Social Networking In Vehicles

By

Philip Angus Liang

Submitted to the Program in Media Arts and Sciences,
School of Architecture and Planning,
In partial fulfillment of the requirements for the degree of

Master of Science in Media Arts and Sciences

Massachusetts Institute of Technology

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2006

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Abstract:

In-vehicle, location-aware, socially aware telematic systems, known as Flossers, stand to revolutionize vehicles, and how their drivers interact with their physical and social worlds. With Flossers, users can broadcast and share information, communicate with one another, and experience a more information-rich environment. Instead of seeing only a physical reality, a user will see a context-enriched reality, with "tags" provided by their social network, and presented to them by the Flosser. The Flosser turns a moving vehicle into a social networking hub, linking social information with the user's vehicle, allowing the user to learn more about their surroundings from social fabric inputs. It will also allow the user to ascertain the location and contactability of other members of their social network.

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Social Networking in Vehicles

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Acknowledgements

This thesis is dedicated to my parents, for being the greatest parents anybody could have. Thanks Mum, thanks Dad, you don't know how much your support meant to me.

To Isabella for being by my side, being my best friend and future wife. Thank you for standing by me the whole time. This thesis would not have been possible if it weren't for you.

And to those who made this possible. Thank you Ryan, for finding me one day meandering around MIT and showing me a whole new world. I don't know where I'd be if you weren't "the car guy".

Thank you Bill for teaching me discipline and showing me almost anything is really possible.

Will thanks for teaching me how to engineer.

Retro for teaching me how to find the right size of anything and how to fab.

Peter thanks for teaching me German culture, attitude and how to fab.

Tad you have opened up my concept of good and bad thank you.

Patrik for educating me about cars.

Susanne for brining sanity back into my world.

Dan you inspired so much of this thesis, thanks for all the amazing advice.

Federico you have taught my not only how to think but how to see the world.

Jon your support, brilliance as well as technical ability got me through this thank you.

To my readers, Bill Mitchell, Sandy Pentland and Federico Casalegno for the invaluable advice and suggestions.

And finally Frank, Helen, Carol, Cousin Dave, TC, Chris your support was invaluable.

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Introduction 1.0

Motivation 1.1

Since 2003, I have worked with the Smart Cities group, developing sustainable smart vehicles for cities. Part of the core philosophy of Smart Cities is to change the design and operation from cities, from the car up: that is, focusing on automobiles as an instrument of change, and effecting change at the city level by starting with change at the car level. The Flosser system is fundamental to my idea of changing vehicles and the way we see a city and interact with it.

Smart Cities aims to change the design and operation of cities[i], by giving urban planners new options and new ways to view and solve problems. The core project is a one way shared vehicle developed to facilitate a new way of navigating a city, and other projects, such as a redesign of Paris's bus system, build from the core set of ideas. In all of the Smart Cities projects, a clear opportunity emerged to vastly improve the utility and usability of a Smart City vehicle through new technology combining social networking and location-based electronics.

Many of those navigating a city are infrequent visitors; this became clear when I helped design a one-way vehicle for traveling into a city. Suppose a business traveler arrives at an airport, and needs to find his way to a meeting, and satisfy his craving for sushi on the way there. Navigating to the meeting can be accomplished with today's GPS technology. But how to find a good sushi restaurant in a new town? Our traveler could rely on commercial information about sushi restaurants, which is context-free, not necessarily trustworthy, and not much better than pure advertising. Instead, with Flosser technology, such a traveler could access information provided by his friends (whose tastes should mirror his own – or he can select only the recommendations of friends who share his taste on the matter at hand)[ii].

Cities are anonymous without the social facts and narratives that make them meaningful to humans[iii]. Traditionally, stories circulated informally, through social networks, and locations became "tagged" in individuals' minds. Someone might know that a building was where two of his friends first met, or where something entertaining happened to him, or where his car was

towed. The Flosser replicates this type of knowledge, but more importantly, allows it to be shared: the user can see his environment's relevance to his friends.

The traveler's friends can set up "tags" for him, to point him to their favorite spots in the city, and things to look out for. With a sufficient density of comments, layered and separable by type and source, this traveler sees the city within a social context, and an otherwise lonely drive through a new city can turn into a full tour provided by his friends – who, unlike friends in their real-life form, can be muted, switched off, or switched between, to optimize his entertainment and information experience.

Thesis Structure 1.2

The objective of this thesis us to investigate how social networking in vehicles can change the way society and communities interact. This thesis begins by investigating vehicle culture, the state of the art as well as social networks.

I present my ideas and solutions for introducing social networking into vehicles via a product I call a "flosser". The flosser is based around the concepts of tags and location based social networking. The third chapter of the thesis extensively looks at the flosser, the scenarios the flosser can create as well as the technical aspects of the system and a working demonstrator in a vehicle.

The evaluation section of the thesis covers how testing was conducted as well as qualitative results. This is supplemented by social studies where I create personas based around an extensive qualitative study of subjects.

The shared vehicle work demonstrates how the flosser maybe implemented into one way shared vehicles the Smart City Group has been researching at the MIT Media Lab.

The conclusion of the thesis covers the research discoveries as well as how to optimally implement social networking into vehicles.

Problem statement 1.2:

Automobiles are the dominant transportation mode in the United States[iv]. Almost everyone is at some point in their day a driver. At the same time, individuals have become accustomed to navigating information-rich worlds. Yet a driver is presented with very little information about his environment. Information commonly presented, such as that from in-car navigation systems, is not specific to him, his context, his trip, and his social network. Drivers may travel without the benefit of knowing how their surroundings may relate to their lives and their social networks. A curiosity I have always had has been the question what are the people doing on the road beside me? Do I have any friends in the area who want to meet up for a cup of coffee? What do my friends think of this location?

An enormous wealth of information is available in a city which isn't currently being displayed to a driver. Social wealth and data is only currently available in a pull model and not a push model, in the case of a pull model if a driver wishes to attain information about a location he would have to enquire about it. Either from a source such as a friend via phone or by looking at reviews friends might have posted online, in terms of efficiency even though this gives a highly filtered and accurate answer it is time consuming versus being able to access his review directly in the vehicle.

One inspiration for my proposed Flosser product is the realm of social networking websites, such as Orkut or Friendster, and web plugins that allow groups of users to "tag" and discuss web content real time. My idea takes this concept into the physical environment, and into the vehicle. Instead of marking and discussing web pages from our desks, now my friends and I can mark and discuss restaurants, landmarks, and streets and roads, at our computers and in our vehicles, seamlessly creating a location based social network propagating the city with a large library of information.

Another inspiration for the Flosser is the in-vehicle assistance services, such as Onstar and BMW Assist, sold to drivers. These have been popular, and profitable. Some automobile industry experts have even proposed selling cars on an ASP model – giving away the hardware, in return for a hefty software subscription. However, extant premium in-car assistance systems lack two crucial aspects: customization, and true integration to in-vehicle electronics. In addition the systems are not built on open architecture and thus have the problem of being inaccessible

outside the vehicle and not open to input. Currently with telematic providers even though they offer a great deal of services the information is not filtered to your user and social data cannot be added into the system[v].

First, a restaurant recommendation from an existing in-car guidance service is generic, and likely linked to advertising; it has no social context. Directions are similarly anonymous, and cannot note that the user's friend lives in this building, or that the woman he fancies spends her Saturday mornings in that coffee shop. Second, when the recommendation is made, it is verbally dictated to the user, who then must remember it, manually record it, or manually enter it into the GPS system[vi].

At a more subtle, cognitive level, it is often not optimal to present all the directions to a place, and all the information about it, at once. The moment of calling in to the assistance system is not necessarily the best time to present the driver with the cognitive load of all the details about his destination[vii]. Instead, the Flosser system, expanding upon the idea of "turn-by-turn directions" presented by GPS systems, displays the entire information package of the destination as the driver proceeds on his route. This takes the common-sense approach of presenting information as it is necessary, rather than the more blunt method of dropping all the information on the driver at once at the moment of inquiry.

In addition to reading social content, such as restaurant recommendations and the social relevance of various places, the user can create it, while driving. This develops the idea of "tagging," which has been already attempted in several map-based applications. Several cities are testing tagging applications. However, no system exists that allows for tagging while actually at the tagged location – that is, in real-time, on the fly. That is the motivation for my approach. The difficult part of the problem is making content creation, or tagging, work, from a cognitive perspective and a user-interface perspective, when the user is a driver whose primary in-vehicle task is driving. I propose a system that will allow for tagging on the fly, with cognitive loads realistic for a driver to handle.

Background 2.0

Current Art for Vehicular Telematics and mapping 2.1:

Current telematic solutions, such as Onstar and BMW Assist, have been developed by engineers, rather than by user interface experts. Because of this engineering origin, they have focused on safety rather than on more user-centric convenience and "leisure" services such as social networking and restaurant recommendations. Most heavily advertised features are lockout assistance, stolen vehicle location, and automatic police notification upon airbag deployment[viii]. Actual user data, however, finds that there is a significant untapped demand for such leisure based information from telematics systems. Onstar reports that the most popular query on a Saturday evening is not for lockout assistance or towing, but for the nearest adult entertainment.

Such requests, at certain times, are repetitive and predictable – and yet no specific system exists within Onstar to manage them. There is no well-developed restaurant or other leisure based recommendation service, there is no context-specificity or user customization, and directions and other information are dictated by the operator, and not connected to the user's in-car navigation systems.

Navigation technology has been advancing at the technical level, but has not caught up with user demands and desires. Mapping technology now incorporates 3D maps, as well as (often outside the US) traffic information, which are large steps forward. Volkswagen has been in discussions with Google to use Google's 3D maps in its navigation systems. A 3D view affords the use of landmarks and physical objects as navigation waypoints, not only two-dimensional streets. In addition Google intends to add additional data by offering a free 3d content creation tool with complimentary add-on's into Google Earth.

In Japan, Alpine and Nakamichi have developed routing systems that are based on landmarks, rather than the more usual map-based street names. Realizing that "make a turn at the red building" makes more sense to a human than "make a turn at the street sign that says X." My proposed system takes this one step further, by customizing landmarks to the specific user: After all, landmarks have meaning only within a user's specific context, and outside of

immediately focal landmarks (e.g., the Eiffel Tower), different landmarks may be salient for different users. If my gym is in a certain building, that building is useful to me as a navigation landmark, but may not be as useful to others who are not familiar with the building.
Existing landmark-based navigation systems assume their users to be solitary and uniform, and make no accommodations to their individual needs, or their social context. Aside from the appearance of mobile telephones, a driver's information environment has not significantly changed since the first automobiles appeared. No automobile-specific information and networking tool has been developed to take advantage of 21st century developments in software (social networking tools, voice command, mapping databases, massive storage, fast queries) and hardware (GPS-telephony integration, mobile LCD touch screens).

