezvousers rate the experience of communication during the rendezvous no differently to when meeting at unfamiliar rendezvous points (see Figure 4).

5.2. *Reasons for being late*. When meeting at novel rendezvous points, rendezvousers are more likely to attribute problems rendezvousing to lack of geographical information and to lack of travel information than when meeting at familiar rendezvous points (see Figure 5). When meeting at novel rendezvous points, rendezvousers are also less likely to attribute problems rendezvousing to ''side-stepping'' i.e. to the spontaneous, opportunistic performance of additional tasks en route to the rendezvous. However, there is no difference in terms of likelihood of attributing problems to the mode of travel, poor planning, and not valuing success.

5.3. *The Rendezvousing Task*. Whether meeting at novel and familiar rendezvous points, the size of the rendezvousing group does not appear to differ. However, meetings at novel rendezvous points are more likely to include strangers (see Figure 6).

5.4. *Related Tasks*. When meeting at novel rendezvous points, the plan does not appear to change more or less frequently, than when meeting at familiar rendezvous points, either before or *before* or *during* the rendezvous (see Figure 7). When meeting at novel rendezvous points, rendezvousers communicate more, both before and during the rendezvous, compared to meeting at familiar rendezvous points (see Figure 8). Also, *before* meeting at novel rendezvous points, rendezvousers tend
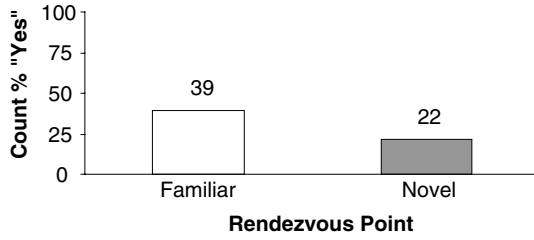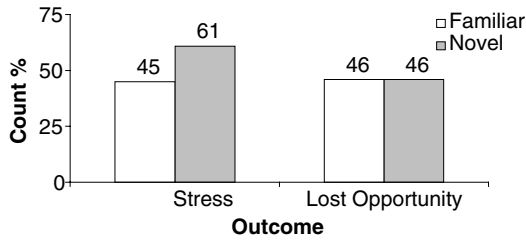
Figure 1. Did you all meet up as initially agreed?

Figure 2. Did you incur any stress/lost opportunity as a result of problems rendezvousing?

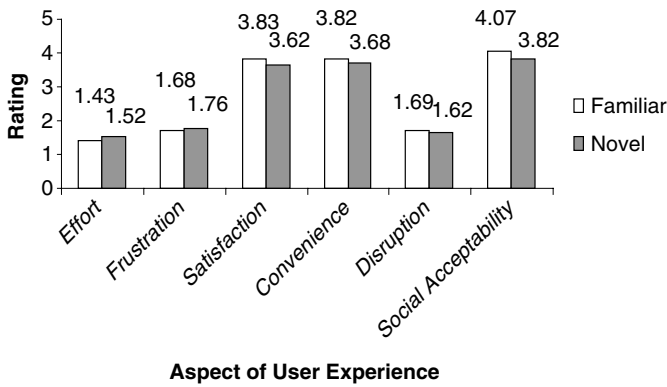Figure 3. How much stress/lost opportunity was caused by problems rendezvousing?

Figure 4. User experience ratings for communication during the rendezvous.

Table 1. Summary of Findings.

| Parameter | Indicator | Values | | Statistical Significance |
		Novel	Familiar	
Outcomes				
Meet as agreed	Count %	78	61	$P = 0.009 < 0.01$**
Stress (Yes/No)	Count %	61	45	$P = 0.023 < 0.05$*
Level of stress	Mean Rating	2.54	2.13	$P = 0.04 < 0.05$*
Level of lost opportunity	Mean Rating	2.26	1.87	$P = 0.04 < 0.05$*
Reasons for Rendezvousing Problems				
Lack of Geographic Info.	Count	24	4	$P = 0.00 < 0.001$***
Lack of Travel Info.	Count	12	3	$P = 0.011 < 0.05$*
Spontaneous Additional Task	Count	1	10	$P = 0.012 < 0.05$*
Rendezvous Tasks				
Include Strangers	Count %	17	6	$P = 0.013 < 0.05$*
Related (Enabling) Tasks				
Communication (Before)	Mean	3.24	2.46	$P = 0.026 < 0.05$*
Communication (During)	Mean	1.78	1.25	$P = 0.019 < 0.05$*
Talking (Before)	Mean	1.54	1.19	$P = 0.049 < 0.05$*
Text Messaging (During)	Mean	0.68	0.36	$P = 0.007 < 0.01$**

Ratings were on a scale of 1–5, 1 = low and 5 = high.

to use telephony more compared to *before* meeting at familiar points (see Figure 9). *During* rendezvous at novel points (whilst en route), rendezvousers also tend to use text messaging more compared to rendezvous at familiar points.

