# Field trials

## What does this technique do?

In field trials a product is tested by users in a 'real life' setting (as opposed to testing under artificial laboratory conditions). Both the product and the field trial setting are designed to be as close as possible to actual usage. This often involves installing a particular piece of equipment and then monitoring its performance over a period of time. It is common to allow users to operate equipment as they would in actual usage, and it is usual to monitor that usage using objective and subjective measures.

One common method is to conduct regular interviews with users in order to plot their experiences in using a product. In addition the technique can be used in conjunction with other data capture tools e.g. diary keeping methods (See Activity Diaries). Usage and non usage of equipment can also be recorded in such trials, and in some cases the product itself can keep automatic records of its usage i.e. where the product is computerised and has automatic logging facilities.

The result of such an investigation can be a "problem list" which contains valuable information for designers regarding the potential for improving the usability of a product. The use of field trials is very common for the testing of new products prior to their commercial launch. Often this is referred to as Beta testing. A Beta testing site is essentially a test site where new products can be tested before being commercially available, and it is common for developers to use existing customers to assist them in this process.

**SPECIAL CONSIDERATIONS**

General ▶

People with communication problems ▶

Mental Impairment ▶

▶ See Sources of Further Information

The rationale behind Beta testing is that often it is only possible to identify certain problems by testing equipment in realistic settings approximating actual usage. Consequently by allowing 'friendly' organisations or individuals to use new products prior to actual release, potentially expensive mistakes can be identified and rectified. In addition, the use of field trials has good face validity as, unlike laboratory–based user trials, field trials are not conducted in artificial settings. Products are used in the context of the whole environment in which they have to work in and many practical difficulties that would not be apparent in controlled settings can be revealed. Products often interact with their environment in ways which cannot be anticipated in advance, and can therefore be missed if only controlled user trials (See User Trials) are performed.

It is difficult to make explicit recommendations about the design of field trials. To a large extent this will depend on the complexity of a particular product and the nature of the anticipated user population. Some products need to be used extensively before users become accomplished users and the full range of usage is achieved, whilst for other products very short trials are all that are needed. Often this can only be determined by trial and error, and by monitoring a particular trial to see whether there are changes still taking place in user performance over a period of time. Once usage appears to have stabilised for a new product, then the trial is complete.

# When to use it

Field trials are normally applied when a final prototype is available, or a complete product is to be evaluated. Because of the relative time and expense of running a field trials it is not common to use them in the early stages of product development, but rather to use them for evaluation purposes.

# What resources are needed?

Compared with other techniques, field trials are resource intensive as the performance of a product needs to be examined over an extended period. Resources to conduct regular interviews with end users are also usually needed to gain maximal benefit, and the approach is very expensive to apply when large numbers of users are involved. However good results can be obtained from field trials with as few as four participants, and even field trials with single users are also of some value.

The duration of a field trial is a factor which needs to be given careful consideration. No detailed recommendation can be give as it will depend

largely on the complexity of the product being investigated. What can be said, however, is that trials should be conducted until usage settles down into a regular pattern, and the user is confident that they know how to use the product. For some simple products this can be a short as a few hours, whilst for other more complex systems days or months might be needed. Some flexibility is needed in planning field trial duration. For example, if during a field trial it quickly becomes obvious that a product has fundamental flaws then product redesign clearly needs to be addressed. It is reasonable in those circumstances to draw the field trial to a close prematurely and so avoid wasting resources on an extensive study. Following redesign, a further field trial could then be conducted.

Field trials are inherently less controlled than laboratory–based trials, but often some degree of control can be attempted to allow a combination of activities to be observed. One common approach is to allow subjects periods of time when they can use the product freely and as they see fit, this is then interspersed with periods when they are require to perform specific tasks or activities. This allows some control of the tasks to be performed which means that information can also be gained on infrequent activities which might otherwise not be observed.

The costs of using the field trial approach will vary with the number of subjects to be tested and the length of time given to the investigation. Field trials also need resources for analysis purposes, and again the resources needed for analysis may also vary considerably with the kind of measures used and with the degree of detail recorded.