Despite there being only a few new in vehicle technological developments. New social forms have emerged around the vehicle culture. Flossin' is a cultural phenomenon that originated in the United States in the 1990s. Car enthusiasts in New York and Boston started repetitively driving a predefined route traveling up and down a sector of the city. This later became known as Flossing. Flosser's are vehicle enthusiasts and technological early adopters, and what they have done through impromptu communications and social gatherings, Flosser telematics will do through technology.

Vehicle culture 2.2:

This thesis has a focus on Vehicles and Social Networking, something which already happens in an out of vehicle environment today. Since humans have first been building cars they have been a national symbol as well as cultural art pieces. The concept of cruising dates back to 1835 a man named Arthur Anderson suggested the idea of sailing for pleasure[ix], he submitted the concept to the Shetland Journal as a fantasy concept later forming a cruise line P&O. As the concept spread from sailing to other forms of vehicles; nowhere else has it made as large an impact then the automobile.

Since horse drawn carriages were first introduced humans around the 16th century they introduced a culture of class as well as social networking and events. By establishing rules associated with carriages a culture grew from it. Some of the cultures included the formalities of the drivers as well as for a short period in 1601 no man could sit in a horse drawn carriage[x]. The carriage was a success symbol which often led to a social status and clubs. A sport was derived from this which I still active today the sport of equestrian show driving is active throughout the world.

Source: United States Equestrian Federation

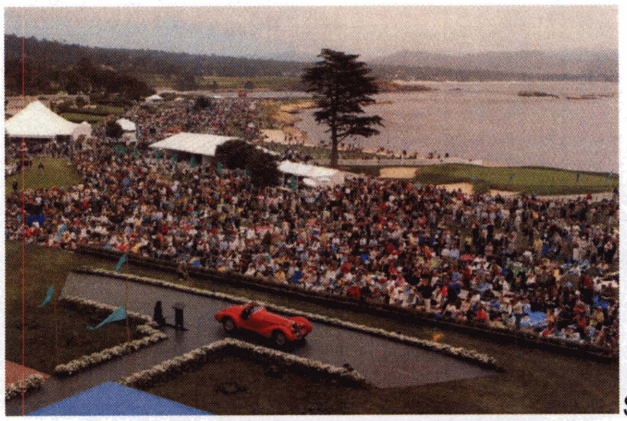
As the automobile became increasingly more accessible with decreasing costs and mass production a culture grew around the car itself. Popularized by Hollywood movies as well as being an American status symbol the car became a gateway of self expression in the 1930's leading to the hot-rod era.

Car owners began to form clubs to arrange meetings and arrange for drives on their favorite streets, "cruising" them. The culture became so proliferate and powerful it was banned on certain streets, according to the state of California "cruising". The technical term for "cruising" in the state of California is

""Cruising" means the repetitive driving of or being a passenger in a motor vehicle two or more times within a four-hour period, in the same direction, past a traffic control point established pursuant" – Section 52.5005 California State Law [xi]

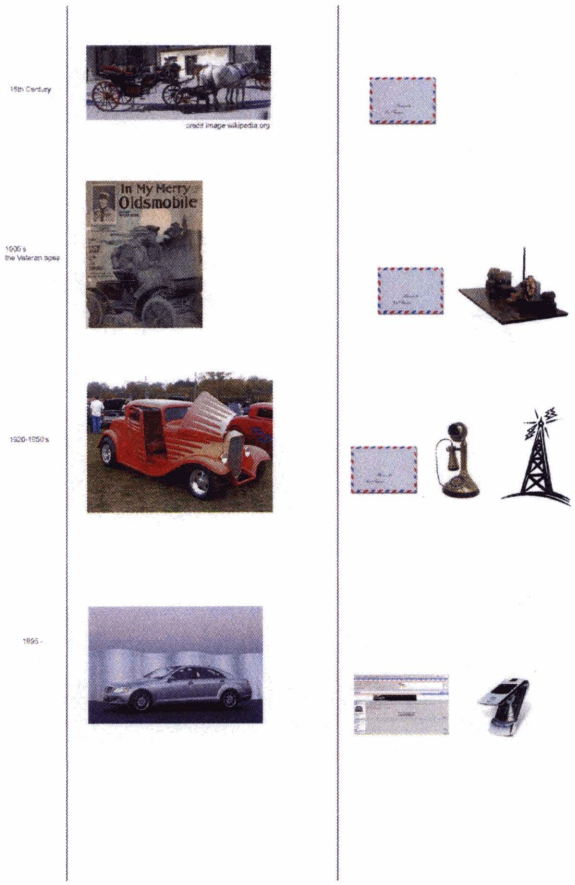
Fundamental to car culture is not just showing your vehicle but also meeting others with a similar hobby, from informal meetings to advanced online meets the culture thrives from remotely meetings. This also has to do with the concept of vehicles, the idea it can get you to and from destinations. On a simple level a car meet will consist of friends phoning each other and meeting up in small packs, possibly even meeting from a conversation from an online board.

Example meeting board online typifies the methods used by Cruisers and those in communities to meet up. The communities themselves are increasingly international, on this board there are meets being setup in 4 continents. The meetings themselves normally begin in specific car targeted boards and can range from a meeting of 3 or more vehicles to groups of hundreds of vehicles depending on the popularity and event type. In some cases, even though not online a large concourse can have over 5000 Vehicles [1] .


Source Pebble Beach Concourse

Technology and car culture 2.3:

Car users have always been leading and early adopters of technology in vehicles. Beginning with the radio the culture of vehicles emerged, with the likes of Wolfman jack who encouraged hot rodders to get out on the street and to go "cruising". The radio started as the first real technological breakthrough, as DJ's encouraged the culture. There was nowhere else this was as proliferated then Southern California, the combination of ideal roads and the acceptance of the culture[xii]. Publications such as "Hot Rod Magazine" added to the culture, they were also the pioneers of the car meets.



Sources: Wikipedia, Hotrod Magazine, Mercedes-Benz

A core element of vehicle culture is the car meet. Previously it was difficult for car clubs to arrange spontaneous meets as well as fan organized meets. They would often be setup by clubs or organizations who could afford to publish meets as well as setup competitions. With the proliferation of the Internet this rapidly changed, today car meets can happen within hours although most of the time arranged well in advance for larger groups. In itself a social network although not a circle type network they prove effective in their tasks.

Genealogy of current Internet based car meets 2.4:

Online internet forums have become the most proliferated meeting locations for car enthusiasts, it allows them not just arrange meets but discuss relevant topics. Part of the reason why it has become such a successful method of communication is the quick responses people can get within a community; in addition the majority of car forums are well policed and moderated to keep them on topic. It is common to see message boards govern themselves with power users helping moderate forums. It also helps when arranging meets, below is an example of a typical meet.

* User will post information about a meet
* Other members of a forum will respond
* A final time as well as location is decided upon either by the organizer or by vote
* The meet happens and is documented online like the screenshot below

Image courtesy of the M5board

Social networks 2.5:

Social networks have recently emerged as some of the most powerful online tools, since the advent of "circle of friend" type social networks such as Friendster have proven extremely powerful. With the average social network being 125 people in size and an average maximum of 150 users[xiii], social networks represent a unique density of information as well as knowledge. Circle of friend type networks succeed greatly in sharing information as well as keeping friends informed of events and latest information but falls short of adding in location information.

Social networks were first analyzed with the study of villages and apes, and how the size of a social network would fluctuate and infer a new set of rules. Early studies focused on Ape villages and the maximum size they could attain before becoming overly taxing and requiring advanced structure.

Today Social Networks have been brought into the spotlight with new online tools which allow people to easily access social information and updates. These "circle" type networks allow friends to stay in touch as well as inform friends of events they otherwise miss.

Source Friendster

An example circle type network [xiv].

Social Wealth 2.6:

Social networks such as the flosser software generate, give the freedom to the user to build a kind of community based on shared value, empathy, emotion, but also to build instrumental society for instrumental goals. The flosser adds speed to the location based tag experience.

In 1887 Ferdinand Tönnies analyzed the distinction between society and community. He theorized communities were held together by the feeling of togetherness. Society on the other hand is there with the objective of a common goal.

A system like flosser is not intended to improve society but rather improve community and evolve the concept of closeness and empathy. By adding an additional tool for community, a social network now has a way of accessing more specific community information. This information in turn allows for communities to become closer and build up a social fabric.

The Flossin' Solution 3.0:

The Flosser 3.1: My planned in-vehicle system will act as a platform for safe communication between drivers, cars, and network-based information sources such as the Internet, GPS data, and proprietary databases such as Google Maps. The system will be aware of its location, and be capable of communication and interpretation of social information. These basic features will serve as building blocks for more advanced features to be created in a modular system architecture.. The primary focus of my solution is to offer location based social networking in a vehicle. The primary and simplest features will be based around location sensitive communication systems, and being able to communicate basic messages to members of the user's buddy lists. Controlled through a central display within the vehicle, the Flosser is designed to be a conduit of communication for the user's social life and vehicle.

The system's key component will be its ability to manage and display tags based around the user's filtering criteria. For example, a user could easily instruct the Flosser to only display tags relevant to the group of friends with whom he is spending the evening. On the other hand, on a weekday morning, the Flosser could display only tags relevant to the user's business, rather than social tags. The social tags are not meant to run a user's life, or change where he is going, but to serve as an assistant to the user – informing him of the social meanings of the world around him, and supplementing the mobile telephone as a communication system. While many social destinations could be planned with a mobile telephone, the map-based and tag-based system could be useful in a situation where level of knowledge of the city differs. For example, suppose a friend is visiting from out of town: his friends could relay information about their destination and about the social tags surrounding it, to his vehicle's Flosser. This is superior to a map that has to be printed out or emailed, and is not integrated to the visiting vehicle's navigation system, nor to the visitor's social network.

The key element to make this work will be tagging; a user can make an unlimited number of tag categories, often overlapping: one tag on a building could be both "restaurants" and "Jenny's favorite places." In my appendix, I present a list of some potential tag categories.

The interface for the system (show pic) will be a simple map schematic shown in two modes, both with and without the destination set. There will be two key modes to using the flossin' architecture, the primary method of using the Flossin' architecture will be with the

Technical Topology 3.2:

A key challenge is adapting the system's user interface to the limited cognitive capability of a driver whose primary task is driving. A web-like interface with minimal steps needed to input information is crucial to achieving a transparent system that imposes a minimal cognitive load on the driver. The key information will be displayed by a map driven by Google Maps, on the main in-vehicle display screen. Several layers of tags will be available to add or subtract from the map view – as previously discussed, these could be social tags, business tags, and so on.

Communications: The Flosser will be compatible with any IP based network for in vehicle use. I will test it using web based offline testing, supplemented by EDGE GPRS for in-vehicle testing[xv].

Location awareness: The system will use GPS to determine its location. The Flosser will also link GPS information with online mapping databases, such as Google Maps, to accurately determine neighborhood information. Subsequent layers of information, based on the user's specific interests, preferences, and networks, can also be added into the mapping databases. For example, a user could add a map layer with his friends' current locations, his friends' homes current locations, or the locations of all nearby sushi restaurants.

