

**B07.2****When is the display of a mobile phone also the back of an envelope?**

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**Abstract**

The continuing growth of revenues for mobile telephone operators depends on them persuading their customers to use their phones regularly for tasks other than making phone calls and sending and receiving text messages. There are already some initial text based offerings that apply GIS expertise and technology to providing value added services that mobile phone subscribers can use. For example, you can use your phone to discover the address of your nearest Indian Restaurant. However, feedback from mobile phone users suggests that a service they would be prepared to pay for and would use regularly would be one that delivered maps to their phones – however small their display. Extensive research with potential end users of such a service and in-depth user testing has led to a solution that enables mapping information to be successfully delivered to mass market mobile phones. This paper examines the need for such a technology and user's reactions to using it. It provides an analysis of the ways in which it can be applied within a mobile telephone network to deliver a useful service to its subscribers. Finally, in line with the conference theme of "Finding your place in the GI network" it analyses the demands placed on geographic data providers by the roll out of such a service to mobile telephone network subscribers.

**Introduction****Maintaining revenue growth in a saturated market – a driver for increased use of geographic data**

As Western European mobile phone markets reach saturation, the continued growth in revenues for mobile network operators (MNOs) now depends almost entirely on persuading mobile phone users to use their phones regularly for something over and above the familiar voice calls and text messaging.

There is increasing acceptance that there may not be a single 'killer' application that turns out to be the 'next text messaging' and that operators will need to roll out a 'killer cocktail' of services in order to achieve significant revenues from value added services.

Some elements of this cocktail have already been launched, including a number of Location Based Services (LBS). These make use of geographic data to provide services to users which are relevant to mobile phone users 'on the street'. For example, you can now use your mobile phone to identify the nearest cash-machine. Such services represent a significant opportunity for suppliers of geographic data and related geo-spatial technology alike. Access to such data via a mobile phone can provide great benefits to the user, and the potential for such services to attract significant usage from consumers is well documented.

However, like many new mobile phone based services, LBSs are taking longer to fulfil their potential than MNOs and suppliers would like.

## Usability issues

In order to examine why LBSs have not fulfilled their potential to date, we first need to consider the two key criteria for a successful mobile phone service:

- Relevance to the user 'on the street' - a successful service must satisfy a need in situations where users only have their phone – and do not have access to an alternative source of information such as a PC or written material
- Usability – no matter how compelling a service, if the usability burden is too high, the majority of users will not continue to use the service

Many LBSs certainly fulfil the first criterion – most provide information which is absolutely relevant to mobile phone users when they are out 'on the street'. However, where most fall down is in the area of usability.

Given the size of screen on mass market mobile phones, there have been few interactive services launched to date which offer graphical output. It is possible to provide many elements of an LBS successfully using text – but some tasks would benefit immensely from the addition of graphics. One of the key elements which contributes to the usability of many geo-spatially oriented services on the fixed internet is the ability to graphically display geographic data – in laymans' terms 'to provide a map'. So far, the challenges presented by the very small screen sizes of mass market phones have largely prevented the inclusion of mapping in mass market Location Based Services.

### Walking directions – which is best, text or graphics?

The typical user of a service which provides information regarding the identity of the nearest cash point, bar, or restaurant of a particular type, is likely to be one who is unfamiliar with the local area. Therefore, not only will they need the address of the location they have selected – but will also typically need directions of how to get there on foot from their current location.

Some current services offer text directions for pedestrian use. However, text is often not the most natural way to express optimally-usable directions for pedestrians. The issue with directions is that the level of detail required is often very dependent on the specific route being followed. For example, the phrase "turn left on Tennison Avenue" may be difficult to interpret correctly if there is no road-sign marking Tennison Avenue. Such directions can be augmented with further information – but this can make the text long and difficult to understand e.g. "after the Devonshire Arms on the right turn left into Tennison Avenue opposite the Post Office on the right". The ideal is for the user to be presented with all the information they might need, whatever the situation on the ground, but for this not to detract from easy interpretation of the basic directional information – this is virtually impossible with a purely textual approach.

### How suitable is the back of an envelope?

Person to person communication of directions uses a mechanism well-known for its simplicity and ease of use. Given the availability of a small piece of paper – the metaphorical 'back of an envelope', the majority of routes can be expressed quickly and easily by some well chosen hand-drawn graphics highlighting the key features of the route. For a route which appears simple 'on the ground', the user might just refer to the road names labelled on the sketch-map. However, the provider of the sketch-map will typically also include additional information such as the name of a pub 'on the corner' that marks key decision points within the route. The main benefit of this graphical approach is that the user can choose to use the information on the sketch-map at a number of different levels – which matches their specific requirements at each point along the route.