Automatic data logging can produce a great deal of information which is time consuming to summarise, and in addition it can be time consuming to report the results of regular interviews and usage diaries. As with other techniques, it is important to give some attention to the analysis of results when defining a field trial, and a good rule of thumb is to ensure that data captured can be easily summarised. Where possible simple multiple choice or yes/no answers to questions should be considered which allow material to be summarised simply and quickly. For many investigations it may be sufficient to generate a simple list of problems and suggested improvements. As with other forms of investigation, pilot studies will help in defining exactly what should be investigated and how analysis should be conducted.

# Who can use it

Field trials can be used by a variety of developers. To gain the optimal amount of information from field trials some skill is needed in the setting–up of the procedure as using a product over a trial period is not

the same as actual usage. In addition it can be useful to complement the data captured by using other techniques, and some experience in performing user trials, designing questionnaires and conducting interviews will be useful (See User Trials, Interviews and Questionnaires).

# The informants, who are they

## Users, actual or potential

End users of the product under consideration are potentially the most informative participants in trials like this. Their perspective on the day–to–day usage of the product will be unique and therefore invaluable. However developers/testers should be very clear about what kind of previous experience of the same or similar products the participants should have. Users may be recruited through user organisations or by contacting schools or institutions in the area.

## Other Parties

Many products within rehabilitation technology require that persons other than end users themselves interact with the system (e.g. carers; members of the family etc.). It is not unusual for products to have an effect on the quality of life of these other people and so it is valid to obtain their views when conducting a field trial. Many of the benefits of a product may be in supporting other people such as carers, for example with the use of hoists or communication aids, and where possible the views of all those who regularly interact with the user in the trial environment should be taken into account.

## Selection of users

Although the ideal is to let a "representative sample" of the user population test the equipment, this is often difficult and prohibitively expensive to apply. After defining the user population, (for example by using the results of the User Analysis summation tool) the testers should decide whether to approach the extremes of the distribution (best case — worst case) or the mode (the typical case).

# Special considerations

## General

Field trials do require a considerable degree of effort and involvement on the behalf of users. Equipment may have to be installed in a person's home which has practical implications. There are a number of issues

relating to the use of field trials which need careful consideration before a trial is organised.

One of the most significant of these issues is a moral concern, in that some consideration needs to be made of how long a product's use will be supported by a developer, and what will happen to the equipment after a trial is concluded. Where a product improves the value of a person's life considerably, there are ethical questions as to whether it should be removed after a trial has been completed, thereby returning the individual back to their original state. In addition there are questions as to how long a product may need to be supported by developers after a formal trial has been concluded.

For field trials to be successful it is also important that users can obtain adequate support in the event of problems. Often this can mean ensuring that there is a helpline to assist in queries about usage, but in addition it can also mean ensuring that a product can be repaired quickly. Poor reliability of equipment can seriously affect the outcome of any trial and it may be difficult for users to separate out the different elements of the "product offering" when making an evaluation. Thus in a field trial it is important to try and test a product and all of the other elements which will make up that product's offering, which includes amongst other things: the quality of any training and instructional material, and user support in the event of queries and/or product failure.

Where a product has to be installed in the home of a user particular care is needed to ensure that installation causes a minimal disruption to the home, and that furnishings are returned to an acceptable state. With some disability groups it may be better to arrange for installation to take place when the person is not present. This should be discussed with the participants in the study.

Participating in a field trial requires interest and motivation on behalf of users. One should be aware that many disabled people may not be motivated to participate in these kinds of exercises. On the other hand there are numerous examples of disabled people finding this kind of activity very stimulating and interesting. However, it should be remembered that the users agreeing to take place in a field trial may not be typical of the population of disabled users, and in addition that their attitudes to the trial may not be independent of the testing situation.

The very act of conducting a field trial can have effects on participants which can colour the results of such trials. For example participants may find the attention they receive by taking part in a trial to be motivating in itself, and as a consequence may aim to please the investigators. Some types of product may also have symbolic value to users which is independent of the utility of that technology. For example a

computerised product may be desired by a young disabled person, as technology is associated with progress, and that having such technology can give messages to others about their status. It is difficult to eliminate these potential sources of bias, but careful interviewing can help. In addition many of these sources of bias are likely to be short term, which are less significant when extended trials take place.