Input/Output: The system will be mounted via a laptop in the vehicle supplemented by buttons on the steering wheel for safe user input. The steering wheel has proven to be the safest location for interaction with the vehicle, as the driver does not need to remove his or her hands from the wheel.

Information management: A central server, kept at Flossin' headquarters, will contain each user's location, user status, and other information. The server software will be the Floss Server, based on MySQL Server. The main data tables will contain: User, IP Address, Status, GPS Co-ordinates, Status and location of information folder. The folder will contain the user's shared files, as well as backup data.

Web Based Architecture 3.3:

The Flosser approach is web based for both architectural and standardization reasons. In order to appeal to a wide range of its intended user base, and have the ability to reach a ubiquitous cultural target, the Flosser was built on a web-based interface. The web based approach allows for the use of the Google Maps API, an open mapping system that contains perhaps the world's most accurate street and satellite maps. This extends the web-based approach seen in many new in-vehicle systems, such as Mac Minis running LCD web browsers in vehicles. My objective was to be able to maximize the potential user base while using off-the-shelf hardware or software. With a web-based system, I was able to get through the technical as well as social barriers currently preventing ubiquitous computing from tapping fully into vehicles. The web based approach allows the Flosser to also integrate with other devices, whether mobile PDA/phones, or office and home computers.

Flosser Scenarios 3.4:

Example Scenarios: Based on research in online communities and interviews, I propose a few features for the Flossin' system. These constitute only example applications and scenarios I have investigated. These scenarios are made possible by the features listed above.

Travelling from New York to Boston: Drivers often find themselves traveling to unfamiliar cities often along new routes, where they may not be aware of social connections and other important waypoints. A person could be traveling from New York to Boston, not knowing of any drivers or friends on the route. A tagging system would alert the user to friends along the way, as well as locations relevant to their friends. With the Flossin system the user will have access to socially important locations and people – a car on the road alongside the user could be "tagged" as belonging to a friend of a friend. In this scenario, the user could have arranged a spontaneous meal with a person who was coincidentally driving the same route. It can also be used to find entertainment to break up the journey such as a driving range.

The Social Tour of Boston: Traditional tours of cities often reveal a good deal about the city but little information about its social fabric. With the Flossing system it is possible to partake not only of a city's physical infrastructure and landmarks, but also its social fabric. In the case of a social tour the user of the system will be able to drive around the city retrieving location based messages, or location tags. Friends can leave one another tags all around the city with recorded voice messages that provide a socially relevant, customized tour of the city. Instead of hearing a generic introduction to Quincy Market, the user can hear one – sent to him automatically by the flossin' system – that is spoken by one of his friends, and details amusing adventures his friend has had in this place.,

Looking for somebody to go Flossin with: Flosser's primarily arrange meals and events based around where their friends are, and no longer have to seek out exactly where their friends are but can arrange it dynamically while traversing their pre-defined routes. A set of friends can click on a function that will use mapping databases, as well as business directories, to suggest convenient meeting venues that align with their travel routes, and their current preferences. This can also allow for dynamic linking of vehicles when a social group links up to form a train of vehicles to traverse this street.

Future event tag – Future events can be set up, in the style of a schedule planner. A map can show the user where he has events planned in the future. This could greatly help in optimizing time and gasoline spent driving. If I need to run an errand on the west side of town, it is helpful to see a tag showing that I am due to go there tomorrow anyway. Similarly, when friends are attempting to plan where to meet next week, I could suggest locations where I am due to travel next week.

Dynamic tourism - With tags left throughout the city, combined with a navigation system linked to map databases, anyone can become a tour guide. The Flosser user no longer must listen to official routes through the city, but instead can drive on a narrated route defined by a friend. If a friend is an architect and has programmed an architectural tour of Boston, the system could navigate the user through the tour efficiently, also allowing the user to leave his own comments and tags on the waypoints. Alternately, professional tour guides could make a niche industry – providing tours of cities either free of charge, or as paid content. The social-networking aspect of the Flosser would make it intuitively easy to rate the tours provided by such professional tour guides, ensuring that the best would be recognized.

Mobbing – Web-based informal gatherings, known as "mobs," have become a new form of technology-asissted social networking. Friends openly planning on forming groups or event may use the Flossin' system in vehicles to allow for dynamically generating and forming groups. In the case of a group of friends gathering they may specifically be trying to get as many people to join or possibly even trying to dynamically holding an event such as a dynamic pillow fight

Finding a property - By Keeping the Flosser system open to your social network BUT also allowing a public database to be created it can be used not just as a simple tool for finding social events in cities but also a property. In one example it is conceivable to type in a need such as

* Looking for -> Property -> Type -> 2BR -> Rental -> Start 06/07 -> >$2000

The flosser can then set this alert to inform you whenever you pass such a property, a tool such as this will allow for the Flosser to also become a residential finding tool.

Tags 3.5:

Social tags can layer a city with not just social information but also basic facts people might want to know, such as directions, typical traffic pitfalls, and useful telephone numbers. I plan to initiate and categorize filters to manage the wealth of tags that will be created with the user of the Flosser. The filter will operate on several data variables that will be present in each tag.

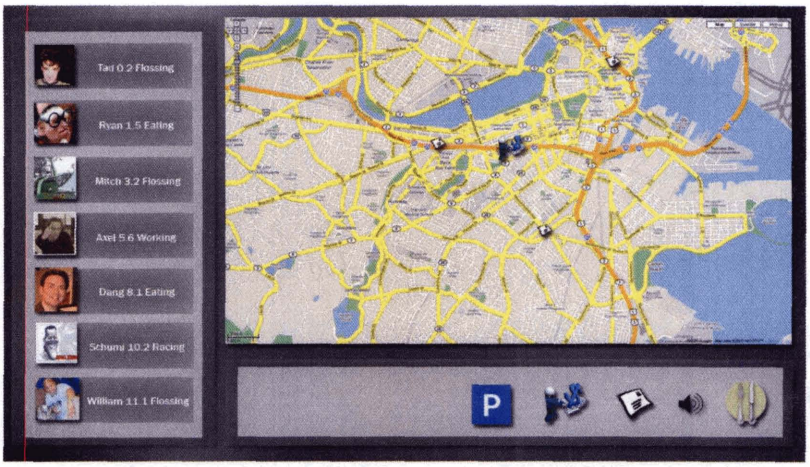
Time – All tags will be timestamped to allow for virtual scrolling of tags, and automatic deletion of old tags. Time context will be among the most important offered by my system. Many tags will be relevant only for a few hours – for example, a café where two friends are enjoying a conversation could be a relevant tag only for that afternoon. Out-of-date tags could also be seen as a user's "diary" or "journal," giving him a glimpse of his personal social history, for example viewing the tags that were created for the user's birthday party last year.. The time element allows concrete to become a book in itself, with pages and pages of tags left by a wealth of people.

Category of information – The kind of information possible, such as recorded social events, information tags, advertisements or directions. Initially, I will limit the number of categories per user to a recommended five categories, to make it easier for the user to flip between the layers while driving, and also minimal cognitive load while creating tags. Example categories could be, "historical events", social events, reviews, messages and custom.

Importance and rating – Tags will be rated by fellow users, with highly rated tags being ones that many fellow users approved of. Flosser tags will eventually lead to a new form of tourism. Rather then seeing the sites a person may navigate the city of distances, or even potentially roads by reading the most popular tags within a certain area. This can also be linked into famous sites and used to filter popular sites which might be filled with an overflow of poor information. It is conceivable the bulk of people who will be leaving social tags will not be the best of content creators. This can also act as a filtering system for tags, if reviews are rated as bad they can be eliminated from the system to prevent poor content from over stacking.

Interface design 3.6:

One of the primary challenges to designing the user interface was being able to display many layers of social information at the same time without excessively distracting the driver. Compounded into the problem was finding an input method which would fit into the tight requirements of a moving and static vehicle the original Flosser interface presented the user with neighboring friends, supplemented by the map itself. The original solution, however, had several key flaws and incorrect assumptions, as detailed in the figure below.



UI Design Evolution and thoughts 3.7:

The friend's column, which dominated the left side of the screen, displayed friends' physical locations and distances from the user. My original thought knew friends' locations would be of key importance to social networking. Further research (cite papers) revealed that the information most relevant to users' needs, and most in-demand, was not friends' current locations, but what social events they were going to, and what social events they just attended – more generally, not their current locations, but where they just had been, and where they were going. Current location information is not as useful as "predictive" and "historical" information. This is one key insight that is missed by purely technology-based solutions, which attempt to extrapolate human location services from tracking physical logistics or package delivery. Current location is simply not that relevant: "On I-95, near mile marker 121" is that much less useful than "Heading to John's birthday party in Cambridge, starting at 8pm, others invited to join."

Such prediction information is the cornerstone of social management systems. In the case of the prediction information, it can be used for help with future planning of events. This could also apply to social tags and groups. Suppose a working group at the Media Lab has a biweekly lunch meeting. Currently, such meetings are organized by email – any information about the restaurant, reviews, price ranges, menus, and how to get there has to be either neglected, or transmitted manually in the body of an email. Instead, with the Flosser, a tag could be placed at the restaurant's location, viewable by everyone invited to the meeting – and linked to all necessary information about the meeting. Most interestingly, each user would see the tag slightly differently – depending on how that restaurant might be linked to their social networks. A friend of mine may have negatively reviewed this restaurant, while someone else's friend may have met her future husband there.

A location-based tagging system has myriad applications beyond leisure use of meeting points. Consider commercial applications, currently pioneered by firms such as Igloo in Finland. Every house in the service area is registered in the system from satellite maps, and owners may add more information about their residences, such as offering their residents for sale or rent. Currently, although the system has location data for all its listings, the only interface is a standard static web interface, with no provision for "drive-by" access. Consider a combination of such a real estate listing system with an in-car access platform. With the flosser for example

say you are looking for a 2 bedroom apartment in a certain area you can set your car to alert you when you are passing through the area and somebody wants to sell you can then set it to tag an alert helping you find things in the city. This concept can apply to anything the user is searching for, be it a squash court, a luggage store, or a dentist.

These options allow any data item to be location based and easily exchanged. The intention is to conveniently offer the user information without flooding him with it.

If a user is looking for a type of establishment not among those pre-defined, I have left a "custom" category for users to use for this purpose, by typing in their match. I have intentionally left this out of the main interface, as not to present the user with too many options, or cognitively overloading them. The custom window is absolutely necessary in some form, however, as there is such a wide variety of potential uses for things that could be found with the Flosser.

