CTA
Transit Operations & Technology Management Divisions

AVL - Bus Tracker Planning Update and Business Case
February 14, 2007
AVL Planning Update
Pilot Project Background

• Key System Components:
  1. Data Communication Methods
    • Cellular data communications
    • WiFi / Cellular / Digital Radio Switching (Mobile Access Router)
  2. Customer Information Application (Bus Tracker)
    • Website providing stop specific arrival predictions and a city map
    • Scrolling sign at one bus shelter displaying next two bus arrival times for that stop
  3. Control Center Software Application (CAD/AVL)
    • Displays real time bus location information, route incidents, and other reports

The CTA has a refined set of requirements for the customer information application as well as the data communication methods, while a transitional approach is recommended for CAD/AVL
Bus Tracker released to public August 5th, 2006

Example of Customer Feedback

“I just wanted to let the CTA know how much I like the bus tracking system on Route 20. I ride the Route 20 bus between Michigan Ave and Peoria St … I can now plan my return trip using the tracking system in the afternoon. I check the bus tracker online from my office and leave when the bus is approaching Peoria St. I now never have to stand in the rain, snow, or cold waiting for a bus. This is a great feature! Thanks.”

-- Pamela G

- Public use of website reached a steady state around 500 visits/weekday (~2.5% of #20 rides)
  - Variable message sign has been in continuous operation at the Madison & Jefferson stop
  - A slight increase in web traffic from November 2006 to December 2006 may be due to the colder weather.

- Insight into customer patterns of website usage
  - Users seem to prefer the predictions page
  - Most viewed stops: #1 – Madison/Throop; #2 – Madison/Laflin; #3 – Madison/Peoria

- Positive results in post-release customer survey of the #20 route
  - Perceived wait time at the Madison-Jefferson stop fell by a statistically significant 3.5 minutes to an average of 9.5 minutes. Since research has shown that customers value waiting time twice as much as travel time, this reduction in perceived wait time should increase customer satisfaction
  - Bus Tracker also positively impacted the customer ratings of knowing next bus arrival, reliability, wait-time satisfaction, and willingness to recommend CTA service.

* Data taken from the week 1/22-1/26
Procurement of the customer web information, BusTime, will provide the communications to complete the on-board platform as well as increases the level of service to bus customers with real-time arrival information.

**Customer Info - Alternate**
- SMS (text messaging)
- Bus Stop Signs
- Interactive Voice Response

**Customer Info – Website**
- Prediction Engine
- Customer Website

**Benefits**
- Improved Security
- Increased Ridership

**Computer-Aided Dispatch (CAD)**
- Components
  - AVAS - Automatic Voice Annunciation
  - APC - Automatic Passenger Counter
  - AVM - Automatic Vehicle Monitoring
  - Historical AVL Reporting (BLIS)

**Benefits**
- Improved Customer Information
- Service Quality Support
- Planning and Performance Mgmt Support

**Other Real-time Apps**
- Video (Security)
- Fare Collection
- On-bus Customer Information

**Real-time Databases (e.g., AVL, APC, AVM)**

**Real-time Network**
- Components
  - Mobile Access Routers
  - Cellular Services

**Benefits**
- Real-time network connectivity to every bus

**On-bus Intelligence and Post-service Analytics**
- Components
  - Prediction Engine
  - Customer Website

**Benefits**
- Decreased Wait Time
- Improved Perceptions
- Improved Security
- Increased Ridership

**Areas (size of box) denotes approximate size of investment**

- Past Investments
- 2007
- Late 2007 and Beyond
## AVL Planning Update
### Changing Customer Behavior

<table>
<thead>
<tr>
<th>Without Bus Tracker</th>
<th>With Bus Tracker</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Schedule-Based Relationship</strong></td>
<td><strong>Prediction-Based Relationship</strong></td>
</tr>
<tr>
<td><img src="image" alt="Schedule-Based Relationship" /></td>
<td><img src="image" alt="Prediction-Based Relationship" /></td>
</tr>
</tbody>
</table>

*Expectations will now be set by fundamentally different information -- perceptions of CTA service will be measured against a different standard*

### Implications

**Wait time at the bus stop is reduced:** Informed customers will not go to a bus stop until a bus is actually going to be there

**Denominator for service reliability is changed:** The static schedule was the best information available, now it will be a real-time prediction engine