In summary, meeting at a novel rendezvous point impairs outcomes in many respects, and increases communication. Meetings at novel rendezvous points also involve strangers more frequently, are tend to go wrong for different reasons. However, meeting at a novel rendezvous point does not affect user experience of communication, the relative use of alternative communication services or the stability of the plan for the rendezvous.

6. DISCUSSION.

6.1. *Effects of Novelty of Rendezvous Point upon User Performance*. Overall, the results were as expected. When meeting at novel rendezvous points, the failure to meet up as initially agreed becomes more likely, the reporting of stress increases, and the levels of stress reported increase, because rendezvousers lack the geographic and travel information they need to be certain of arriving at their destination in good time. Communication increases, because other rendezvousers are a good source of this information e.g. a rendezvouser may phone a friend for directions to his or her house. Also, communication may be suspended awaiting further geographic and travel information e.g. "I'll find out exactly when the train is, and then get back to you". These findings may be welcomed by those developing personal navigation and related services, since they support the assumption that rendezvousers will benefit from this kind of service. These findings also underline the fact that, when rendezvousing, navigation is closely linked to communication – once a rendezvouser has obtained additional navigational information, he or she may wish to exchange it with the group.
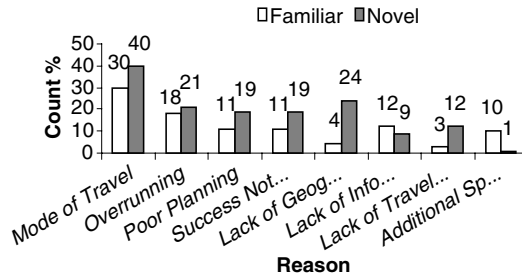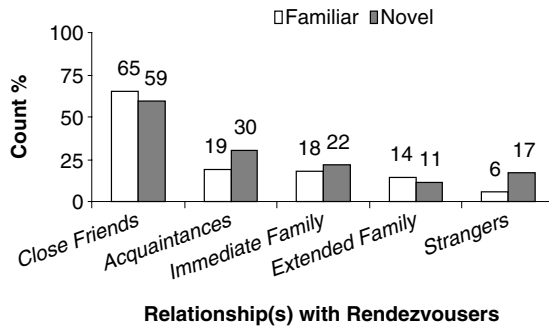
Figure 5. Reasons for problems rendezvousing.

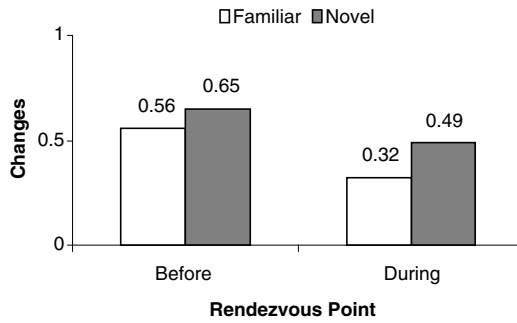**Figure 6. What relationship(s) do you have with other members of the rendezvousing group?**

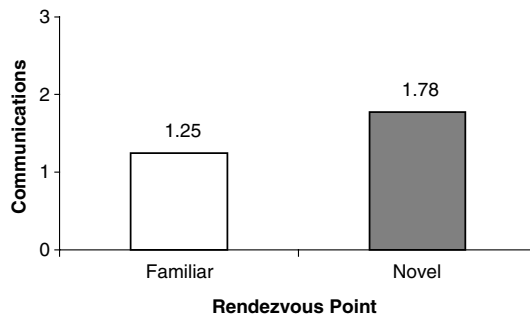**Figure 7. Number of changes to the plan before and during the rendezvous.**

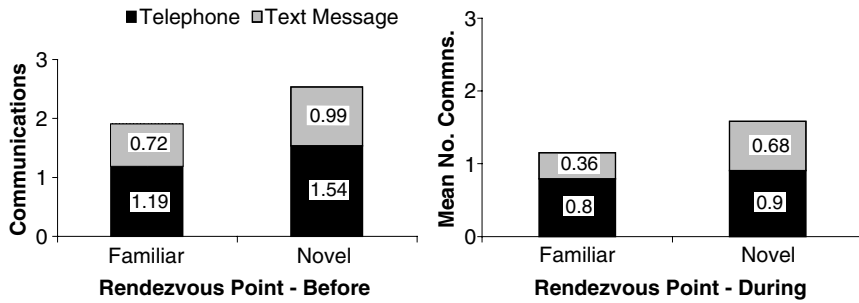**Figure 8. Number of communications before and during the rendezvous.**

Figure 9. Number of telephone conversations and text messages before and during the rendezvous.

Diaries suggested that problems due to the 'side-stepping' were less likely when meeting at a novel rendezvous point, because side-stepping was not on rendezvousers' agendas. Travelling and navigating against the clock is enough to occupy them, physically and mentally, to exclude thoughts of 'popping into' convenient outlets en route. Rendezvousers were presumably unaware of their proximity to local outlets anyway.