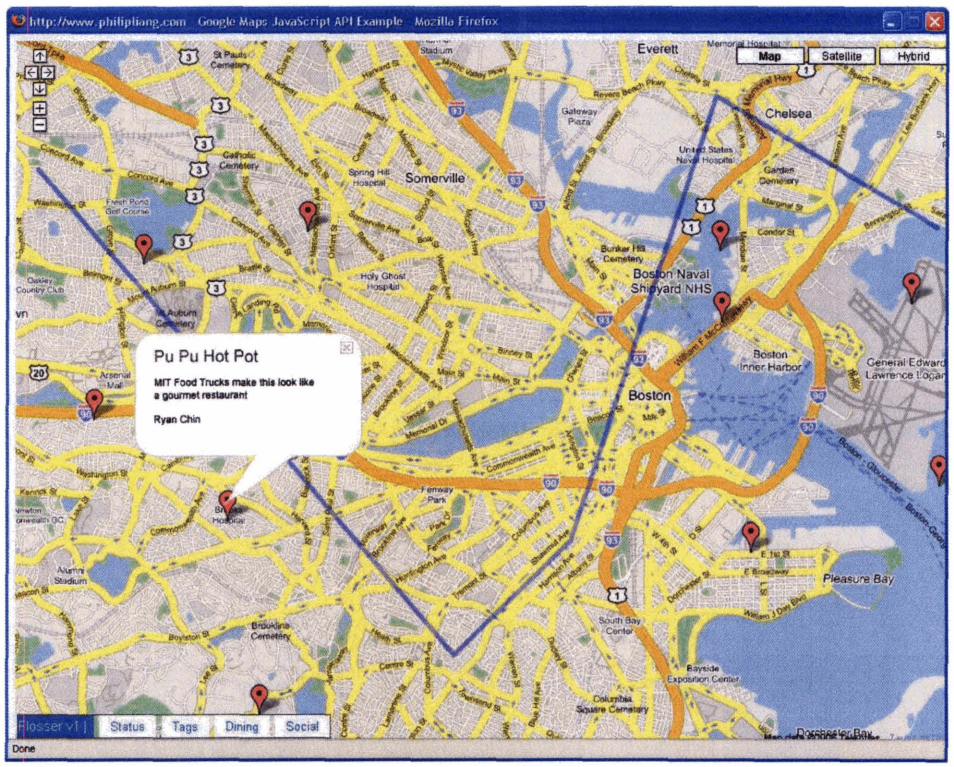
A "push" type search is also possible, in which the Flosser is set to alert me to nearby places that match a certain description. Suppose I have moved to a new city, and I am looking for a new gym. I could set my Flosser to alert me whenever I am a short distance from a gym, so I could take a look at it while driving by, and create a tag with my comments on it. One could even imagine a car-mounted camera that could photograph the view out the windshield when passing by the landmark that has been set on "alert mode. Once I have found a satisfactory gym, I could turn off this particular alert. Or, if I like to always check out new gyms, I could set the Flosser to always alert me to gyms I have not yet seen.

This would be especially useful for long trips, where the average traveler knows very little about areas adjoining the highway. If I am driving cross-country, I could set the Flosser to alert me when I am near a driving range, so I could stretch my legs in the middle of the trip; it would be very unlikely that I would otherwise know of driving ranges in an area that is only "drive-through country" to me. Owners of such attractions could be allowed to, for a fee, enter a free-text field into their location's tag: for example, the owner of a driving range could boast of its size, or opening hours, or even offer a discount to Flosser's.

Design solution 3.8:

The current flosser interface is web based with a simple menu system to facilitate the easy to access menus. One of the design criteria was to easily be able to access certain functions during the use of the Flosser the following key functions are menu based so they can be activated while driving. It incorporates the thoughts through the evolution and tries to answer all the questions with a simple interface concept.

The web-based map would be centrally placed in the vehicle's dashboard. As several automobile user interface studies show, in today's sophisticated vehicles, much of the operational information displayed on the dashboard is not necessary – the function of a gage such as oil temperature is primarily decorative in a modern vehicle.



Input of Tags 3.9:

Input:

The flosser is designed to have two methods of input. The first consists of leaving a real-time tag, while driving. This is especially useful if the tag is meant for immediate use – e.g., if another person is following a few miles behind. The primary method of inputting tags, however, is through a standard web browser, most likely at the user's primary desktop computer. The user can click on a location (on the Flosser web server), select the type of tag, and create the tag. Below are the tag choices for input in the order the user is offered it. To initiate an input a user simply has to point to the location on the map to create the tag.

Type of tag

Event	Duration of event Input start time Input end time	Type Of Event Public Private Custom	Event description Text entry Voice entry Custom entry Video		
Message	Duration of messsage Start Time End Time	Type of message Public Private Custom	Message Text Visual Video Custom		
Location	Duration of message Start Time End Time	Type of location Public Private Custom	Location description Text Visual Video Custom		
Review	Duration of review Start Time End Time	Type of review Public Private Custom	Quality Rating 1-10 Scale	Cost Rating $-$$$$	Description Text Visual Video Custom

User menu States and choices

User states allow the user to control one's privacy and visibility, and to announce one's social availability and activities. Since the majority of journeys will not require the flosser or will be unexpectedly using it, the system gives users the choice of being anything from a social butterfly to being a complete recluse.

Status –

Available – (People in my social network may observe and contact me)

Invisible – (I can see others but they cannot see me)

Offline – (I am not connected to the system)

Flossing – (Cruising a pre-defined route, and others are free to join)

Travelling – (Travelling for non-social reasons)

Choices

Events	Type of event	Time		
	Private	Now		
	Public	Specify start time		
	All	Show all		
Message	Type of message	Time	Show	
	Private	Recent	Top rated	
	Public	Historic	Worse rated	
	All		All	
Location	Type of location	Type	Show	
	Private	Shopping	All	
	Public	Of interest	Top rated	
		Top rated	Worse rated	
		Special		
Reviews	Time	Type	Sort by	Filter
	Show most recent	Public	Cost	High quality
	Last 6 months	Private	Rating	Low Cost
	Last year			
	All			

Output and methods of output for tags 3.10:

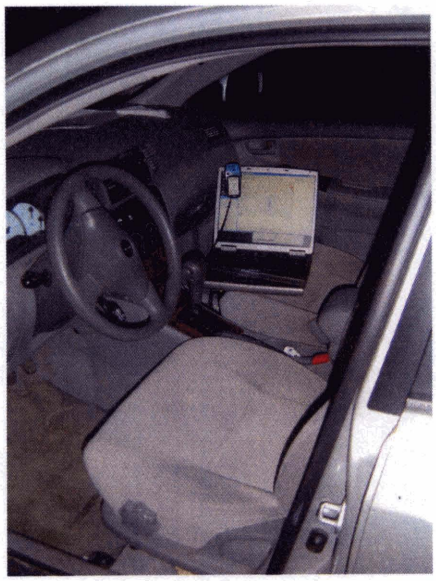
There are two potential scenarios for tags to work for users based around their requirements,. I envision two main uses: pull-based and push-based tags. Pull-based tags come in responses to current user searches, while push-based tags come to the user through the user's preset preferences.

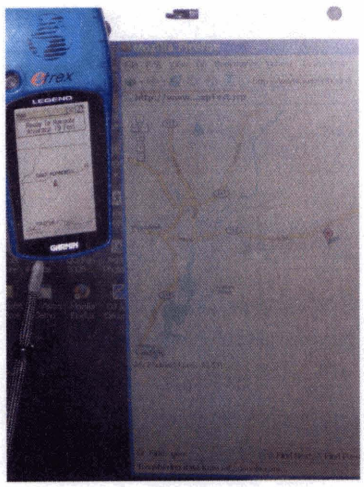
Push based tags: Push based tags are tags the user has chosen to come up as alerts, or, depending on the system's configuration, emergency tags. Push tags cannot be as cognitively taxing as pull-based tags, as the user is not expecting the push-based tag. Push tags could come up immediately, in real time, or could be added to a queue of waiting, low-priority tags. There could be a priority label for each tag, and a driver could set a minimum priority threshold to be alerted of tags. For example, "alert me of tags of priority level 8 and up when I am on the highway, or priority level 3 and up when I am on surface streets." A driver could customize alerts, based on types of tags and priority levels – for example, a sound of sizzling food when he is being alerted to a restaurant.

User selected tags: Tag selection on an open map can be tricky, as it is driven by both menu based and map based systems. A map-based system must have some method of selecting a location. A one-directional scrollwheel will not work for this application; the choices are not a small, finite list that can be scrolled through. Traditional interfaces such as a trackball or trackpad, or a fixed mouse, would work best. At the Smart Cities group we have looked at alternative interfaces and in the long term I believe there will be a possible solution soon. One intriguing hybrid possibility is a trackpad, combined with a BMW Idrive type "turn-knob" controller.

Test implementation of Flosser 3.11:

In order to prove the technical feasibility as well as web interfaces, I conducted testing on the Flosser. During the testing I mounted a laptop in a vehicle and attempted to use it while navigating. The design choice to go web based meant it was difficult to shrink it down to a smaller form factor although it did prove invaluable.





The test setup used a Garmin GPS unit connected to a laptop PC using the Flossin' engine connected to the Google Maps API. The tags were linked to the google maps API via a MySQl database. The system was capable of adding tags as well as operating them although the setup

made them close to impossible to actually use while driving. Even when stopped. It was during this time where I concluded not just the cognitive but also physical load of having to transverse such a solution made practical testing difficult until new interfaces were developed within the vehicle.

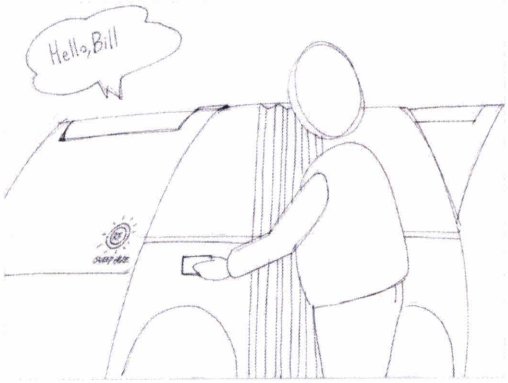
During testing a few technical aspects came into play, for example the GPS was normally <20feet accurate resulting in multiple location tags being incorrectly displayed.

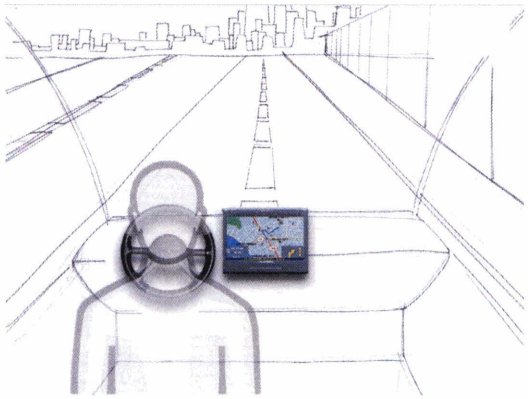
The GPS data and map were sometimes out of sync resulting in erroneous results. Final implementation should have some intelligent algorithms to resolve this such as street direction correlating to the lane on the map.

The tests were useful but could not conclude much due to the physical setup, without a proper interface which is easily accessible to the driver testing within a vehicle was ineffective in testing the system.

