TRAVELLER INFORMATION SYSTEMS: WHAT DO END-USERS REALLY WANT?

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1. OVERVIEW

Undoubtedly, traveller information is an important and exciting area for research. The rapid evolution of technology coupled with the public's growing acceptance and desire for information has ensured that research and system manufacture is continuing apace. Indeed, the UK Government's Transport White Paper (DETR, 1998) has necessitated the re-appraisal of traveller information by setting time frames and guidelines for the implementation of good quality services. However, a large proportion of the traveller information research literature is very much service-provider centred, in turn reflecting a similar philosophy in the supply and presentation of information. With the development of advanced traveller information systems (ATISs), there has certainly been a demonstration of the ability to provide a high tech basis for information provision. Although the means and style of delivery is advanced, the underlying core information is often similar to that found in a paper-based timetable.

Whilst there is a 'technological push' towards ever more sophisticated information services, there is some evidence to suggest that while the 'market pull' might not be in a totally different direction, it is not altogether aligned with the services on offer. In short, there is a mismatch between the information available and the information required by the end-users that could stem from an ignorance of the end-user's requirements. Many contemporary services may be based on a set of fundamental, underlying assumptions about the traveller and the traveller's information needs. If it is accepted that current services are not fully meeting the needs of the travellers, the need to focus research on the end-user appears to be the best approach in attempting to optimise information provision. To this end, this paper aims to present the background philosophy and methodological issues currently being used to address the question, 'What do end-users really want from traveller information?'

In approaching this question, it is hoped that a greater understanding of user needs will be achieved, potentially leading to the provision of information that is more effective in assisting trip-making decisions. Therefore, the rationale of the study addressed in this paper has been to challenge existing design and, in proposing alternatives, employ methods and techniques hitherto typically regarded as unconventional in the field of traveller information provision. The paper highlights limitations in the current provision of traveller information and associated research. It then presents the rationale and evolution of an alternative approach that seeks to better understand user requirements from traveller information systems. Although specific findings of the ongoing study are included in the paper, they are intended to be illustrative rather than giving a comprehensive account of results. The focus of the paper concerns the underlying approach.

2. INTRODUCTION

2.1 What's wrong with traveller information?

There are numerous situations that illustrate the shortcomings or limitations in current provision of information to travellers:

- The information might not be available to the end user, for whatever reason: Perhaps a driver's preferred radio station doesn't broadcast travel information for his or her part of the country, assuming of course that the radio isn't equipped with RDS. A driver of a car without a radio cannot expect to hear travel updates at all. If the driver is deaf, however, he or she might have a radio but is unable to hear it. Alternatively, a driver lacking confidence might choose not to use his or her car for trips into the town centre because he or she is unaware of information about car parks.

- The information value may only be realised when used in conjunction with other information: For instance, the fact that the number 47 bus leaves from Park Avenue at 5 minutes past the hour is only useful if the recipient knows where Park Avenue is, and he or she knows where in Park Avenue the bus stop is, and which side of the road he or she has to wait.

- If the transport service doesn't reflect the information, the information has failed: Perhaps the information is incorrect. If the train was running early it might already have left the platform, or the platform might have been changed at the last minute, or the train might have been cancelled altogether. If, during any of these occurrences, the information hasn't adapted to the situation, it becomes ineffective or misleading.

- Perhaps the information is missing altogether: A traveller who has just had his or her hip replaced might have to hope for the best that the coach they catch to visit their friends will 'kneel' and the steps will be shallow enough for them to climb aboard.

- What constitutes basic or essential information anyway? One person's basic information may be another person's trivia. For instance, an able-bodied traveller might not even notice information concerning the accessibility features of taxis. For a person in a wheelchair, it could make the difference between getting to the shops or staying at home. Likewise, a regular traveller might only *need* information about route or time variations whereas someone making a particular trip for the first time will require all the information the seasoned traveller uses, including the existing information the seasoned traveller often takes for granted. In journey recovery situations, the latter becomes more important for all travellers to inform decisions about what to do next.

Such examples, and there are many others, highlight the potential to improve the provision of traveller information. Such improvement is constrained in part by resource implications, co-operation between relevant parties concerned with information delivery, and limitations and costs of technology. Significantly however, improvement is constrained by the extent to which user needs are understood.

