
altVerto: Using Intervention and Community to Promote Alternative Transportation

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Abstract

We seek to motivate drivers who regularly use web-based local and mapping services and have access to viable alternative transit methods — such as public transportation, carpooling, walking or bicycling — to use these alternatives instead of driving alone. altVerto works with users' existing habits to intervene during trip planning, and then sustains long-term positive behavior through progress tracking and community-building around alternatives to driving. Our study investigates how computer-mediated intervention at decision making moments and online transit-related community motivates and sustains the use of alternative transit methods.

Keywords

Transportation, Persuasive Technology, Online Community, Motivation, Intervention, Decision Making, Notification Systems.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Background

Transportation in the United States mainly consists of single-occupant vehicles. Excessive use of this form of personal transportation damages the environment,

increases congestion, and contributes to health problems. In many cases, alternative options — such as public transit, carpooling, walking, or bicycling — are readily available and offer financial, environmental, and health benefits. Despite efforts by transit operators, environmental groups, and governments to encourage people to use transportation alternatives, single occupant commutes continue to increase [3].

Our initial user research revealed that users are aware of some of the general tradeoffs between driving and other forms of transit; this knowledge, however, is usually not sufficient to persuade them to not drive for any given trip. The same users reported not being able to break their “car habit” both because of their own personal routine and a lack of information about the specific tradeoffs between options.

“I would like to help the environment and I know I'm not doing the best job.”

- Fran. Minneapolis. MN

A review of relevant literature shows that providing general information about a behavior’s environmental benefit is not effective in persuading users to change their behavior. Instead, information shown frequently at the time of decision, with feedback, has been shown to be more effective [4]. Public transit studies have found that individualized coaching is the most effective way of providing this information. In Portland, Oregon, a trial of the international TravelSmart coaching program increased transit use and physical activity among users while reducing vehicle usage [6]. The Transportation Research Board reports that individualized marketing can double alternative transit use among targeted individuals [5].

Work at Stanford’s Persuasive Technology Lab demonstrates that computer technology can be designed to alter people’s behavior [1]. In a study

comparing the effectiveness of web-based interventions to non-web-based interventions in the treatment of chronic illness, web-based interventions were found to have better outcomes for the patients. These outcomes included increased knowledge of the disease field and increased participation in treating the disease [7].

These studies informed our design goals and led us to examine ways to provide benefits similar to the individualized marketing campaigns through technological means.

Design goals

Our goal is to motivate people to use alternative transportation options instead of driving alone. We propose a technological solution that will intervene during a user’s trip planning routine to present transit alternatives and sustain a user’s choice for alternative transportation. We target users who use web-based mapping sites and local directories, and who have a predisposition to consider alternative transit but regularly drive instead. altVerito will be most easily integrated into areas with well-developed public transportation systems, such as the Seattle metropolitan area. While we design for these users, we consider other stakeholders including transit operators, local businesses, and the community at large. Specifically, we present a solution that could be implemented by one or more of these stakeholders using only current technology and limited resources.

Design research

We followed an iterative process of research, analysis, and development. Our design process consisted of an initial contextual inquiry, idea development and validation, and then detailed prototyping.

Initial user research

We conducted a contextual inquiry with 31 subjects from nine US states and three other countries to understand why people do or do not use public transit and what their transit experience is like. From this inquiry and a non-scientific online survey adding 37 users to our sample, we diagrammed relationships and themes in the data. We formed eight personas, incorporating relevant characteristics of transportation users, such as age, occupation, family situation, cohabitation status, and disabilities.

Our initial user research led to a number of findings that helped focus our solution ideas. The diagram generated a list of prominent themes in transportation that coincided with themes found in our literature review. We chose to focus on a subset of these themes, namely: time use, socio-economic divisions, community connections, and alternative transit options.

This subset of themes was then incorporated into our persona development allowing us to establish goals for each persona and to create a categorized user perspective of transportation. This revealed that transportation users differ in their decision factors for choosing a mode of transit. While some indicated time and convenience as the most critical factors, others focused on weather or task type. The goals also showed that some categories of users would not be easily convinced to use other transit forms due to certain constraints (e.g. parenting young children, carrying large or numerous objects, poor access to transit options, etc.). These findings were the basis for determining our target users: people that have access to the Internet and who have considered alternative transit but have not effectively changed their habits.

“Taking the bus gives you something more in common – you’re at the same corner waiting for the same bus every day, so you feel connected somehow.”
- Alicia, Washington, DC

While these users are aware of the general costs of their transit choices in the long term, they consistently described not knowing the specific costs for any particular trip. Existing tools do not measure these costs, and so do not compel behavioral change. Taking into consideration the opportunity for persuading users by presenting information at the time of decision [4], our design process then explored how to intervene and bring specific information to the users’ habitual decision making process.