Flosser and shared vehicles 4.0:

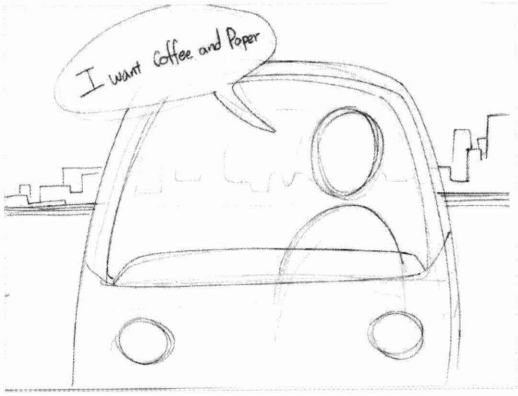
Since its inception, the Flosser was meant to fit (technologically, as well as socially) into shared citycars and other shared vehicles. Its intent was to modularize vehicular interfaces, so people could easily swap vehicles without having to get accustomed to a new interface. A user could log in and have their "skin" (interface) and settings automatically transferred onto the vehicle they are driving. In addition the work done integrating the Flosser into a custom vehicle has lead to innovative interface ideas as well as scenarios in a shared environment which brings the Flosser deeper into somebody's lives. This was also a useful exercise in working out what is possible when the Floser truly becomes integrated with the city as well as social networks.

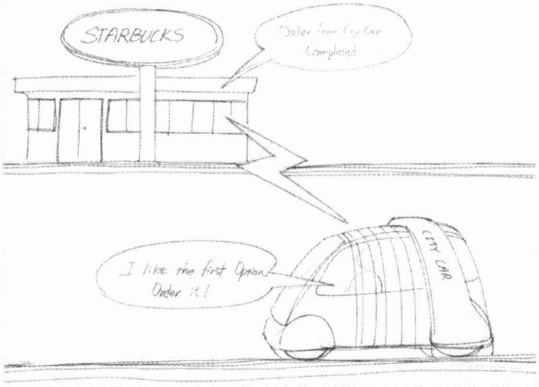




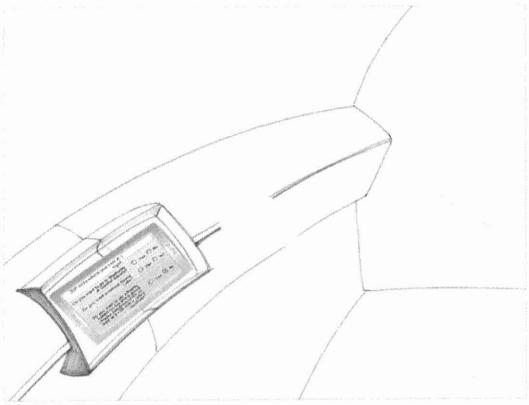
Images courtesy of Smart Cities scenario group, Chang Young Joon, Ryan Chin, Philip Liang, Shelly Lau, Dan Greenwood

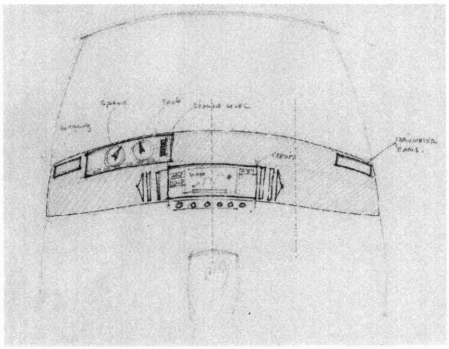
In the above image the vehicle via RFID is aware of who is entering the vehicle. The Flosser can match the user's RFID to their Flosser Server login information, and download their personalized interface and data to the car computer, as the user is entering the car.





In the above image the user asks the flosser for a coffee. The Flosser can recommend not only nearby coffeeshops, but what coffeeshops his friends recommend.





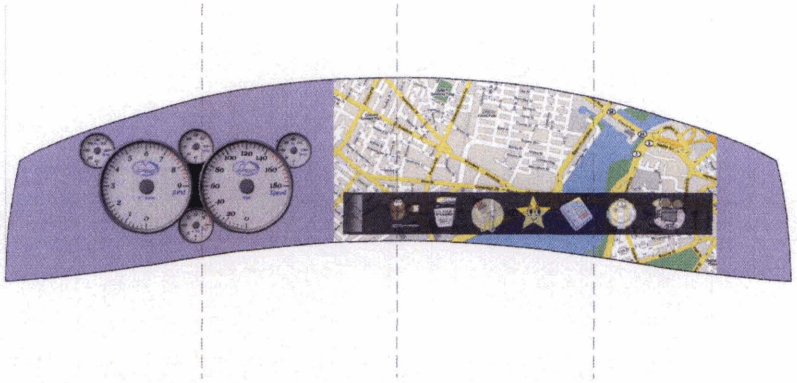
The system in this scenario facilitates and assists the user with this operation. The next stage of Bills journey involves sharing the vehicle with somebody in his social network,

In the above image, the Flosser gives the user the option of picking up a friend who needs the ride. The user decides to let the Flosser guide him to the waiting friends, and giving them a lift.. The use of the social network ensures trust allowing a form of dynamic hitchhiking to take place.

Designing the Flosser for the car 4.1:

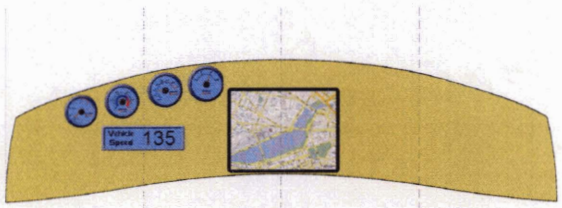
During the process of developing the Citicar and the accompanying scenarios we designed multiple interfaces possible for the Flosser and the vehicle. Cognitive load was a large issue and a key design element was minimalism in the interface: we wanted simplicity not only of appearance, but of the cognitive load upon the driver.

The initial analysis explored traditional dashboard designs and looked at how we could eliminate as much extraneous information as possible while still offering relevant information.



In the designs above the Flosser is the primary element in the driver's information environment. From our user interviews, we ascertained that most drivers do not really need to know things

such as oil temperature and battery voltage as they are driving; they are most concerned with where they are going, and whom they are meeting. For this reason, the traditional "dashboard" type information is made of secondary importance in this interface.



In this dashboard design the concept was to make the map primary but also offer virtal scrolling like that found on an Ipod to control the map, data entry, and also the vehicle's entertainment system.

User Evaluation 5.0:

The objective of the evaluation was to determine user habits and how location and vehicle based social networking will change their lives.

How the testing was conducted: In order to evaluate users I used a qualitative interview model[xvi]. Qualitative interviews would not only yield the most accurate opinions about the concept of Social Networking and the vehicle, but also identify the key downsides users see to social networking. I interviewed a pool of technology power users, as well as people with varying technical ability. I did it this way instead of selecting a large randomized pool in order to carefully screen my respondents, and ensure the people I tested had a true understanding of tags and social networks, as well as making certain that I had a diverse group. As the results show, the most common theme from the interviews was user's agreement on tags they enjoyed and the social filtering concepts. Thus, the testing supports my initial hunch on how to design the tags, and the social filtering concepts.

In order to analyze the data I created a survey in Surveymonkey, a survey website. The testing procedure started by acquainting the user with the concept of Flossin, and the general concept of social networking in vehicles, followed by an extensive test use of the Flosser system. When selecting my test subjects, I wanted to acquire qualitative feedback beyond only quantitative questions such as how a user felt about one system versus another.

Why Personas 5.1:

Without an extensive implementation of a location based social network. Or a sufficiently practical in vehicle setup, I sought a method of articulating what I have observed from my survey. Personas allow a framework for thinking and understanding the reality: it is not the "historical reality", neither the "authentic reality". It is an ideal concept which helps measure and understands the reality I observe from the survey[xvii]. It allows the creation an ideal type capable of playing out the users through the use of personas.

Personas 5.2:

Bob Mitchell - Chief executive Officer

User description: Bob is responsible for running and operating a mid sized organization, his days are organized by his secretary who fits in as much as she can into his busy day. He works as much as 13 hours a day and still drives himself around to meetings as well as to and from his home to his office.

User habits: Bob's schedule does not allow for much recreational activity but he is a power social network user, his business and clients rely on him to keep on track and be informed with every new event which occurs during the day. The social network allows him not only to connect with business partners who might be in the area but also as a way of quickly getting information and updates from friends he doesn't get to see much.

User scenario: Bob starts his day early in the morning heading to a morning client meeting, he doesn't know where the meeting is but uses his "flossers" messaging service to get to his destination. Message Tags left by the client act as a way of getting to the clients office using landmarks rather then signs. After his morning meeting Bob heads into the office where he views his daily event tags to see where he will be traveling today. After his morning meetings at the office Bob has a lunch meeting with a client, afterwards he discovers he has only 20 minutes to get to his next meeting, so he quickly gets on the flosser programs his destination and uses it to find parking as close as possible. After his work Bob heads home at around 6 Pm. When home Bob and his wife decide to go out and enjoy dinner, they go into the Flossin' system at home and decide they don't want to drive more then 10 minutes, they find a new restaurant their friends have recommended nearby. They goto dinner and decide to join some friends afterwards, looking at the Flosser they see nearby events their friends are having and decide to join an old college friend having drinks at a local bar.

Favorite tags: Bob has a clear definition between his personal and private social networks, he values the ability to separate his business and his social life using his Social network as both a tool for work and personal life. His favorite tags are the tags which help make his life more efficient as well as easier to find destinations. Given his life is mostly planned out by his

secretary he has a limited amount of use for serendipitous events except in the evenings where he doesn't necessarily know ahead of time whether or not he's going to be at work or if he's going to be able to go back home.

Type of user: Bob is your typical busy social network user who uses social networking to help him organize his time as well as his social life, he finds the Flosser useful since it offers information locally as well as remotely. Unlike other users who have time during the day and will use Event tags and look for serendipitous meetings bob clearly values the message tags the most. They save him time, prevent him from getting lost as well as keeping him informed of filtered custom filtered information.

Persona 2: Chris Tarshi

User Description: Chris is a self-employed small scale real-estate developer, he spends his time going between sites and meeting up with potential clients and partners. He rarely has a full schedule during the day since it's difficult to calculate how long his tasks will take. He relies heavily on his cell phone and is an extremely active user of Social Networking since this is his primary gateway to finding clients as well as meeting new clients. There are little social barriers differentiating his personal and his corporate Social Network. He has thousands of people in his social network, and relies on his vehicle to get him rapidly to events he or his friends organize.

