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DEFINITION OF PRACTICES FOR BUS TRANSIT ON-TIME PERFORMANCE: PRELIMINARY STUDY

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A survey was conducted to determine basic practices and attitudes concerning on-time performance in bus transit operations. Based on responses from 146 bus operators, it appears that there is wide variation in the definition of "on-time" performance, although a standard definition of no more than one minute early and no more than five minutes late would include the definitions employed by most systems. Determination of on-time performance appears to be a largely informal practice with little statistical basis. There is almost universal agreement that on-time performance is an important aspect of transit operations and there is strong support for research in this area.

In January, 1985, the Bus Transit Operations Committee (ALE01) of the Transportation Research Board discussed the potential need for research into standards and practices for on-time performance in bus transit. It was decided that before the topic was identified as a research need and a priority for committee consideration was established some preliminary investigation was appropriate.

The preliminary research need determined by the committee was to obtain answers to the following questions:

1. What do bus transit operators mean by "on-time performance"? It was accepted that the term usually describes a time period before and a time period after a scheduled bus arrival and/or departure time at a particular location, but that there is probably variation from operator to operator in the breadth of this "on-time envelope".
2. How do transit operators determine if they are operating "on-time"? Committee members were not generally aware of the methodologies employed

by operators other than from their own experience and whether these methodologies were systematic or casual.

3. How important is on-time performance to transit operators? While many transit operators discuss their own performance records, it is not known if they consider this particular performance parameter to measure something of significance or something of passing interest. Further, it is not known which aspects of overall performance, if any, would be expected to be affected by maintaining a good on-time record.

4. Would research in the area of on-time performance be of interest and value to the transit industry? While on-time performance may be of interest and significant to transit operators, it may not be a "researchable" topic or one that would have findings which would be transferrable among the different operations.

Methodology

This preliminary study was conducted through a voluntary survey of transit systems. The survey form as Appendix A was transmitted with a cover letter from TRB Executive Director Thomas B. Deen during July 1985. From August through October, 1985, 146 usable responses were received. A response was considered usable if it included most of the information solicited and was from a transit system operating fixed-route, fixed-schedule bus transit services. Responses from wholly demand response or rail-only systems were not included in the analysis.

No classification of respondents by fleet size or geographic dispersion was attempted, but a general review indicates that the respondents range from very small to very large, and are not concentrated in any one area of the country.

The 146 responses were tabulated and analyzed with the results reported below.

Defining On-Time Performance

As expected, transit operators define on-time performance as a bus passing or leaving a predetermined point along its routing within a time envelope which is no more than x minutes earlier and no more than y minutes later than a published schedule time. In a few cases this schedule point was the route origin, but most responses referred to specified points along the route. It was not specifically determined in the survey if the published time was published in a public timetable or only in driver instructions, but the implication from responses is that a public publication is most common.

Table 1 presents the tabulation of allowable time for early departure. It may be seen that up to 10 minutes early is allowed by respondents, but that nearly two-thirds of respondents allow no early departure within their definition. Over eighty percent of respondents allow no more than one minute early. No early departure is the most common standard. More than ninety percent of respondents allow no more than three minutes early within their standard. Excluding the nearly two-thirds of respondents who allow no early departures, seventy-five percent of the remaining respondents allow departures more than three minutes ahead of published schedule times.

Table 2 presents the tabulation of allowable time for late departures. Only fifteen percent of respondents have standards which allow less than three minutes for late departure, and only five percent allow more than five minutes. About eighty percent of respondents consider departures which

are three to five minutes behind schedule to be "on-time". Within five minutes is the most common (55%).

Combining the early and late departure allowances to obtain a total envelope gives the results shown in Table 3. Nearly ten percent of respondents allow no deviation from published times, with a slightly smaller number having a very broad standard of ten to twenty minutes. About two-thirds of respondents allow a performance standard of at least three minutes but not more than six. The most common (38%) standard is a five-minute envelope -- most of these are in the zero minutes early group.