2.2 Background

In the quest to provide better traveller information, the original aim for the study outlined in this paper was to design, build and trial a prototype advanced traveller information system. A literature search was conducted into the area of traveller information and advanced systems. It soon became apparent that a great deal of the relevant literature was reporting on the multitude of schemes that aimed to provide traveller information in one way or another, usually using modern technology as the vehicle or the key to its success e.g. High tech and Internet based systems (Anderson *et al*, 1997; Dailey *et al*, 1996; Scrase, 1999; Ziter, 1999) and real time information (Anderson, 1993; Balogh and Smith, 1992; Nelson, 1995). Coupled with this, some of the literature reflected the effects new systems have had upon travellers (e.g. Blackledge *et al*, 1991; Polydoropoulou *et al*, 1994; Polydoropoulou and Ben-Akiva, 1996). A smaller number of articles addressed the needs of the traveller and what the traveller actually wants (e.g Cartledge, 1996; Ng *et al*, 1995; Swanson *et al*, 1997).

In short, the majority of the literature was reflecting a top down approach to traveller information, starting with the transport service, producing information about it, supplying it to the traveller and then assessing end-users' views of the system. Only a few seemed to have a bottom up approach (e.g. Franzén *et al*, 1994; Vance and Balcome, 1997; Yang *et al*, 1998), using the end-users' needs as the basis of a system, thus allowing information about the transport service to be tailored to suit. As a result, the focus of this study was reappraised. Would there be any benefit from producing yet another 'front end' to existing traveller information? Would the advanced traveller information system be truly advanced as far as the traveller was concerned or would it merely excite the industry? The answer to both questions was regarded as no.

A more fundamental approach was therefore taken to traveller information itself and what it should aim to achieve. It is clear that a traveller information system is only as good as the information it effectively imparts to the end-user, and without asking the traveller what he or she wants, it is not possible to really know what kind of information should be produced. Even this reasoning is flawed to some extent, in that it suggests that traveller information should be provided for the *traveller*. The person meeting a traveller often isn't catered for. In some instances, a traveller is only a traveller because the necessary information has been acquired to enable the successful use of a desired mode of transport. What about those people who are somehow dissuaded from travelling? Perhaps a good traveller information system should not only cater for existing travellers but also for those people who are uninformed or too worried to travel without the comfort of a supporting information system.

The term 'design for all' is something of a byword for the nineties. It implies that a good design should cater for the greatest number of people and should not exclude any sector of the population from using it. As an example, people with restricted movement in their hands and fingers might have great difficulty in operating some modern car radios because the controls are too small and fiddly. Of course, it is possible to design a radio with bigger, easily operated controls so that the person with restricted dexterity can easily use it, but also, dextrous people will be better able to use it too. So why not cater for every user? This seems an obviously desirable goal. However, few single designs of traveller information systems seem to have successfully integrated the needs of less able end-users with those who are able-bodied and confident. This cannot be attributed to a

lack of available understanding and expertise concerning the needs of less able people as there has been much research in the area of mobility issues (e.g. AA, 1996; Benwell, 1985; Help the Aged, 1998). A good design needs to be sympathetic to the needs of the less able person whilst also benefiting the fully able person. The terms 'fully able' and 'less able' are clumsy, but for the benefit of this study they distinguish between people who are able to effectively use information and ultimately travel, for whatever reason.

2.3 Aims

In light of the appraisal of the current status of traveller information provision and the associated research, the emphasis of the study shifted from designing a prototype information system to attempting, in a more generic sense, to reduce the mismatch between information provision and information requirement. The focus of the study has moved to the information itself rather than the medium of presentation or interface design. As highlighted previously, there is a requirement for effective user-centred information that can be used by all sectors of the population, including travellers, non-travellers and would-be travellers. Evidence from previous studies suggests that in order to find out exactly what travellers want from traveller information, a bottom up approach is the most appropriate.

One of the advantages of this type of approach is that, on an individual basis, an almost immediate answer to the question 'What do people want from traveller information?' can be gained. The wider implication and validation of such answers however demands consultation with a much larger sample of individuals. The structure of the study subsequently addressed in this paper is necessarily flexible and is outlined in Figure 1. It will be appreciated from Figure 1 that as the focus of the study is at its broadest, so the sample size is at its smallest, and as the focus converges, so the sample size increases.

It has been observed that many service-provider-centred information services appear to make assumptions about the needs of the traveller (although this is not to say that all service providers do not consult with end-users). For this reason, it was decided in this study that the minimum of assumptions should be made about the end-user and instead, every step forward (both in understanding and degree of focus), would be taken in conjunction with the end-users. For the same reason, it was considered important that nothing should be excluded from the study in its early stages in case it had any relevance or importance, hence the broad focus at the beginning. As different aspects are addressed and evaluated, so the breadth of the consideration will be reduced until the focus of the study becomes appropriately concentrated.