User Scenario: Chris begins his day with his morning rounds. He travels to the properties he is developing in the morning. During his morning drive a message tag alerts him of a property he might be interested in. He looks at the map and determines it's relatively close so he decides to take a detour to the potential property. After visiting the property he determines the property is appropriate for somebody to live in but not a strong investment opportunity. Using the information Chris decides to leave a "quick tag" from his steering wheel so he can later fill in this information for his other real-estate related friends. After adding the Tag Chris proceeds, to his next destination checking for new developments. Unfortunately he's running behind and won't be able to make lunch with his friend on Newbury Street, he uses a message tag to message his friend informing him of the bad news. His friend recognizes Chris is far away and cannot reach him in time, he uses the review function to find a restaurant close to his destination instead, he determines a comparable restaurant in-between their locations and asks Chris if he wants to join, Chris says yes. He later uses navigational message tags to navigate himself to the destination. During their meal Chris and his friend decide the reviews were not as accurate as others had said, maybe they changed the chef or their suppliers changed so Chris decides to use his phone to update the reviews. After lunch Chris realizes he has two hours of time to socialize before his next meeting. He decides to look for event posts within a ten minute vicinity with little luck. He doesn't have much luck as no potential clients are within the area, instead he decides to put up an event tag of his own asking people to join him at the restaurant for coffee. Within twenty minutes Chris has two people joining him, taking advantage of his large and well organized social network Chris has not only found a few friends who have joined him but also increased his business when they decide to go see his properties. After his impromptu meetings Chris decides to go back and check on his properties. He takes some photos so he can upload it into a location tag for those who are interested later. Chris heads back home to finish adding

details to the tags he has left throughout the city during the day, on the way back home he sees a location alert informing him an old friend is open to having coffee, he quickly makes a change in his target destination and meets his friend for a quick cup of coffee. After coffee Chris finally makes it back home to update his tags before heading out again after dinner. After dinner he uses event tags to see where groups of his friends are clustering, he also uses the list to see where one particular special friend is he wants to see.

Favorite Tags:

Chris relies heavily on event and location tags, given his business is location and Social Network based. The location tags not only act as a reference for him but also allow others to give their opinions as well, in the property industry this is crucial to his reputation. Event tags are particularly important as they allow for Chris to always be meeting with people and increasing his business and social network.

Type of user:

Chris is heavily linked to his social network, there is a thin line between personal and business, and he is a member of almost every social network and literally has hundreds of people in it. He finds the location based services the most useful of all Social Networks since his life is based around property. He enjoys the social aspect of his work, being able to constantly meet new people as well as deliver something tangible to them. He is a power social network user given he relies on his social networking for both his personal as well as corporate life.

Persona 3 – Ryan Botha

User description:

Ryan is an architecture student who isn't as well planned or organized as he would like to be. It's difficult for Ryan to predict how long it takes for him to complete his work so he tries not to schedule too much ahead of time or sometimes very ahead of time. Ryan has a small social network which mainly involves his social friends, since he's in an academic environment there is little which separates personal and business networks. His hours are varied and so is his schedule, his days vary from 15 hour days to 5 hour days depending on his schedule.

User scenario:

Ryan starts his day by looking at his schedule; he sees he has a 3d print to extract in the morning and not much going on later in the day. He walks from his residence to the 3d printer to find the extraction is going to take more time then previously thought. By the time Ryan extracts the print it's already well into the early afternoon; A time he normally reserves for some social activity. He decides it's time for his afternoon social session with his fellow friends, he switches on his Flosser on his phone and sees there is an impromptu gathering at the north end. He walks to his vehicle and asks his Flosser to find the closest parking possible; one of his friends has an available space he quickly reserves. When he arrives at his parking spot Ryan decides it's a great place to do some work so after his friend's leave he stays at the coffee shop with his laptop. After a few hours he realizes it's getting dark and it's time for dinner, deciding he was so fortunate with his parking situation he uses the review tag to locate a find restaurant within walking distance. He puts an event tag there an hour before the meeting time hoping some people will join him. Within a few minutes his good friend agrees, by the time he gets to the restaurant two of his friends will join him. After dinner he decides to go home and write location tags about his afternoon in the North End writing about the people he saw, what to do there and also a bit about the culture of the North End.

Favorite Tags:

The tags used most by Ryan are the event and message tags, since Ryan is unable to keep a formal schedule he wants to maximize the number of friends he can see. The event tag allows him to do this, but as a designer what interests Ryan the most is the urban social fabric he sees daily, he uses location tags as a way to write about his results. Adding to the environment whenever he visits a location.

Type of user: Ryan is a socially oriented user of Social networking, he is interested in how he can contribute to a location and document it. His interest is beyond just meeting people it extends to creating history and documenting events which otherwise may not be documented. He enjoys the vehicle aspect of Social networking since it satisfies part of his curiosities while driving, such as what other friends have traversed this same road? Where are they going?.

Future work 6.0:

The groundwork I laid down for in vehicle social networking is simply an extension of non-vehicle social networking. What the research concluded was that the same social network services open to groups with location based systems such as Google Earth are the kind of tools drivers like to see. The reason why drivers wish to see this information is because they are often looking for this kind of information when in a vehicle and on the road. I believe the future work will be in the interfacing with the data, at the current moment interfaces such as Idrive can do the job but users still find the cognitive load to be exponentially higher then necessary.

The interfaces will also advance to three dimensions, and for this reason increased depth of information in terms of density.

Resource sharing will become a prominent feature I believe with:

* Parking - dynamic and static, in this case it can be both personal and private
* Ride sharing
* Space allocation
* Cheapest fuel

Being one of the most desired features in the vehicle of the future.

The biggest advance I see in the future is linking in information into the vehicle previously inaccessible with links to not only social networks but also government as well as private organizations. In one classic problem is the "pothole" reporting problem, there are numerous times when we have passed over a pothole sustained minor damage yet it might had been prevented if somebody had informed the government of the pothole. Systems such as the flosser can create and tag items such as potholes although at the moment there is no vehicle or method of reporting to the government just yet, and without this feature the pothole reporting remains a cumbersome and difficult to execute task. Future work will be linking this information with other methods of delivering information extending out beyond the flosser and using it as a single social tool.

Conclusions 6.1:

The results shown indicate the concept of social networking in vehicles is sound and fundamentally useful for two main applications. The user survey showed some interesting facts, such as currently people who have social networks appreciate the information they get because it's appropriately context filtered to information they like. They also indicated in interviews that their social networks had reviews but little location information because of the way it was designed and the fact it could generally only accessed at home with limited mobile connectivity.

The two different kinds of users quickly emerged, those who value events and those who value messages. The anomaly was in my opinion an isolated case, the anomaly who trusted professionals more then his own social network it became evident he knew substantially more information about his reviewers then the average person would. So given the circumstances there will and always will be exceptions.

The most useful comments came from two interviewees who kept emphasizing the event tag as a method of socially connecting themselves, there was also a correlation between afternoon activity and event tags. Both users indicated afternoons were when they would go out without a preset destination and also the times they would most use event tags. This also became useful when users determined the interface was map based, as they could easily access map based information. On a side note I think the users were over-enthusiastic about map based interfaces, they might be able to tell you a great deal of location + setting information but it's not strong for specific choices. In the event you are looking for the best Japanese restaurant in the area it would be more efficient to use a list rather then a map, for this reason I'm looking toward developing a hybrid interface which will link the two together. Or at least a method where the map based interface can show certain information which will rank the system more then generic data.

There was also a correlation between flossers and active users with no destination with their careers, those users who lived a more social lifestyle were more likely to use social networking in vehicles. They were prominent and active flosser as well as isolated themselves to just want to see event tags and create serendipitous situations. It was also clear the people who wanted this feature made their living from a form of social networking as developers where this tool

could be useful to helping them find economic deals as well as expose themselves. On the other hand the data concludes users also enjoyed message tags.

As for the user output, there was a mixed bag, most people chose the real time approach to the problem choosing to use a real-time based system rather then a delayed system to receive their messages. I believe this is because of user habits, even though we are aware the cognitive load imposed by cell phones happens to be extremely dangerous to driving it is still an active and huge cultural phenomenon to talk on phones in the vehicle. It is my conclusion the delayed response is the socially responsible solution but the real-time solution is the preferred solution.

As for user Input it was clear the data indicated none of the solutions were sufficient to creating a tag as well as using it in the vehicle. Given the current nature of inputting information into the vehicle this is a challenge not just faced by Flossin but all data input in vehicles in general. The best suggestion I think came from an interviewee who suggested this as an interface for creating tags in a vehicle. Basically he stated he wanted a on the steering wheel control which would allow him to physically tag something and later at home add the details into the tag. This system would be both cognitively low taxing as well as efficient although lacking in the spontaneous real time department. I feel this is one of many input methods which must be inputted into the vehicle.

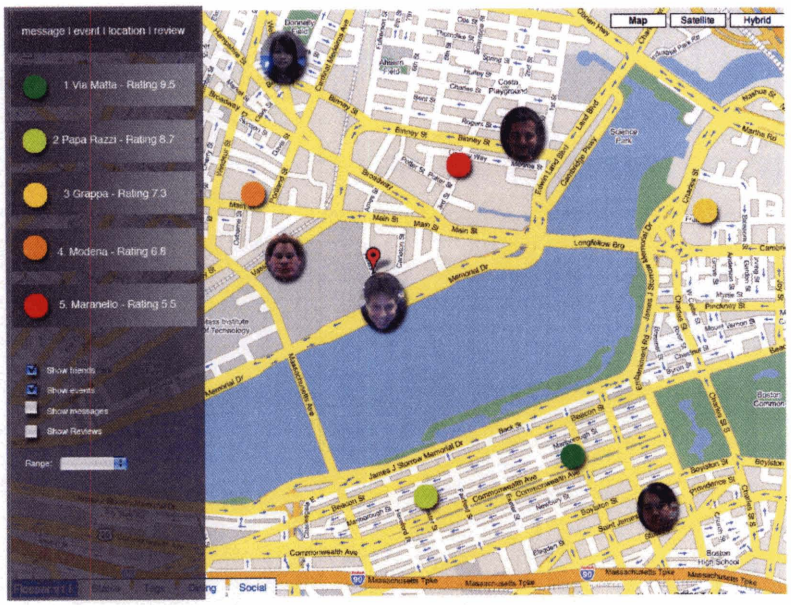
In conclusion it is clear social networking in vehicles will be a future trend provided by auto manufacturers. The major hurdles come in the UI interface design as well as the integration.

The optimal interface derived from the conclusion

Based around user comments I have designed an update the interface for any future work done in the field of Social Networking in Vehicles. Even though these designs are untested I believe they will make a strong template for next generation in vehicle Social Networking systems.