Methods for Determining if Performance is "On-Time"

A wide range of methods for determining if buses are operating on-time were reported. Generally, it appears that most of these are casual observations by supervisory personnel. Very few respondents indicated a systematic, statistically based survey procedure. In some cases drivers were expected to report in real time (by radio) or in requesting relief from "unrealistic" schedules. Rider complaints were also listed as a method for determination.

As a corollary to determination of slippage in on-time performance, remediation generally followed a sequence of driver counseling (or discipline) followed by schedule or route revision if improved driver performance was not possible or sufficient.

TABLE 1
Early Allowance

Minutes	Number	Direct		Excluding Zero	
		Total %	Adj %	Number	Total %
0	93	63.6	64.1		
¼	1	0.7	0.7	1	1.9
½	4	2.7	2.8	4	7.7
1	19	13.0	13.1	19	36.5
2	8	5.5	5.5	8	15.4
3	7	4.8	4.8	7	13.5
4	3	2.1	2.1	3	5.8
5	8	5.5	5.5	8	15.4
10	2	1.4	1.4	2	3.8
Subtotal	145	99.3	100.0	52	100.0
No Response	1	0.7	-		
Total	146	100.0	-		
Median	0			2	
Mode	0			1	
Mean	0.9			2.5	
Std. Dev.	1.8			2.1	
Q ₁	0			1	
Q ₄	1			3.5	
N	145			52	

TABLE 2
Late Allowance

Minutes	Number	Direct		Excluding Zero	
		Total %	Adj %	Number	Total %
0	10	6.8	6.9		
½	4	2.7	2.8	4	3.0
1	4	2.7	2.8	4	3.0
2	4	2.7	2.8	4	3.0
3	27	18.5	18.8	27	20.1
4	9	6.2	6.3	9	6.7
5	79	54.2	54.7	79	59.0
7	3	2.1	2.1	3	2.2
10	4	2.7	2.8	4	3.0
Subtotal	144	98.6	100.0	134	100.0
No Response	2	1.4	-		
Total	146	100.0	-		
Median	5			5	
Mode	5			5	
Mean	4.1			4.4	
Std. Dev.	1.9			1.6	
Q ₁	3			3	
Q ₄	5			5	
N	144			134	

Importance of On-Time Performance

The survey question on importance of on-time performance was open-ended. An amazing similarity in choice of words for responses resulted. As shown in Table 4, only one respondent did not think on-time performance is important. Most respondents believe operating on-time is at least "very important" and ranged up to "critical" and "essential". Generally, these responses emphasized the marketing aspects of overall system reliability and credibility. Many respondents did note that other operating aspects, such as safety, are at least as important as being on time. Some respondents commented on a relationship between schedule reliability and operating costs, noting a possible reduction in standby operators and vehicles and overtime when operations reliably conform to schedules.

Need for Research in On-Time Performance

While a clear majority of respondents indicated that research into on-time performance would be beneficial (70% as shown in Table 5), a number do not believe that such would be worthwhile. Those responding negatively tended to cite other, more pressing research needs (principally in areas yielding direct cost reductions) and the possibility of externally imposed standards which might be the result of such research. There is a clear indication among the negative responses that on-time

performance is a localized problem and can and should be addressed solely by local initiative.

Among those responding affirmatively, there appears to be a correlation between the relative importance on-time performance is believed to have on marketing the service and the possibility research will yield procedures which will be transferable and adaptable. There may also be an overtone of those who feel that they do well wanting to know just how well they do compared to others so they can promote their own good performance to their riders. The converse may also be true.

Conclusions

There is wide dispersion within the transit industry as to just what constitutes on-time performance. There is consistency in the methodology of definition, but the parameters applied to that methodology vary widely. Within that variation, however, a potential standard which allows as much as one minute early departure and no more than five minutes late departure would include a large number of transit systems.