Design process

Based on our initial findings, we created narratives of experiences that we believed would help persuade users to try alternative transit and continue using it. From these ideas, we prepared twelve storyboards depicting these experiences; our goal was not to design an entire system but instead to focus on the individual experiences. We took these storyboards to potential users, and asked them to discuss how the situations might or might not fit into their lives, and then propose revisions or alternatives. From the resulting feedback, we arrived at a core set of features:

- a tool that intercepts requests for directions from mapping websites and interjects information about available transit alternatives and their benefits
- behavior tracking and statistics
- a trip planning tool focused on alternative transit
- route information that can be socially annotated.

Each of these features required validation, detailed design, and integration into a cohesive product. We relied on three different methods: a journaling study based on an experience prototype, a user priority-ranking exercise, and paper prototyping sessions.

“It would be neat to see just how much you might have benefited the environment by walking instead of driving, or how much gas money you saved, both personally and with a group.”
- Janice, Ann Arbor, MI

FIELD TRIAL

Our field trial focused on simulating the experience of intervening during a user’s trip planning process with alternative transportation options. We recruited seven volunteers — students and professionals (ages 15-60) in rural, suburban, and urban areas across the United States. These volunteers provided a calendar of their planned trips for one week. Members of our team sent the volunteers a daily email with a list of the alternatives for each trip. For each transportation option, users were shown the number of calories he or she would burn, the estimated cost, travel time, pounds of carbon emissions released into the atmosphere, and other relevant information.

“Having a web-browser plugin for my computer would be AWESOME. As I mentioned in the last log, I love the factoids and any that pertain to transportation would be really neat.”
- Lisa, Chicago, IL

Users also answered a daily journal prompt on our website. Users could comment on each other’s journals and were also presented with general statistics on transportation costs, environmental impacts, and congestion trends. Based on the notifications they received, users provided feedback about which information they considered most persuasive or interesting, and the best time and format in which to receive it. They also told us how they wanted their decisions recorded and with whom they wanted to compare their choices. Users also reported what information about specific routes or transit options they would find helpful and what they would want to share with others. We then incorporated these suggestions into our prototypes.

“The discussion comments might inform users that a certain bus is always overcrowded coming into Philly from the suburbs before 9AM.”
- Justin, Philadelphia, PA

SEMI-STRUCTURED INTERVIEWS

We completed priority ranking exercises and analysis of paper prototypes in hour-long semi-structured interviews with our field trial participants. These interviews were conducted in conjunction with follow-up

interviews for the field trial. Five additional subjects were also recruited to participate.

During the user priority ranking, users indicated which pieces of information were most persuasive and important to their decision making. This prioritization helped us determine what information to present and how to present it. The paper prototyping feedback explored the appropriate interaction flows. Based on this feedback, we prepared a high-fidelity visual prototype to communicate our design ideas.

Proposed Design

We envision altVerto users progressing through three stages: intervention, regular use, and social interaction. The first stage, intervention, is primarily achieved through the altVerto plugin. The plugin intervenes with specific comparisons between different transit options when the user visits a local-information website or mapping service. Users can then visit altVerto.com for more detailed transportation information. Display of individual and group performance data over time, as well as social forums that build a community around alternative transit, promote regular use of altVerto.

The altVerto plugin

The intervention component begins when a user installs the altVerto plugin. The intent is to reach the user at or near the decision making point. The plugin detects when a user requests driving directions, an address, or business location online. When these actions are detected, the altVerto notification shows the user their alternative travel options and information about calories, cost, carbon emissions, distance, and weather (figure 1). Users can customize the information displayed in the notification to match their preferences.

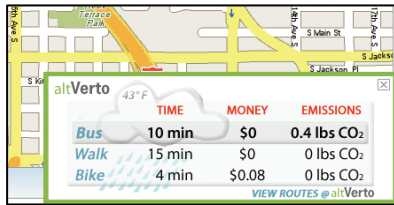


figure 1. the altVerto plugin intervenes when users visit route-planning websites.

We expect some users would install the application out of curiosity or because they generally feel they should drive less but need a reminder. Others may need incentives or targeted marketing to convince them to install the altVerto plugin. For expanded appeal, the altVerto service would be available for personal information management applications, mobile devices, and third party applications through an API.

The altVerto website

The altVerto website provides detailed information and a more interactive experience via four main areas: a trip planner, user profiles, discussion boards, and general information.