Future interface solutions 6.2:

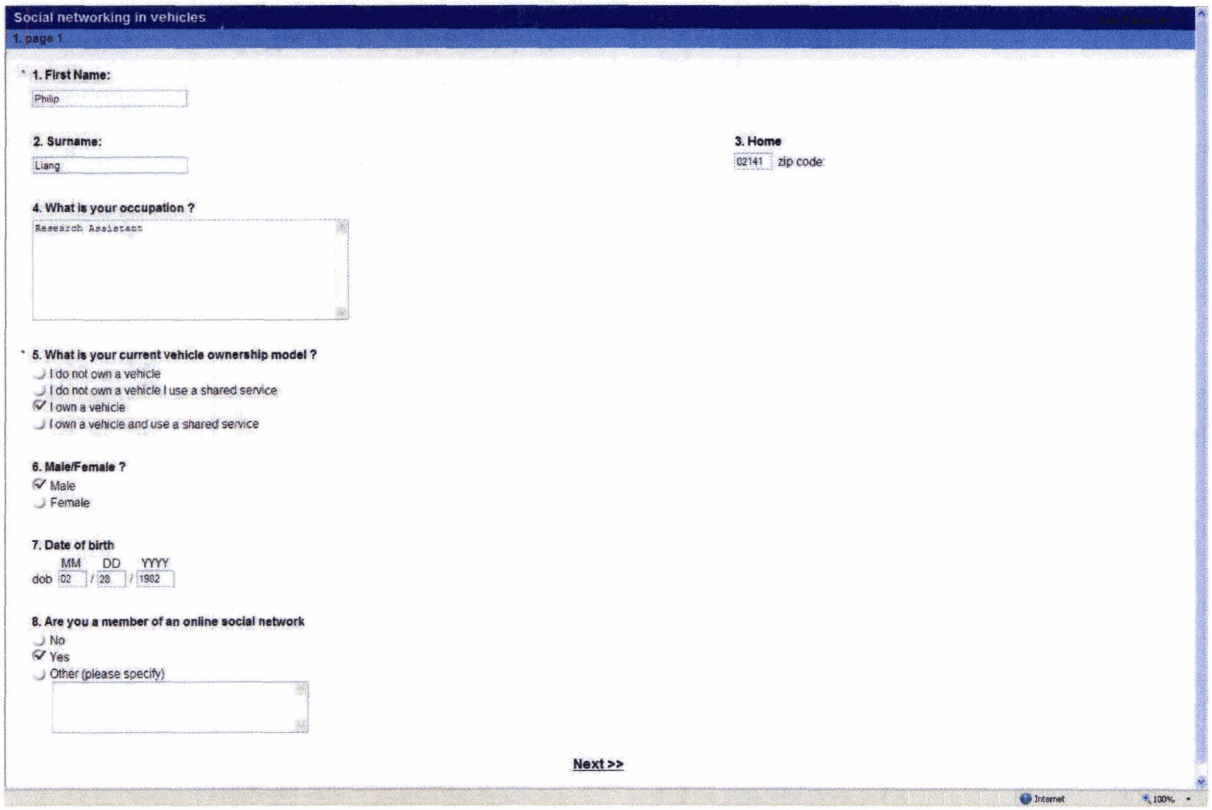
The interface below shows an easier way of identifying friends and people within a social network. Instead of having them set on a list it's possible just to show them in a visual method on screen. One of the issues has the user double reference with the original design, it was difficult to find a number then reference it on screen.



In this latest interface revision, the list has been implemented back in. The primary reason for the list was in the user survey which indicated users wanted the list for looking up certain information and the map for others. This makes sense as it's difficult to easily rank information within a map, it also makes sense to have both to observe both a list and map to correlate data. In this design it also has simple check boxes which allow for a view/hide of filtered social information.

Appendix 7.0:

Survey snapshots 7.1:



Page 1 of the questionnaire focused on basic demographics of the driver, the sample required users must have followed the following criteria – They must own or be a member of a shared vehicle system such as Zipcar. They must be a member of a social network and have experience with the social network.

The reason for requiring a vehicle is for a user to have an understanding of what it's like to navigate in a vehicle and make choices, the requirement for the social network is in place to ensure the user has an understanding of social networks as well as the information associated with it. It in unfortunate though that none of the users have used location based social networking and little location based services besides reviews.

Social networking in vehicles

3. Tags

* 13. How would you rate the usefulness of tags ?

	Useless	not very useful	average	useful	very useful
event	○	○	○	☑	○
location	○	○	○	☑	○
message	○	○	☑	○	○
review	○	○	○	○	☑

14. How important are each tags to you

	Not at all	Somewhat important	Average	Above average	Very important
location	○	○	○	☑	○
event	○	○	○	☑	○
message	○	○	○	○	☑
review	○	○	○	☑	○

15. What are your favorite tags and why ?

Event tags so I can meet with friends

16. What scenarios would you find most useful ?

learning about a friends story

17. Which feature would you use the most ?

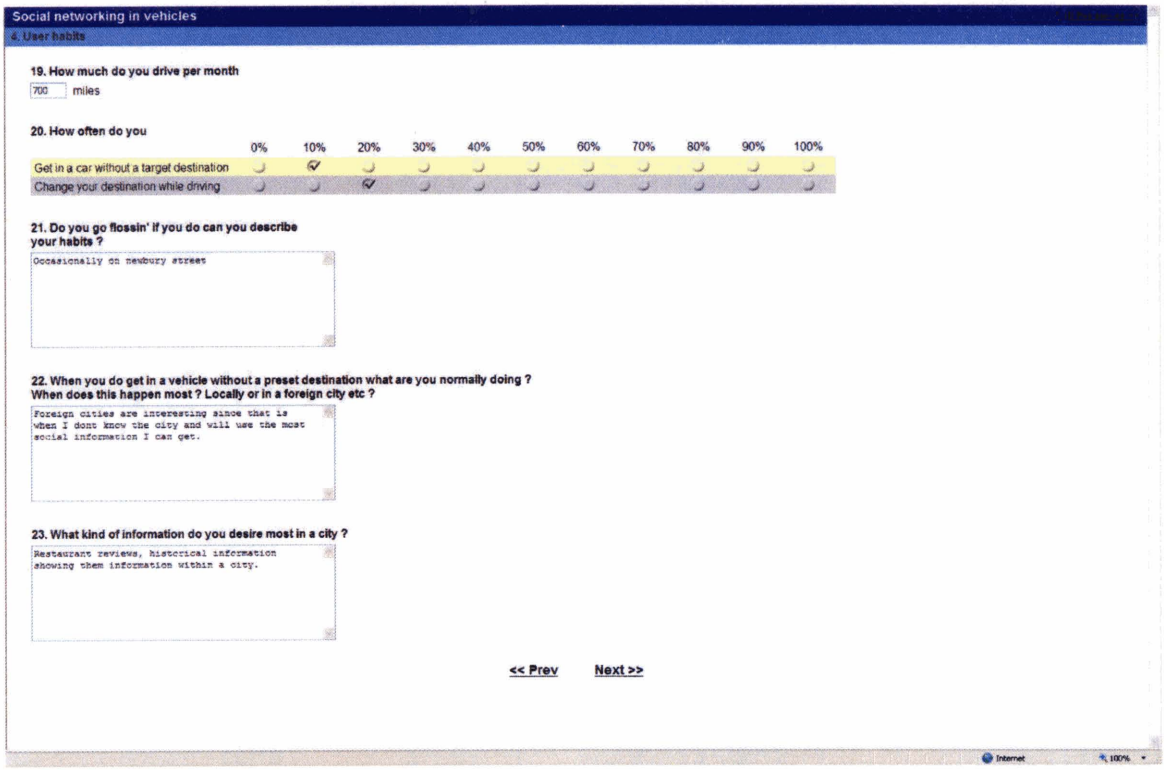
The review tags looking for nearby restaurants

18. Additional comments ?

I would like to see both professional as well as social wealth information.

<< Prev Next >>

The tags questionnaire focuses on the usefulness of tags, as well as the ability of the user to sum up which tags he or she will likely use the most. Each user had a strong understanding of tags and their concepts. During the testing it became apparent there are two kinds of people: those who value personal messages, and those who value serendipitous events.



Social networking in vehicles

4. User habits

19. How much do you drive per month

700 miles

20. How often do you

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Get in a car without a target destination		✓									
Change your destination while driving			✓								

21. Do you go flossin' if you do can you describe your habits ?

Occasionally on newbury street

22. When you do get in a vehicle without a preset destination what are you normally doing ? When does this happen most ? Locally or in a foreign city etc ?

Foreign cities are interesting since that is when I dont know the city and will use the most social information I can get.

23. What kind of information do you desire most in a city ?

Restaurant reviews, historical information showing them information within a city.

<< Prev Next >>

Internet 100%

The user habits tried to sum up just how often a user got in a vehicle without knowing his final destination as well as changing his destination. It also asked about Flossin' habits and how they conducted the Flossin'.

There was little correlation about what people enjoyed in the city but this did show user patterns and an interesting correlation between occupation and user habits.

Social networking in vehicles

5. User interface design

24. How would you rate the following tag input methods

	Very poor	poor	Average	Above Average	Excellent
In vehicle icon based		✓			
In vehicle menu based				✓	
Rapid entry on steering wheel					✓
Offline at home					✓
Offline using menus			✓		

25. How would you rate the following output methods ?

	Very poor	Poor	Average	Above average	Excellent
Real time audio alert				✓	
Delayed audio alert			✓		
Real time visual alert			✓		
Delayed visual alert			✓		
Icon based on the map				✓	
Menu based on the map				✓	

26. How would you rate the following display types ?

	Very poor	Poor	Average	Above average	Excellent
Map based				✓	
List based			✓		

27. How do you feel about the interface ?

The map based element is strong,

28. How would you primarily use this interface ?

I would use the map segment primarily

29. Do you have any suggestions for the UI Design ?

Yes make the map bigger

30. What was the weakest element of the UI design ?

The input/output element

<< Prev Next >>

Internet 100%

The interface question targeted how people would like to both input data as well as output data. The information acquired did lead to an interesting conclusion, people do not like delayed messages but rather real time ones in general but in the output what they really wanted was a way to put in a “temp” tag.

In the example given by one power user, he stated the optimal interface for him would be the ability to tag something with a simple click of a steering wheel control subsequently followed by the ability later at home to add to this data.

Social networking in vehicles

6. Social networking in the vehicle

31. How would you rate the following concepts ?

	Very Poor	Poor	Average	Above Average	Excellent
Social networking in vehicles ?	○	○	○	○	☑
Flossin in vehicles ?	○	○	○	☑	○
Usefullness of the flosser ?	○	○	○	☑	○

32. What did you think of the concept ?

Strong, but needs to be refined more

33. How would you user the Flosser ?

As a nevigation tool examining the city

34. What did you dislike about the Flosser ?/

The interface was weak

35. How would you improve the Flosser ?

Add more information into the system, and extend it out of my social database

Overall I wanted to gauge the reaction to the concept of Social Networking in vehicles, the response was positive even though the Flossin' response was a little weaker then I had initially suspected.

The overall conclusion is there are 2 killer apps associated with Social Networking in vehicles They are

Events and serendipitous events which occur

Messages and set messages for the user

Social networking in vehicles

2. Social networking

* 8. How many friends do you have in your online social network ?

16 number.

* 9. How do you rate the quality of information from

	very poor	poor	satisfactory	good	very good
Professional reviews				✓	
Your social network			✓		

10. What kind of information do you most value from your social network ?

Recommendations for restaurants, showing locations I would otherwise now know of.

11. What professional reviews do you value most ?

Zagat reviews are a good one

12. Please name the social networks you are members of, for example Friendster, Orkut etc..

Friendster

<< Prev Next >>

Part 2 focused on the Social Networking element.