To deliver the output from the study, namely an identification of user requirements from traveller information systems, the methodology begins from a broad base encompassing the widest range of potential issues and factors. It then proceeds through a process of consultation to refine and distil such issues and factors. The study then culminates in the use of a structured survey tool to elicit feedback concerning *relevant* issues from a representative sample of the (potential) information-user population. The remainder of this paper describes the processes by which end-users have been approached and how their information requirements have been assimilated. This corresponds with the shaded area of the inverted 'methodological focus' pyramid in Figure 1.

3. METHODOLOGICAL APPROACH

3.1 Overview

The study approach reflects an iterative process of end-user consultation coupled with refinement of study focus. The culmination of the process seeks to elicit and establish user requirements from traveller information systems. The process started with a series of preliminary brainstorm sessions (encouraging a divergent approach to the topics under consideration) to develop initial lists of questions and issues. These were then used to steer a number of focus groups, or discussion sessions, with end-users. Feedback assimilated from these sessions formed the basis from which a more comprehensive and encompassing framework was developed. This framework enables a more systematic consideration of issues and factors to begin. To progress from this stage to a more specific evaluation tool that will elicit and test user requirements for a larger population sample, the intervening activity (which is ongoing) concerns a process of participative design.

3.2 Participative design

Participative design has its roots largely in the study of the impact of computer systems or their processes on end-users (e.g. Mumford, 1995; 1996). Analyses of early 'mechanistic approaches' to system design suggest that designers view end-users as passive, easily quantifiable, predictable entities. These mechanistic designers/programmers regard the process of writing a program, for instance, as an isolated challenge that the end-users have to try and adapt to. The similarity between this approach and that which is evident with some information providers, is striking. Although the discipline is not directly transferable to the problem of providing a good traveller information service, all of the underlying philosophy and most of the methods are valid and therefore participative design is being used as this study's main research tool.

The participative design method aims to reduce or eradicate the mismatch between the programmers' product and the end-users' needs by involving the end-user in the design process from the outset. The users are introduced to the concept of participative design, often by means of a short video, and in a discussion group setting asked what it is they want and how they want to go about getting it. The 'product' is gradually designed and modified using the feedback from the end-users until the finished article is produced. Because the end-users set the goals and design the product, the success rate is generally very high if the end-users' wishes are adhered to. After all, as Kelly points out (Stobie, 1999), nobody is as clever as everybody.

In using this discipline's philosophical approach and applying it to the task of constructing the scenario-based survey tool shown in Figure 1, it can be seen that the end-user should be consulted at every stage and level of the design. In so doing, it is hoped that the survey tool will be capable of providing the ideal forum to determine the respondents' requirements. This process requires that end-users are approached and invited to participate. Also, the simplest method of finding out what people want from traveller information is to ask them. There are a number of different methods on offer, each with benefits and drawbacks. However, in order to listen to people's feelings and

opinions in an unrestricted way without fear of intimidation, the discussion group format was chosen as an initial starting point.

3.3 Discussion groups – Asking people what they want

Four discussion groups were conducted. The first, held in London, canvassed the opinions of Business Travellers, the second the opinions of North London 'Urban Mums', the third the opinions of Young Adults in Manchester, and finally the opinions of Business Travellers in Manchester. On each occasion, six to eight participants gathered around a table and discussed topics regarding traveller information with the direction of the discussion guided by a moderator. Each session was recorded and the resulting dialogue transcribed and assessed. A large quantity of qualitative data emerged from the group sessions encompassing many pertinent insights into user requirements. This highlighted the fallacy of alternative research approaches to understanding user requirements that move directly to large scale structured surveys. The data were of high value because they seemed to reflect the respondents' true feelings about the transport system and the associated value of traveller information.

Items, which might have previously appeared trivial, were shown to be very important to the traveller. A small selection are presented here:

- One 'Urban Mum' said that she had to enter the London Underground system via a station that didn't have an escalator because one of her children was scared of escalators. Others said how difficult journeys were if lifts were out of order if they didn't know it before setting out.
- The discussion groups indicated that people shouldn't be 'second guessed' or seen as predictable, each discussion group presenting at least one surprise. For instance, the young Mancunian adults (who were initially believed to be the most adventurous and self-confident) reported feeling really quite worried about getting lost or stranded when using public transport.
- Similarly, 'Urban Mums' said that they would trust an electronic information system more than a human-based system, whereas business travellers trusted human-based systems in preference to electronic ones, a finding contrary to what would have been presupposed.
- The issues of trustworthy information and of information cost figured highly. Due to the animosity towards a flawed transport service and its information systems, it was clear that there was a gulf between the needs of the travellers and that which could be fulfilled by the provision of good traveller information.