**Frustration with service variability will be reduced:** Customers will spend less time waiting outside (inclement weather, safety, etc.), and not become agitated with CTA service if other routes run by a stop regularly
Our market segment for the Bus Tracker application is the set of highly connected riders that find themselves waiting longer than two minutes at a bus stop.
## AVL Planning Update

### Justification – Benefits Classification

<table>
<thead>
<tr>
<th>Benefits to Customers</th>
<th>Direct CTA Benefits</th>
<th>Future CTA Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits created by a real-time arrival prediction system experienced by customers.</td>
<td>CTA may see some revenue enhancements from the deployment of a web-based real-time arrival prediction system.</td>
<td>The entire real-time network investment has several benefits that are difficult to quantify and creates future options.</td>
</tr>
<tr>
<td>▪ Shorter Actual Wait Times</td>
<td>▪ Improved Customer Satisfaction</td>
<td>▪ CAD/AVL &amp; Communications Platform</td>
</tr>
<tr>
<td>▪ Shorter Perceived Wait Times</td>
<td>▪ Increased Ridership</td>
<td>▪ Remote Video Surveillance</td>
</tr>
<tr>
<td>▪ Increased Information</td>
<td>▪ Improved CTA Image</td>
<td>▪ Advanced Networking Capabilities</td>
</tr>
<tr>
<td>▪ Higher Perceived Reliability</td>
<td>CTA will be providing the same real-time location information to the Control Center and street supervision for the improvement of service</td>
<td>▪ Fare Collection Alternatives</td>
</tr>
<tr>
<td>▪ Reduced Wait-Time Anxiety</td>
<td></td>
<td>▪ Potential Web-Based Advertising Revenue</td>
</tr>
<tr>
<td>▪ Net Societal Benefits of Increased Mass Transit Usage (public benefit)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If we achieve a 3.8% adoption rate, the monetized customer benefit of reduced actual wait time will equal the CTA’s investment in the entire system*
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Justification – Breakeven Analysis

August 2006 FTA study

“Real-time Bus Arrival Information Systems Return-on-Investment Study”

Supports the concept of justifying the purchase of a real-time arrival prediction system by measuring the wait-time benefits for customers

Wait-Time Reduction Break-even Analysis*

If we achieve a 3.8% adoption rate, the monetized customer benefit of reduced actual wait time will equal the CTA’s investment in the entire system

* Assumptions

- Benefits modeled after FTA study
  - 7% discount rate
  - $11.20/hour USDOT time value estimate
- 10 yr useful life of field equipment and software
- 5 yr useful life of servers
- Re-investment in software in year 7
- Customer benefits vary by scheduled interval
- 75% cellular and MAR contract burden
- NPV based on 10 yrs of operation
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Justification – Sensitivity Analysis

Average Wait Time Reduction

- Average customer utilizing system is expected to save 2 minutes.
- FTA study utilizes a USDOT estimate of $11.20/hr for customer time value.
- If Bus Tracker shares MAR/Cellular infrastructure with another application - 50%.

Customer Time Value

- $7.20 for 1 min
- $11.20 for 2 min
- $15.20 for 3 min

MAR/Cellular Contract Burden

- 100%
- 75%
- 50%

Discount Rate

- 10%
- 7%
- 5%

FTA uses a 7% discount rate, 5% is the current 3 month T-Bill average (4.95%).
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Customer Demand – Feedback from Pilot

“Any chance that you will roll this out to the rest of your buses? As a new user of public transportation, I suspect this will increase the number of riders because of the convenience of checking arrival times.”
-- Michelle F

“Having spent many cold/wet/rainy moments waiting outdoors for buses, I always thought this would be great idea for the riders. I'm glad to see this is being tested out in the city. Keep up the good work!”
-- Matthew L

“I've lived in Chicago all my life and think this is a great idea. I would use it VERY often. I look forward to these trackers being put on other routes such as the 124, 157.”
-- Derek J

“I just wanted to let you know that I really like this system, and hope it will soon be able to be expanded to other bus routes and/or EL lines.”
-- Jared L

“I loved tracking the #20 but have moved... when will more bus routes be in the system? I would like the #60 to get tracked.”
-- Nathan M

“I often drive instead of taking the CTA on nights & weekends, because the inbound bus times are so unpredictable. This will allow me to use the bus and be on-time when going to meet people.”
-- John L