The objective was to determine how people rated information from a social network over a professional network. The data revealed users tend to believe friends more than professional reviewers. There is a well-known trend for homophile: that like attracts like, and that friends tend to like the same things. Users especially like timestamps in the social network. One subject said the following about whether he prefers professional reviews, or his friends' opinions when judging restaurants or other venues:

"Personal opinion, they are friends so they know more about what I'm interested in, they would customize their information first, friend's filer information for you.
This was interesting since professional reviews " - Subject 7

This shows another interesting point: information from a user's social network is pre-filtered for him already. He has filtered his social network already by choosing whom he wants as his

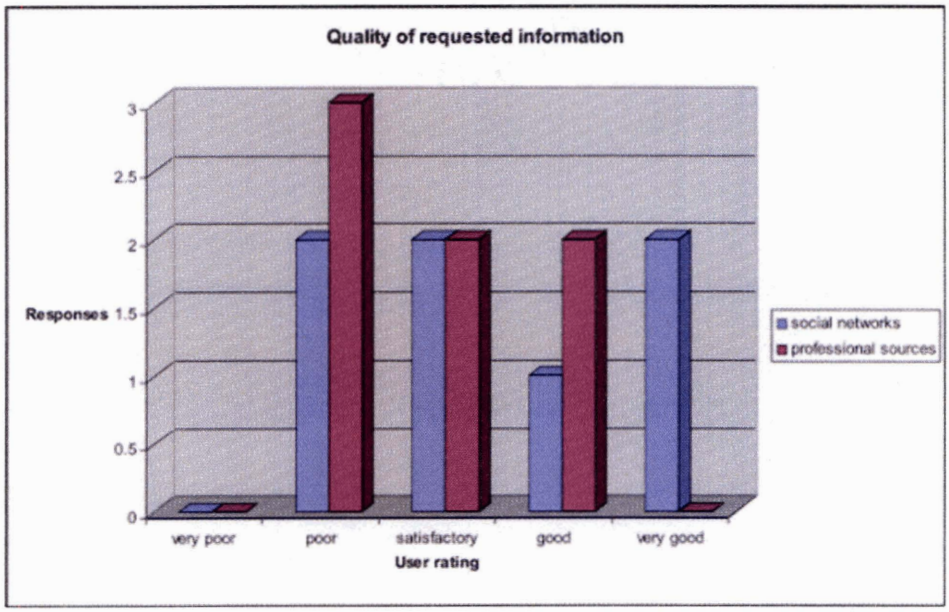
friends. This lets him piggyback on the filtering he has done in selecting his friends, and apply that filtering to selecting the reviews he reads and follows.

When applied to an in vehicle information network the survey data suggest that social network based information is more valid within a vehicle than outside a vehicle. Perhaps this is because of the spontaneous nature of in-vehicle social networking. In a spontaneous situation, individuals are more likely to trust a snap judgment from a friend, rather than extensively researching the possibilities from an authoritative source.

Evaluation Quantitative Results 7.2:

The qualitative heuristic evaluation led to multiple design critiques and a further understanding of how people can apply social networking to their vehicles.

Social networking habits and trust:



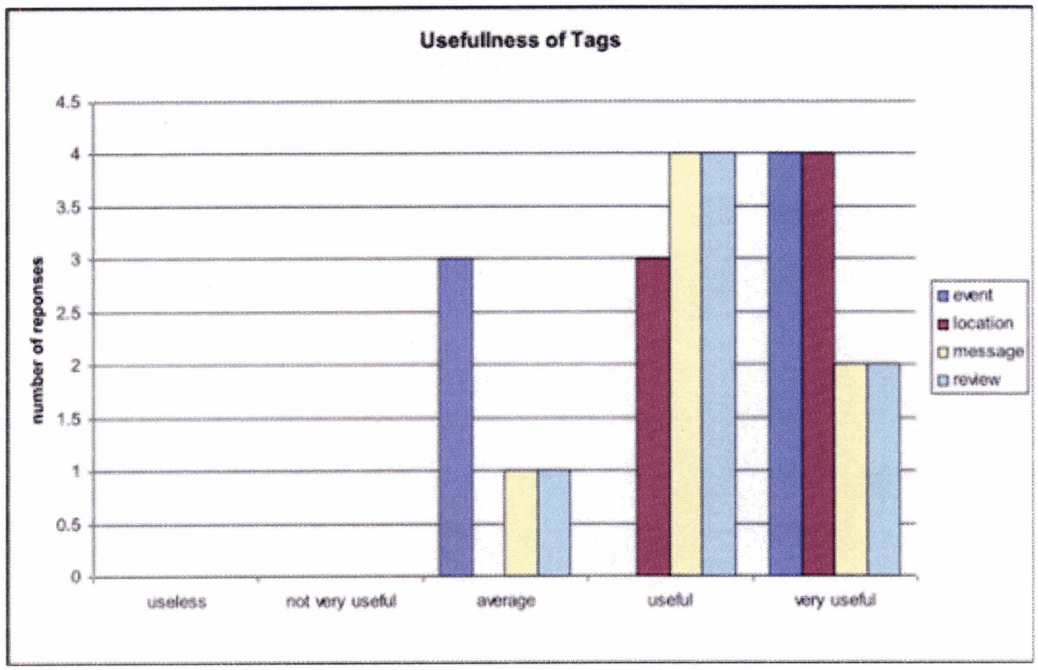
The results from the qualitative survey indicated my subjects trust their social networks more than professional sources such as restaurant-review websites or guides. The major factor in this was the "filtering" element the users spoke of: friends are already preselected as having similar tastes, and these friends will filter their recommendations for social context, whereas the information presented by professional sources is not context-specific.

"Personal opinion, they are friends so they know more about what I'm interested in, they would customize their information first, friends filter information for you." Subject 7

In the extreme case where one subject clearly stated he did not trust his social network but rather professionals, he knew so much about professional reviewers, that it could be argued he used them as his personal network – therefore possibly reinforcing the point about social networks.

Tags and types of users

The data indicated early on there are two distinct kinds of people, those who value targeted social messaging more and those who value serendipitous events.



The comments make indicated user habits in vehicles are often correlated to their usage behavior in the vehicle.

"Event tag, really interesting because it coordinates people in space and time. It's a pretty new idea and it could possibly accommodate spontaneous events which is nice." Subject 5

"Message tags can be important because they might have specific information that is pertinent to me." – Subject 2

The "event" biased users tended to speculate afternoon coffee sessions, being on the road meeting with friends in the same vicinity, they wanted the feature to rapidly meet up. There were also two subjects who noted this is an "afternoon" feature mainly targeted at finding activities when there was simply dead time.

When subjects were asked which social scenarios they considered most useful here were some replies.

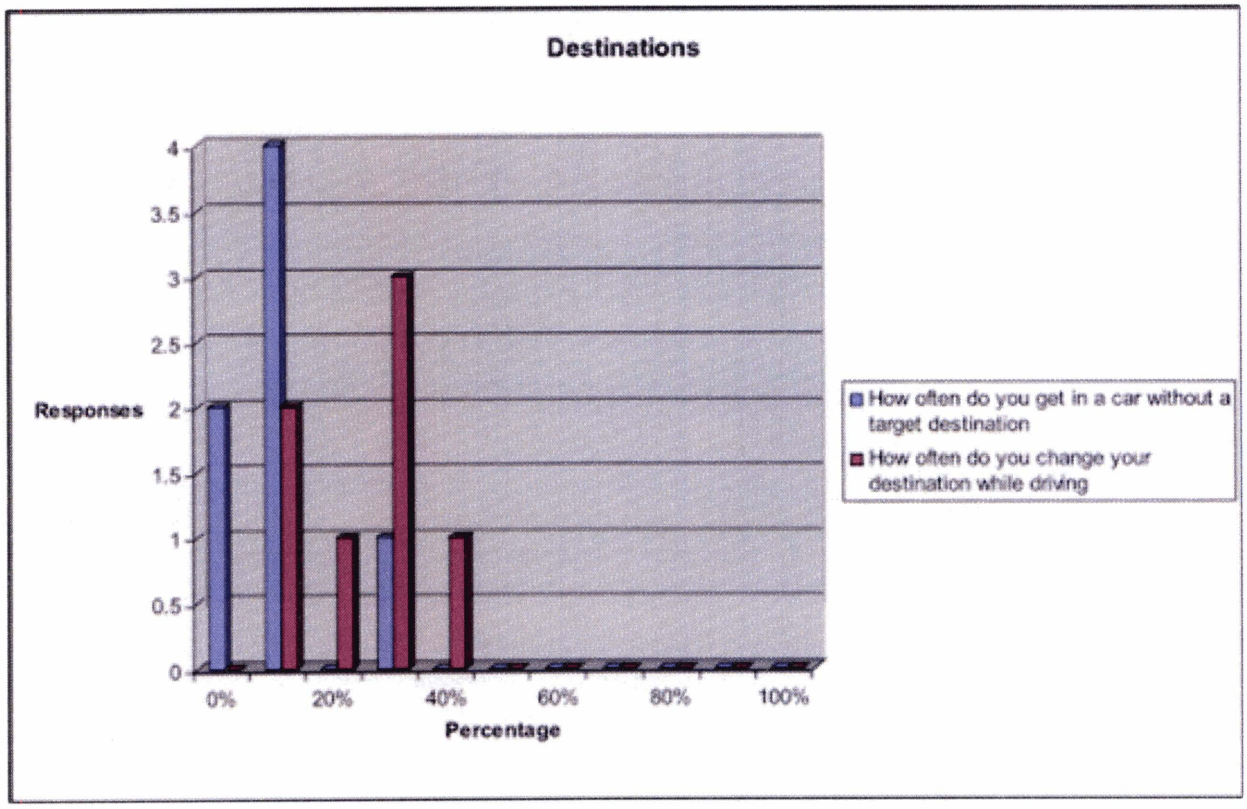
"Professional collaboration, dating, new woman acquisition and fun existing things to do with dating partners. This allows us to unveil the spices of life. How do you know something is a block and a half away, this way it lays bare the awesome coolness that's around us all the time. All of it." Subject 1

"4 o clock in any given afternoon you have finished it's work for the day you want to procrastinate and hang out with friends anybody who is available just to attract intellectually socially and you can immediately see whose up for a meeting you don't have to make 20 phone calls to locate a coffee partner." Subject 6

"Situated driving and directions navigation, reviews." Subject 3

The theme of location, people and navigation become intertwined. The data suggests people currently do not have a tool they can use to go and meet others serendipitously especially when in the vehicle.

User vehicle studies



The original design of the Flossin' system was intended for so called "flosser" people who cruise without any destination just picking a street go drive up and down. In this study I wanted to find out how many people actually go out looking for serendipitous events. The interesting data indicated on average active social network users with vehicles will have no final destination 10% of the time they get in the vehicle and will on average change their destination 24.2% of the time when they get in the vehicle. There was also a correlation between career path and habits, for example those who "flossed" or had no destination were more likely to have careers that encouraged such behavior. In one example a "self-employed" real estate developer who relies on social networks and serendipitous links to enable business contacts would get in his vehicle as much as 30% of the time without knowing a final destination. This user was also a primary fan of the event tags in vehicle use.

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