Determination of on-time performance is largely an informal process and performance reports are generally not based on systematic and/or statistically based analysis. At the same time, on-time performance is considered to be an important transit performance characteristic. The need for research in the area is not universally supported, particularly considering the felt need for assistance in direct cost reductions. However, there is strong support for such research.

TABLE 3
Total Envelope

Minutes	All Responses			No Early Allowance		
	Number	Total %	Adj %	Number	Total %	Adj %
0	12	8.2	8.3	12	12.9	13.0
½	1	0.7	0.7	1	1.1	1.1
1	2	1.4	1.4	1	1.1	1.1
1½	1	0.7	0.7	4	4.3	4.3
2	8	5.5	5.6	0	0.0	0.0
3	12	8.2	8.3	12	12.9	13.0
3½	2	1.4	1.4	0	0.0	0.0
4	9	6.2	6.3	4	4.3	4.3
4½	1	0.7	0.7	0	0.0	0.0
5	55	37.6	38.1	54	57.9	58.8
5¼	1	0.7	0.7	0	0.0	0.0
5½	1	0.7	0.7	0	0.0	0.0
6	17	11.5	11.7	0	0.0	0.0
7	7	4.8	4.9	2	2.2	2.2
8	4	2.7	2.8	0	0.0	0.0
10	9	6.2	6.3	2	2.2	2.2
20	2	1.4	1.4	0	0.0	0.0
Subtotal	144	98.6	100.0	92	98.9	100.0
No Response	2	1.4	-	1	1.1	-
Total	146	100.0	-	93	100.0	-
Median	5			5		
Mode	5			5		
Mean	4.9			4.0		
Std. Dev.	2.9			2.1		
Q ₁	3.3			3		
Q ₄	6			5		
N	144			92		

TABLE 4
How Important is On-time Performance?

	Number	Total %	Adj %
Not Important	1	0.7	0.7
Important	37	25.3	25.9
Moderate Importance	1	0.7	0.7
Very Important	50	34.2	34.9
Highly Important*	8	5.5	5.6
Extremely Important	12	8.2	8.4
Critical	7	4.8	4.9
Essential**	27	18.5	18.9
Subtotal	143	97.9	100.0
No Response	3	2.1	-
Total	146	100.0	-
Median		Very Important	
Q ₁		Important	
Q ₄		Extremely Important	
Mode		Very Important	

* Also: great importance; very high importance

** Also: most important; absolutely nothing more important; imperative; fundamental; vital; paramount; key; absolute importance; ultimate importance; primary importance

TABLE 5
Research Needed?

	Number	Total %	Adj %
YES	90	61.6	70.3
NO	38	26.0	29.7
No Opinion	18	12.4	-
Total	146	100.0	100.0

APPENDIX A: SURVEY INSTRUMENT

NAME OF TRANSIT SYSTEM:

IF YOU FIND THAT YOU ARE NOT OPERATING "ON-TIME",
WHAT DO YOU DO TO CORRECT THE SITUATION?

ADDRESS:

NAME OF PERSON COMPLETING SURVEY:

HOW IMPORTANT DO YOU THINK HAVING A HIGH "ON-TIME"
PERFORMANCE RECORD IS TO THE SUCCESS OF YOUR OPER-
ATIONS, AND IN WHAT SPECIFIC AREAS (MARKETING,
EMPLOYEE RELATIONS, COST CONTROL, ETC.) IS THIS
IMPORTANT? WHY?

TITLE:

TELEPHONE:

HOW DO YOU DEFINE "ON-TIME" BUS OPERATIONS?

DO YOU THINK THAT A SPECIAL RESEARCH FOCUS ON "ON-
TIME" PERFORMANCE BY THE BUS TRANSIT OPERATIONS
COMMITTEE OF THE TRANSPORTATION RESEARCH BOARD WILL
BE BENEFICIAL? IN WHAT WAY?

HOW DO YOU DETERMINE IF YOU ARE OR ARE NOT OPER-
ATING "ON-TIME" AS DEFINED ABOVE?

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