Compared with more traditional maps, the sketch-map approach often also makes much more efficient use of limited space – with scale being varied to provide more detailed information where it is needed most. This can be very significant when faced with the very limited screen sizes of mass market mobile phones.

### What if a mobile phone display could be used as the back of an envelope?

Given the argument that the expression of walking directions using minimal space is best approached using sketch-maps, if the display of a mobile phone could be effectively utilised as the back of an envelope – what then?

Firstly, the capability of LBSs could be improved to provide a complete solution to the user. Not only would the user be able to identify the nearest Indian Restaurant, but they would also be able to view its location, and to easily find their way to it, guided by graphical images provided on their mobile phone. There would no longer be the need for the typical user to augment their use of basic text directions on their phone with the use of a printed street-map.

However, perhaps an even more exciting prospect is that of enabling the mobile phone to be used as a paper street-map substitute for navigation in the final stages of any pedestrian journey – not just those where the ultimate destination is the result of a search done using the phone. The ‘last mile’ of a journey is often where mistakes are made. “Which way do you turn as you emerge from the tube station?”, “How far along the road is the turning?”, “Whereabouts is the building or business that you’re looking for?” These are all critical questions, but one which traditional printed maps are ill equipped to answer. Add this to the natural reluctance of many people to accept the significant inconvenience of carrying a paper street-map at all – and using a mobile phone as a ‘last mile’ navigation device begins to become extremely compelling.

### What do mobile phone users want?

In order to find out exactly what mobile phone users think about using their phones as personal navigation devices, m-spatial commissioned some independent research. This consisted of a combination of face to face interviews, focus groups, quantitative surveys and structured user testing of some prototype technology. The remainder of this paper presents some results from that research and looks at the implications for the wider GIS community.

## The Results of the Research

### Why do mobile phone users want to see maps on their phones and what would they use them for?

Some of the participants in the research were already familiar with existing Location Based Services. Many felt that although they might be able to use a service that would tell them where the nearest cash point was or the nearest Indian Restaurant, these services would be significantly more compelling if they included the ability to view the location of these amenities in a graphical way. Likewise, the use of a Friend Finder type service might be improved by the ability to view their location graphically.

However, what really caught the imagination of most respondents was the possibility to use their phone as a personal navigation device – that would enable them to find their way as a pedestrian from one place to another e.g. from a car park or tube station to their ultimate destination. Some had used existing systems which provided text directions – but reported that these were often difficult to follow.

One of the most significant findings was that almost all the participants regarded the use of their mobile phone to find their way around as a logical use of their mobile phone. Many value added services fail to capture the imagination of the average mobile phone user because they do not provide a service which is fundamentally useful. The idea of finding your way using your phone is fundamentally useful for two key reasons – which echo the key reasons why people own mobile phones in the first place:

- **Convenience:** Participants reported that the key benefit over and above use of a street-map was the fact that they nearly always carry a mobile phone, but rarely carry a map. Therefore the advantage of the phone based approach is that it is always available, even without any preplanning for the journey. This is directly comparable with the main reason for having a mobile phone – it’s convenient to make and receive calls at any time, wherever the user may be.
- **Safety:** Participants also reported that there was a significant safety benefit to having this feature on their phone. Many mobile phone owners initially buy the phone for peace of mind – knowing that they

can be contacted in an emergency, but often more importantly can use it to avert an emergency themselves e.g. if their car breaks down or if they get lost. These subscribers see the ability to use their phone to avoid getting lost as a significant safety feature. This would even give the confidence to some users to make trips they would not ordinarily make without the availability of such a service.

### User Centred Development

Given the initial premise that a sketch-map based approach would provide the most usable pedestrian navigation service, it was still critically important that the design of the technology incorporated as much input from users as possible. As a result, many iterations of a prototype were produced and tested face to face with users in a variety of geographic areas. Only when the stage was reached where all user requirements had been met was the design of the final prototype finalised.

### What are users' reactions to using such a service?

Based on this extensive user feedback, a final prototype version of the sketch-map generating technology was produced. In addition, a final prototype version of a pedestrian navigation service which utilised the technology was also produced.

The final stage of testing was an independently organised user trial in central London. Half the participants were given a Siemens ME45 (with a small monochrome screen) and half were given a Trium Eclipse (with a medium sized colour screen). They were given the phone for a week and then asked to summarise their experiences by responding to a comprehensive questionnaire.