3.4 Brainstorming - a problem of categorisation

When addressing the feedback obtained from the discussion groups, some initial difficulty was experienced in assimilating the qualitative data. Each subject had raised issues regarding their needs and how they could be affected by trip type, mode or other factors. There did not appear to be any simple underlying factors which drew all the information requirements together and even attempts to merely record the 'nuggets' of information, by formulating a matrix of the variables and their interactions for instance, proved to be too big a task. It was necessary to identify the important characteristics of each type of traveller, the trip type and the mode in order to understand how information

requirements stemmed from each set of factors. The 'person factors' (type of traveller) were initially addressed.

Historically travellers have been viewed, as indicated earlier, as quantifiable objects and passive recipients of information. In recent years, as representative groups and organisations have found greater voices, the needs of less able people have been made known to a greater number of people. Despite this, the labels 'elderly' or 'disabled' are often used as blanket terms for people who have restricted mobility or greater needs of some sort. These labels, however, do the groups concerned an injustice and are not descriptive. For instance, there are many elderly people who are mobile, able-bodied and self-confident, and many young people who lack confidence, experience, physical ability etc. Age, therefore, is not a good dimension by which to measure the ability to travel. Likewise, the term 'disabled' covers a huge range of factors from the most debilitating motor impairments to outwardly invisible problems such as dyslexia, diabetes or incontinence. Again, people who have 'disabilities' are not necessarily ineffective travellers.

3.5 Person factors

To begin establishing a better framework by which to understand the traveller, a description system which better views the traveller as a complete person was addressed. The terms 'fully able' and 'less able' used in the introduction to this paper, although clumsy, might better reflect the underlying capabilities of people than terms such as 'business traveller', 'urban mum' etc. Obviously, there are objective physical characteristics that will have an impact on mobility and information acquisition but there are also psychological factors that have a direct bearing on mobility and information acquisition. Being lazy can be very debilitating, and being frightened of a particular aspect of trip making can prevent a person from travelling at all. From this, it is clear that some method of categorisation should be used which identifies travellers according to physical and psychological characteristics.

Physical characteristics not only include the usual well documented disabilities but also include other significant factors such as 'pregnant', 'tall', 'obese' or 'smoker'. For each of these factors, a list of descriptors, or qualities, was assigned along with a list of implications for the traveller and the types of information issues raised for each variable. This was carried out by a process of brainstorming, empathising with each group of people and their interaction with each mode of transport. A sample of these factors is reproduced in Table 1.

Implications – general	*Implications – information*	*Specific Information Requirements "Information about..."*
Require seat at termini, stops etc. Require seat on vehicle Can't walk too far Require more room on vehicle? Require longer seat belt? Require more seating along route? May need toilets Can't carry much luggage Travels slowly Can't negotiate too many stairs/inclines Won't use smoky etc. areas Require special seat on vehicle? Intolerant of crowding May have special dietary requirements	May require seating if queuing for information etc. Location of information may need to be close to services. Information could be located closer to other amenities to minimise walking etc. May require reassurance as to correct vehicle, route etc.	Distances from starting point to pick-up point and from set-down point to final destination Locations of seating along route Locations of toilets on the vehicles, termini and pedestrian route. Safety features of vehicles Locations of telephones General information about amount of steps at termini, on vehicles and pedestrian routes. Specific information about steps/inclines involved in route Alternative routes with lifts, escalators etc. Where and how to get a taxi Carrying of luggage Information about crowding and smoking etc. Special seats or seating areas suitable for pregnant women Locations of refreshments, distances, costs and menu etc.

Table 1: Physical Characteristics - example entry for 'pregnant'

The subsequent categorising of psychological factors aimed to consider the 'how, why and when' of information type and delivery. The investigation of Personality within the discipline of Psychology has many scales to offer and are well documented in basic psychology texts (e.g. Engler, 1991; Pervin, 1984), however, none seemed directly applicable to describing the traits exhibited by travellers. For this reason, a novel range of characteristics was devised which included factors such as 'extrovert', 'worrier', 'lazy' etc. all of which could make a big difference to travel behaviour and information seeking. This was not considered to be a drawback because although the term 'worrier' is not scientifically derived, it is immediately identifiable with a human condition and therefore serves its purpose for this study. A sample of the listings produced is shown in Table 2.