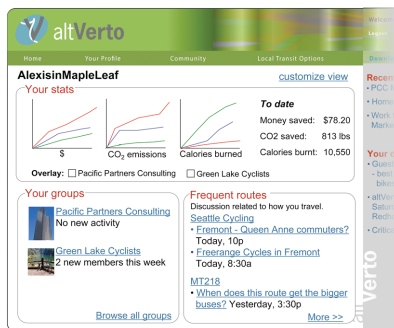


figure 2. User profiles show their savings to date, the groups to which they belong, and relevant discussions from the forums.

“altVerto might consider adding the ability to rate transit routes or route times for timeliness and reliability.”

- Antoine, East Brunswick, NJ

The trip planner aims to replace other online route planners in the user’s routine. A search using the planner returns results for driving, public transit, walking, and bicycling, as appropriate. A cost and benefit comparison is also presented. Although, altVerto does not organize ridesharing, this page would link to rideshare sites to post or search for the selected trip. The users of the plugin would be directed to the same page when clicking to request more detailed information after viewing the notification.

Users can store favorite trips or locations for quick re-use. Users can also customize their results with specific vehicle information to receive customized results. After a search, they can record which form of transit they have chosen and can print the directions or send them to a mobile device. The trip planner records choices to a user’s profile (figure 2), and over time builds statistics comparing the user’s behavior to worst-case and best-case behaviors.



figure 3. The trip results page presents travel options, allows users to compare results, and allows them to send directions to their mobile devices.

Recording the costs associated with transit decisions reinforces positive behavior and encourages users to seek other opportunities to use alternative transportation. This last point is particularly important because users have already made their choice of transit mode for routine trips, such as work or school commutes. In these cases, users are not likely to seek directions from a mapping service and the plugin would not be able to intervene, so we must persuade users to actively seek out other forms of transportation.

Other website features are aimed at retaining altVerto users as alternative transit users. During our interviews and field trial, users expressed a strong desire to be able to discuss transit options and learn more about particular routes. We include this in two forms: a route view page and topical discussion boards.

The route view pages combine different types of content (figure 4). Basic route information such as operating times and fares is displayed. Users can view aggregate ratings for cleanliness and timeliness and add their own opinions. A discussion board feature is

The screenshot shows the altVerto website interface for the MT316 Northgate Express route. At the top, there are navigation tabs: Home, Your Profile, Community, Local Transit Options, Discussion, and Help Page. The main content area is titled "MT316 Northgate Express" and includes a "Service Advisory" stating "MT 316 is running 5 minutes late today". Below this is a schedule table with columns for "Start", "End", and "Frequency". The table shows service from Monday to Friday (6:00a to 9:30p, 30 minutes frequency) and no service on Saturday and Sunday. To the right of the schedule is a "Map view" showing the route line with stops at "4th & Union" and "4th & Royal Brougham". A "Line view" section provides details for a station: "Station: Covered bus shelter, Parking: 500 spots, free Transfer: 5174, MT412, and 514". It also lists "Area businesses" such as "Masala of India (700)", "Jai Tai (85 R)", "Borshers Deli (150 R)", and "Target stores (160 R)". At the bottom, there is a "Discussions" section with a table of posts, including one titled "Why doesn't this route go to UW?" and another "New buses said on this route starting today buswaven".

figure 4. The route page contains route overview, stop information, user ratings, and a discussion board.

"A discussion forum might be useful for new bus riders to get tips and information about their route. I could also see it being used as a tool to discuss issues/concerns about the bus route and perhaps serve as a way for riders to take collective action."

- Janice, Ann Arbor, MI

"The environmental information makes me want to ride my bike or walk, so I DIDN'T USE MY CAR ONCE TODAY! I saved 270 trees. Wahoo! I rock."

- Andrea, Madison, SD

also provided for topics such as quality of service or organizing social activities like book clubs for route-riders. Additionally, different views of the route are shown, with information on parking, amenities, and businesses at each stop. The local business listing would be a tie-in with directory services that choose to link to altVerto directions from their listings.

More general discussion boards are tied to locations and modes of transport, e.g. Seattle area biking or Chicago Public Transit. In these forums, users can share their favorite bike routes or ask for public transit advice. During our field trial, some users noted they might use these for organizing collective action, such as a petition to increase transit service. A study of grassroots campaigning explored this relationship between community, social software, and collective action [2]. One journal study participant now not only tries to carpool more often but also encourages her peers to do so.

Conclusion

Through an iterative design process, we constructed altVerto to use a combination of intervention and incentives to actively effect lifestyle changes in people who primarily travel as single drivers. altVerto begins to encourage change in user behavior through a notification feature that intervenes without requiring any change in users' established routines for trip planning. As users monitor their progress and feel good about their transit decisions, their behavior is further sustained by involvement in the altVerto community. In our experience testing, users' behavior was positively influenced by this method, indicating great potential for altVerto to increase public welfare by promoting transit decisions that are environment and health conscious.

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