The user experience of communication remains unchanged when meeting at novel rendezvous points, because other factors are more important determinants of user experience, for example, the context in which communication occurs i.e. before or during the rendezvous (Colbert, 2002; Colbert, submitted for publication). The effects of these factors overshadow any effect of novelty of the destination.

It was not expected, however, that the reporting (presence/absence) of lost opportunity would remain unchanged, when meeting at novel rendezvous points – lost opportunity should increase as a consequence of getting lost and missing travel connections. However, the diaries suggest that 'navigational' problems may be anticipated by rendezvousers and accommodated by plans which specify 'stepped' group activities, for example, an invitation to dinner that might state '8 pm for 8.30', and serve drinks at 8 pm, the meal at 8.30 pm. When activities are stepped, the point at which opportunities begin to be lost is put back, relative to the onset point for stress, and so stress tends to increase more than lost opportunity. In the above example, a dinner guest who gets caught in traffic and does not arrive until 8 pm, may get stressed about the delay, but may not feel he or she has lost an opportunity to socialise.

Diaries suggest two reasons for the increased likelihood of meeting strangers at novel rendezvous points. First, meeting a new person may be the motivation for going beyond the boundaries of one's own familiar territory. For example, a guest at a house party may be good friends with other dinner guests, but have never met the host before. Or a student may be running an errand for a friend, such as dropping off some floppy discs at another student (the stranger)'s house. Second, novel meeting points may be deliberately selected to mark special occasions, such as marriages, or birthdays, and strangers and acquaintances figure in special occasions more than they do in routine occasions.

When meeting at novel rendezvous points, text messaging during the rendezvous is more frequent than before the rendezvous. Diaries suggested this increase may be due to the exchange of progress reports – statements that marked how far a rendezvouser

Table 2. For Illustration: Performance Goals for a Group Awareness System.

Finding	Current Values		Change Sought	Target Value (Novel)
	Novel	Familiar		
Outcomes				
Meet as agreed	78	61	reduction	70
Level of stress	2·54	2·13	reduction	2·30
Costs (User Experience of Communication)				
Effort, Frustration, Satisfaction, Convenience, Disruption, Social Acceptability	1·52	1·43	constant	1·52
Reasons for Problems Rendezvousing				
Lack of Geographic Info.	24	4	reduction	18

had proceeded towards their destination, and when they might arrive. For example, a student travelling a long way by car before giving another student a lift for the final leg of the journey may send his future passenger progress reports en route, just to keep him or her in the picture – there is no real need, or opportunity, to talk to him or her. Occasionally, rendezvousers used text messages to record names and addresses, or give short and simple directions, such as "take a left out of tube its about 300 yards on your left opposite grocer's". They preferred to have critical information written down for future reference, rather than to rely upon their memory for speech. Since our students either did not have, or did not use e-mail on their mobile telephone, written information required during a rendezvous must be transferred by text message. (Before a rendezvous, it could be exchanged via e-mail to their PCs.)

6.2. *Setting Performance Goals*. Actual projects would probably set goals for user performance by considering the data collected by this study in conjunction with other specific inputs, such as focus groups, 'practice' studies (see Tamminen *et al.*, 2003) and technical feasibility studies. The goals of actual projects are also likely to evolve as user feedback is obtained from initial designs and prototypes. In this illustration, however, the goal is set at about the level required for the future service to achieve a statistically significant improvement[3] over current technology. The illustration sets goals for a project developing a group tracking service.

Viewing the position of other rendezvousers is assumed to give reassurance that no, or only a few, opportunities will be lost, and so reduces the mean level of stress (see Table 2). Given that the service provides a map display, the attribution of problems rendezvousing to lack of geographical information, should also be reduced. Goals for the user experience of communication specify no change from current values, because, rather than endure significantly lower levels of 'social acceptability' or 'frustration' with a group awareness tool, rendezvousers would be expected to use the telephone or text messaging instead.

7. CONCLUSION AND FUTURE WORK. This study has collected data that enables user performance goals for navigation and related services to be set at more appropriate levels. Having set user performance, it will now be possible

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[3] Assuming any later evaluation has the same sample size and variance as this study.

to assess the extent to which new technology achieves these goals. For example, it may be possible to repeat the diary study in, say, 2005–7, when students may have adopted the technology currently under development, and assess whether they have indeed become less stressed, reduced the likelihood of being late because of lack of geographic knowledge, and communicate no more than usual.

The findings of this study may also be used to support the design of potentially more user-friendly services. For example, if rendezvous at novel meeting points are more likely to involve strangers and acquaintances, and other rendezvousers are an important source of information, then perhaps services should encourage the exchange of contact details prior to a rendezvous, or the setting up a common point of contact (say, a group home page for the meeting). Perhaps position-aware text messaging services could make it easier to send 'progress report' messages, or to insert place names and directions into text messages, so that rendezvousers have an accurate, written record of important information.

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