Implications – general	*Implications – information*	*Specific Information Requirements "Information about..."*
Fear of confined/cramped conditions Intolerant of confined spaces whilst travelling May have panic attack May not travel if conditions aren't correct or conditions can't be determined	Wouldn't tolerate a confined kiosk May not wish to stand in a crowded area waiting for information Some telephone boxes or kiosks could present problems	Seating arrangement information: diagrams, sizes, images or video of areas How to book such seats, cost etc. Journey routes to avoid and alternative routes Length of journey 'Escape routes', opt out areas and help numbers Need to know about other ticketing, information, refreshment areas etc.

Table 2: Psychological Characteristics - example entry for 'claustrophobic'

These listings constitute a set of building blocks which can, in combination, represent the profile of any traveller. It is then necessary to relate such profiles to specific information needs.

3.6 Information items – Everything an end-user could want to know

The physical and psychological characteristics listings include a first approximation of information requirements attributable specifically to each characteristic. Such requirements were derived from the discussion groups and brainstorm sessions described earlier. These requirements were then supplemented by a series of additional information requirements not uniquely associated with the characteristics considered. This resulted in an arguably definitive listing of information items that could be required by end users. An excerpt from the listing is reproduced below:

Is there a travel service to my destination?
What mode is it?
Where does it depart from exactly?
How far from my starting point is that?
How much aggravation will it cause me to get there?
Where does it arrive exactly?
How far from my finishing point is that?
How much hassle will it be to get there?
Is there a better mode?
Is there a different service?
When is the first service?
When is the last service?
What time does the service depart the starting point?
How frequent is the service?
Is there an alternative route/ service/mode?
How long does it take?
What time does the mode arrive?
What route does it take?

Where does it stop?
Does it stop at all?
Are there any time/day route variations?
Is there a return service?
Where does it depart from?
What time?
How long does it take?
Where did the mode originate?
Which service is it?
How will I know which is the correct service?
Where do I wait for the service?
Are toilets provided at the departure point?
Are other washroom services available?
Are they attendant controlled?
Are they wheelchair accessible?
Where are they?
How can I find them?
Is the departure point all on one level?
If toilets are on a different level, how do I get there?

How is information portrayed at the starting point?
Is there more than one information medium?
Is the same information provided on all media?
Is the same information available at home?
Where can I park if I need to?
How much does it cost?
How far do I have to walk to the next mode?
Are there any shops nearby?
Where can I get something to eat?
What sort of things are on offer?
Are special provisions made for less able?
Are there lights in the car park?
Is the car park monitored in any way?
Is the car park secure?
Where can I put my bags/cases etc.?
Will someone help me with my baggage etc.?

Completion of the above stages in the methodology produces an extensive account of user characteristics and a separate, though clearly associated set of information items or requirements. The next stage of the process is to refine and distil from these listings characteristics and information items that are of (most) significance in practice.

3.7 Unstructured interviews

To accomplish this next stage, the process of participative design began in earnest. Discussions of the results from the earlier stages were held with a range of individuals representative of user characteristics identified. The lists of physical factors and psychological factors were used as the basis for identifying individuals to be interviewed. Some of the person factors could not be tested by virtue of the fact that subjects could not be found or the range of subjects questioned did not exhibit some of the more sensitive or peripheral characteristics. This part of the study is ongoing and notably missing characteristics such as 'blind' and 'wheelchair bound' will be addressed in the near

future. People exhibiting the following characteristics, or groups representing those people, were contacted:

Pregnant	Speech impediment	Dyslexic	Shy
Tall	MS sufferer	Heart condition	Worrier
Obese	Slow moving	Diabetic	Sceptic/angry
Poor	Stair impaired	Smoker	Lazy
Deaf	Poor Balance	'Adventurer'	Frightened
Hard of hearing	With children	Leader	
Mute	With luggage etc.	Lazy	

Each subject, or their representative, was approached and an unstructured interview conducted. The subjects were asked to recount the types of journey they embarked upon, the specific problems they encountered during the journey, their specific information needs and what happened when things went wrong. In particular, the subjects were asked to recount 'nightmare' trips they had experienced and to provide reasons for the difficulties they encountered, and how effective information might have helped. The interviews were taped where possible and the key elements transcribed for later analysis.