Some key observations comparing the use of the phone (for pedestrian navigation) to the use of an ordinary map were:

- The phone is always with them and is therefore more convenient than a map
- The phone service is easier to use than a map - having entered a start and end point it steps the user through the route
- The phone service provides much more detail about the route and surrounding landscape - allowing the user to find their way successfully, even in the absence of clear street names.
- The phone service is always accurate and does not go 'out of date' (given the regular update of data afforded by it being a server based service)

### Quotes from Trialists

Trialists were asked to comment on their use of the service. The following quotes are representative of the feedback from the majority of users:

- "Simple and easy to follow, more convenient than a map"
- "Always with you, easier to navigate than a map"
- "No need to ask anyone, clear and easy information"
- "You feel safe, never lost"
- "Like having someone with you"

### The Commercial Potential for such a Capability

The results from the trial provided information regarding the proportion of users who would be likely to use the service in preference to paper street-maps, the number of times per month they might use the service and how much they would be prepared to pay for it.

As a result, a business case has been constructed. This leads to the conclusion that for a typical UK mobile network operator, the ultimate revenue opportunity for a 'last mile' pedestrian navigation service could easily amount to over £3.5 million per month.

However, the benefits of being able to useably represent graphical geographic data on mass market mobile phones go far beyond the revenue that may be achieved from this individual service.

The results of the research indicate that such a service would make many mobile users (the majority of which may never have used another mobile data service apart from SMS) use their phone on a regular basis for something other than voice and text.

This is significant news for the GIS industry as a whole. If such a service can kick start demand for new LBS then this generates demand for all sorts of geo-spatial technology and data, over and above that involved in delivering 'maps on phones'. If a situation can be achieved where the average mobile phone user begins to see their mobile phone as a valuable and useful source of information about the area in which they are in, this will lead to the development of a significant new market segment for geo-spatial technology and geographic data providers alike.

### Exploiting the commercial potential

In order to help MNOs address this opportunity, it is not enough to simply develop a production version of the prototype technology and service proved in the user trial. Over and above the requirement for an outstanding user interface and leading edge technology for handling very large volumes of geographic data, very high standards of scalability, availability and reliability are also of critical importance to meet the exacting demands of MNOs.

Since the user trial, m-spatial have invested in designing and implementing a purpose built platform capable of delivering sketch-maps across a range of LBSs, to very large numbers of mobile phone users simultaneously. The platform has no single point of failure – a key requirement to maximise availability and reliability.

The 'last mile' pedestrian navigation service developed by m-spatial will be the first application to use this capability.

### What are the implications for the geographic data community?

There has been a wealth of Point of Interest (POI) data available for some time, but this has been scattered across a wide variety of sources and has been of variable quality. Whilst users of paper street-maps and guidebooks accept that the information contained in them changes over time, and that they may therefore become out of date, the success of the world wide web has created an expectation that information accessed by a networked electronic device will be fully up to date at all times. There is also an expectation that it is complete.

Therefore, for users to become reliant on their phones to provide information about their local area, and to enable them to find their way around, they will need to be convinced that it is accurate and up to date. For example, if a user wants to find their way to a specific shop using their phone and the service running on the phone is not aware of the existence of that shop or its location then the user will be less likely to use that service in future. It is vital that users' expectations are met by the services that are available.

Secondly, the business models pursued by the data suppliers much match the market in which the data is being used. The trend in business models for Location Based Services is tending very much towards risk sharing arrangements where application providers' revenues are almost entirely dependent linked to the level of services that the services receive. It is critical that this is mirrored in the relationships between the service and application providers and the data suppliers. It is well recognised that the costs associated with accurate data capture are high and that data suppliers must achieve a reasonable return. However, they must be prepared share in the risk (and of course potential rewards) of providing a service to consumers – and provide a transaction volume based pricing model to their customers.

## Conclusion

Location Based Services offer a significant opportunity as a substantial market segment for geo-spatial technology and geographic data providers.

However, usage of such services has been restricted to date, largely because of the usability burden associated with the purely textual nature of the majority of services. For example, paper street-maps are still preferred over text directions by the majority of users – and mobile phone users are not prepared to rely on text directions provided by their mobile phones to find their way from one place to another.

The availability to MNOs of a novel technology that provides the ability to display sketch-maps on mass market phones is set to dramatically increase the usage of LBS. Not only will this increase the usability of current services, but the m-spatial 'last mile' pedestrian navigation service will enable the use of a mobile phone as a viable substitute for paper street-maps for pedestrian navigation in urban areas. End user research has shown that the majority of users would use the service in preference to paper street-maps and this will kick-start the use of other Location Based Services. Along with investing significant effort in ensuring the optimal usability of the technology and application which has been produced, m-spatial have also ensured that both of these capabilities can be delivered in a form which is highly scalable, available and reliable – and is therefore suitable for high volume use in a telecoms environment.

In addition, to sustain the increasing reliance on mobile phones for navigation and information relating to a local area, the quality of geographic data is paramount and must be as up to date as possible. Finally, this must be made available to application providers in a risk sharing business model, where the return to the data providers is entirely dependent on the volume of usage of the services enabled by the data.

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