One should be aware that many field trials will reveal serious problems with a product to the extent that particular tasks may not be possible to perform. This may lead to a situation were the user is constantly confronted with his/her disability, and as a result may find the experience demoralising. This must be avoided and it is important that the user's self esteem is not affected by his or her eventual lack of ability to operate the device. For this reason it is important to emphasise in any instructions to users that it is the product rather than the user which is being evaluated.

As with many other forms of investigation there can be particular problems in conducting field trials with certain disability groups, as the health of some potential participants can create problems for the planning and operation of such trials. This is a particular problem when the medical condition of intended users is variable. If end users have a medical condition which varies in severity, this can make it difficult to ensure that the periods covered by the investigation are representative of the user's capabilities, and that their use of a particular product is not being unduly influenced by their medical condition. In many cases the investigator needs to be flexible regarding the time scales of the investigation, and in some cases trials may have to be suspended until a user recovers from a temporary deterioration in their condition. When dealing with the frail elderly or patients with terminal conditions it should also be accepted that some participants may not survive the investigation period.

## People with communication problems

People with communication problems may have difficulty reporting their concerns about a product, and in these cases more objective measures may be needed e.g. direct observation. In addition it can be useful to elicit the opinions of any other parties present, including carers and members of the user's family, and where necessary get them to act as the intermediary for the user in their communications.

## Mental impairment

Many people with mental impairment can participate in field trials if they are properly motivated, and the trials are carefully designed not to create anxiety or be threatening. With such participants extended field

trials may be needed however, as it may take them a significant time to become familiar with a new product. Again the views of relatives and carers may be particularly relevant in recording the impressions gained.

# Procedure

## Planning

Decisions need to be made regarding the numbers of users to involve in a trial and the duration of a trial. Often these decisions are based upon the practical constraints of project time scales and resources, but where possible attempts should be made to run trials for a reasonable period. For very simple products field trials of a few days (or even hours) duration can be acceptable, whilst for more complex systems periods of several months might be more appropriate. There are no strict guidelines to follow and judgement is required in order to decide on an appropriate trial period. One approach which can be followed is to arrange trials on a flexible basis, where a provisional trial period is set, but actual experience determines when the trial is drawn to a close.

The appropriate number of users is another issue which needs resolving in the planning phase. Having at least four participants is advisable, as this reduces the chances of having atypical responses (as well as coping with the withdrawal of a particular subject for whatever reason). If the responses of the different participants differ considerably during the trial this is an indication that there is likely to be a large variation in the way that the population will respond to the equipment, and the trials may have to be extended to include more subjects. If however all subjects respond in a similar way then this is a reasonable indication that one can be confident about the results of the trial being representative, and that more subjects are not needed.

During the planning phase decisions also need to be made regarding data capture during the trials and any analysis that may be required. For many field trials it can be sufficient to conduct interviews with the users (and other relevant parties) at regular intervals, noting what users have used the product for and any particular problems they have had. During such interviews it can also be valuable for investigators to ask users to demonstrate their use of the product, and users can be given specific activities to perform, very much in the same way as in user trials.

Decisions also need to be made regarding the extent to which users should be encouraged to use the product in the trial, or whether they should be allowed to decide not to use the product. It is useful to know that end users will not elect to use a product when they have a choice, but it is also important to tease out the reasons for non use, which may

have little to do with the actual quality of the product.

One solution is to encourage active usage at the beginning of the trial, and to ensure that users have been adequately trained, but then to allow users to decide for themselves whether or not to continue usage. This requires some sensitivity on the part of the investigator however, as it can be easy to give messages to users that they are to blame for not using the product, and in some way "ruining" the trial. To some extent this effect can be minimised by having set periods where users are asked to perform specific activities with the equipment, so that all parties concerned are happy that some empirical data on usage has been obtained. However in a field trial is important to remember that knowing about non use can be as important as usage information, and that emphasis needs to be placed on the fact that it is the product rather than the person that is being evaluated. Under these circumstances non use is a failure of the product rather than of the person.

