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Tech Brief

Improving Public Transit Schedules – Timetables People Can Actually Read

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SUMMARY

The New Jersey Department of Transportation (NJDOT) and New Jersey Transit Corporation (NJ TRANSIT) have initiated a project to identify deficiencies in reading and understanding existing bus transit schedules from a human factors perspective and develop alternative methods for presenting information more effectively. Through an approach that seeks to gain input and feedback from NJ TRANSIT staff, customers, and potential customers and explores the comprehensive body of research that has been conducted on reading and comprehending transit schedules, the research team developed two prototype schedules. Through the use of an innovative performance based evaluation, which compares the two prototypes to a selected existing schedule, the research team is able to quantitatively determine the effect of the proposed schedule modifications.

The study, entitled Improving Transit Schedules- Timetables People Can Actually Read, explores new methods for presenting the extensive amount of information contained in hardcopy bus transit schedules. A key finding of this research has found that while there are better methods for presenting specific features in the schedule, there were still a considerable number of errors in using both the existing as well as "improved" versions of the same schedule. It is concluded that the amount of information may simply be overwhelming and too complex and that NJ TRANSIT should undertake initiatives to reduce the amount of information on its schedules.

INTRODUCTION/BACKGROUND

Imagine that you need to take a bus to get to work. However, due to an unexpected change in your normal working hours or lack of familiarity with using the bus, you need to pick up a bus schedule, figure out when and where to catch the bus, and then wait at the proper location. You also need to carry enough change, which in most cases, must be the proper and exact amount. Using a schedule that is complicated, difficult to read and understand can make this a highly frustrating and downright frightening experience.

Operating over 200 bus routes, many with complicated patterns and schedules, and frequent changes, New Jersey Transit Corporation (NJ TRANSIT) recognizes that reading transit schedules can be stressful and frustrating and may actually deter potential customers. In its ongoing commitment to customer service, NJ TRANSIT, through the New Jersey Department of Transportation's Research Program, has initiated a project to: (1) examine existing literature and research in the area of reading and deciphering transit schedules and other similar forms of information; (2) determine how well NJ TRANSIT's current timetables serve both bus riders and non-bus users; (3) identify the major deficiencies in the current timetable design and (4) develop more effective layout schemes.

RESEARCH APPROACH

The study initially consisted of gathering available human factors and cognitive psychology research in the areas of reading, processing information and interpreting in text and graphical format and we found that several studies were conducted specifically in the area of transit schedules. Some interesting and relevant findings from the literature review that pertain to this project are summarized below:

- One study indicates that time point locations and time points should be displayed on the same axis. NJTRANSIT bus schedules display the time point location and time points on perpendicular axes, thus requiring the user to "flip" the schedule when looking for the arrival departure times for the corresponding location.
- Several studies indicate that the font size should be a minimum of 10 point. We found that in some instances the current NJ TRANSIT bus schedules employ less than 6-point font.
- One study indicates that the most effective timetable layout places the time point locations at the top and the time points below. The user then reads boarding and disembarkation times across. This practice is consistent with NJ TRANSIT bus timetable layouts.

In addition to a review of relevant research and literature, other transit agency schedule layouts were reviewed. The research team also conducted two customer focus group sessions to identify specific strengths and weaknesses as well as suggestions for improving the current schedule layouts for a selected route. Two prototype schedules were then developed based on the results of the literature as well as the focus groups. The existing schedule was then tested against each prototype using a quantitative performance evaluation in which subjects were given a series of written exercises and were then asked to use the timetables to answer questions. Typical questions included what time the subject would need to be at a particular location, where they would need to board the bus and expected arrival times. Responses were given orally and were recorded by the experimenter so as to minimize potential translation errors. Subjects were also asked to respond to a series of subjective questions to identify problems and timetable preferences.

FINDINGS

Performance error rates were alarmingly high both for the two prototypes as well as the existing schedule. The high error rate (performance based questions were answered incorrectly at least 50 % for the existing schedules as well as the prototypes) may be a strong indication that there is simply too much information on the timetable. Furthermore, in order to include the plethora of information and stay within the practical paper size limits, it was necessary to keep font sizes either right at or below than recommended minimums (the body of research recommends a ten-point font size minimum). Therefore, elimination of extraneous information would not only make the schedules less complicated and less intimidating, but would provide the opportunity to increase minimum font sizes.

Other key findings from the performance evaluation and subjective review are summarized below:

- Inclusion of zone information on the schedule and maps was helpful. This also corresponds to the overwhelming positive response in the subjective portion.
- Splitting the tables into morning/afternoon segments dramatically increases the error rate. It is recommended, therefore that NJ TRANSIT retain the current single table format.
- Application of zebra patterns (i.e. shading alternate columns) was not effective in improving the performance. However, there was a very clear preference for this type of display in the subjective responses.
- The directional format (having the “To” directions on opposite sides), which is consistent with the current schedule format, fared better overall than the weekend/weekday format (having weekdays on one side and weekends on the other). This is also consistent with the subjective rankings.
- Slanted labeling was preferable to the current vertical labeling. However, this feature was not specifically performance tested.

The overall error rate was high for the current schedules as well as the prototypes, suggesting that the task of using the bus timetable is difficult for a wide range of people.

RECOMMENDATIONS

The findings of the research were reviewed with the research team and were then culminated into a set of recommended changes to bus timetables. They include:

- Maintain weekday weekend timetables on the same side with the major destination point on opposite sides of the schedule.
- Maintain Map References

- Display the time point location names and time points so that they can be read together without rotating the schedule. This could be achieved by placing the location names at an angle.
- Display AM and PM timepoints in one table but distinguish the AM and PM periods.
- Include zone information on the table.
- Shade alternating columns so that they are more distinguishable.
- Reduce the overall amount of information on the schedule.

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<p>A final report is available online at http://www.state.nj.us/transportation/research/research.html</p> <p>If you would like a copy of the full report, please FAX the NJDOT, Bureau of Research, Technology Transfer Group at (609) 530-3722 or send an e-mail to Research.Bureau@dot.state.nj.us and ask for:</p> <p>Report Title: Improving Public Transit Schedules – Timetables People Can Actually Read</p> <p>NJDOT Research Report No: FHWA-NJ-2003-028</p>	