The unstructured interviews produced useful data and in conjunction with the listings produced earlier, two clear methods of categorisation were determined, 'information delivery factors' and 'specific information factors'. It was found that some subjects did not require any special information but needed information supplied to them in a particular way - delivery factors. For instance, people who are deaf, or have dyslexia, or have a speech impediment don't necessarily need specific information but merely require information that is portrayed in a specific way so that they can understand it, or so that it can be accessed without fear of causing themselves embarrassment.

Within the group requiring additional specific information, it became clear that there were a number of underlying features regarding the need for information. For instance, 'vehicular access factors' could be used to describe the information required by multiple sclerosis sufferers who become easily fatigued and need to be seated near an entrance or exit. Also, obese, pregnant or tall travellers may need to know about the seating characteristics on some modes of transport. Another category 'mobility factors' might be relevant for stair impaired people or people with general mobility problems making them slow moving or sensitive to awkward terrain (including people with children, bikes or bags/luggage). Similarly an 'introversion factors' category might affect the timing, detail and tone of the information so that shy people or worriers will be adequately supported and encouraged by the information service. In this instance, both the type of information and its format are affected.

This first round of user participation, in the steps toward developing the evaluation tool, has highlighted a number of overlaps in user characteristics in terms of how they associate with information requirements. This will enable a distillation of the listings and the next stage in the study will be to prepare a set of design options for the evaluation tool. These will then be discussed and refined in further sessions with end-users.

4. CONCLUDING REMARKS

The aim of the ongoing study is to re-appraise traveller information from the perspective of the end-user. Evidence from the literature and from discussion groups suggested that even basic traveller information is falling short of the needs of end-users, and less able

end-users have reported an even greater shortfall. In order to find out what people really want, a participative design approach is being employed to determine specific information requirements and to create a framework for its formal study and portrayal. This type of design is self-validating when feedback is correctly monitored from end-users and the data set is refined accordingly.

As a result of this brainstorming, design and validation process, an insight has been gained into the needs of a range of people with different abilities and characteristics. In addition to this, a method of formalising and categorising this information has been devised. In its current format, the information or the process by which it was obtained could be used to provide data for an information system. However, this paper reflects only a part of an ongoing project, so the process of participative design and refinement will continue until a scenario-based survey tool is constructed and can be used to collect data about information requirements on a larger scale.

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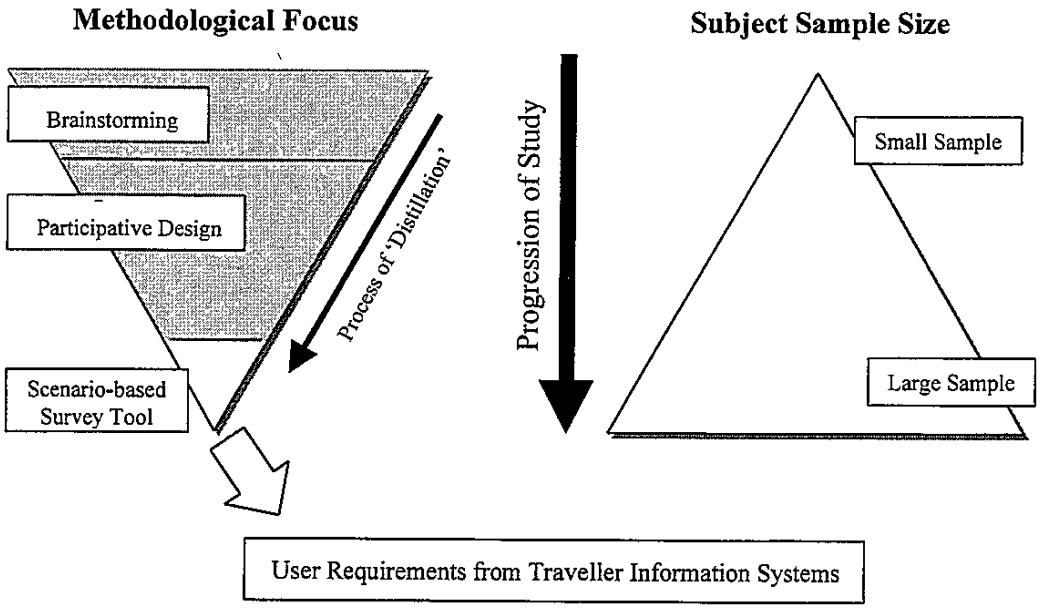

Figure 1: Study Approach