In planning one also needs to consider what will happen at the end of the trials, and as has been indicated earlier there are moral and ethical issues which need to be considered. Where possible it is recommended that participants in trials be allowed to keep the equipment they have been using, and that if possible its continued use should be supported by developers just as a commercially available product would be.

## Running the Trials

Planning the trial should also include setting a timetable for the implementation of the equipment and, where appropriate, for the removal of the equipment after the trial. It is often valuable to establish a liaison or contact person who is responsible for ensuring the trial proceeds smoothly, and is the point of contact for any user queries or problems with the equipment. In planning a field trial is important to realise that what is effectively being put on trial is not just a product, but all of the other attributes which influence how a product is perceived. This includes the quality of any installation, user training, instructional material, maintenance and up–keep etc.

It is therefore important to ensure that these issues are considered in detail, and where possible the support aspects should be as close to anticipated usage as possible. However trials are not identical to the conditions of eventual usage, and the products under test may also differ from those intended for production. For example, prototypes may be less reliable than final products, or differ in some other ways. It can therefore be a good idea to provide a higher level of support than would be anticipated in actual usage, and one option is to have a helpline manned at all times which can answer queries and ensure that equipment is quickly repaired if it fails. Such a helpline can also be more proactive in

some cases, where helpline staff conduct regular interviews with users.

In addition to ensuring that there is adequate support for users if there are problems with the equipment, it is also important to ensure that information regarding the use of the product is obtained at regular intervals. The choice of data capture methods will vary considerably depending on the attributes of the users, and may include the use of activity diaries, regular interviews, and in other cases, direct observation.

## Analysis

Field trials provide a rich source of information about how a product is likely to operate in the real world, but conversely data can be difficult to interpret as a result of this complexity. One way to assist analysis is to use relatively simple reporting forms for problems with usage of equipment, in conjunction with simple interviews and/or questionnaires that can be readily summarised. However it is important not to over simplify analysis of field trial material, and it can be very useful to periodically conduct extensive interviews with participants in order to summarise the problems experienced in use and any improvements that would be needed.

Another technique that can be used in many cases is to bring together participants in a field trial to discuss their experiences collectively. This can be a useful way of summarising the impressions of a number of users and can also provide new insights as to possible improvements to the product that may be needed (see Group Discussions).

# Sources of Further Information ◀  ◀  ◀  ◀  ◀  ◀  ◀  ◀  ◀

Fast (1991) reports the use of field trials to evaluate a new telephone system, which involved videotaping users' interactions with the system at sites such as shopping malls and airports. Field trials were also reported as being a central component of the evaluation strategy adapted by the ASHoRED pilot project in the TIDE programme (Poulson and Richardson 1994). In this study smart home technology was installed in the home of an elderly and visually impaired couple and monitored over a three-month period. Evaluation consisted of direct observation  coupled with regular interviews with end users. Field trials were one part of  the overall evaluation strategy which also included user trials, group discussions and expert opinion.

Buhler and Schmidt (1993) describes the work of a rehabilitation centre for motor impairments and illustrates this with case studies. The approach used promotes rapid prototyping and testing of technology with users. One product described was an innovative product, and in

this case evaluation consisted of introducing the product into a pilot site and then performing a field evaluation which took place over two months. Over that period interviews with users took place, and the collated results of individual users' responses were summarised at the end of the assessment and fed back to individual users.

**FAST, L. 1991,** New user interface strategies for public telephones. SIGCHI Bulletin 23(1) Jan 1991, pp36-37.

**POULSON, D. & RICHARDSON, S. 1994,** Developing adaptable smarter homes for elderly and visually impaired people. Ergonomics and design. IEA '94. Proceedings of the 12th triennial congress of the International Ergonomics Association. Vol 4, 15 - 19 Aug 1994, Toronto, Canada, pp56 - 58

**BUHLER, C. & SCHMIDT, M. 1993,** User involvement in evaluation and assessment of assistive technology. ECART 2. Proceedings of the European conference on the advancement of rehabilitation technology, 26 - 28 May 1993, The Swedish Handicap Institute Stockholm, Sweden Section 30.1 3pp