International Bus System Benchmarking:
Performance Measurement Development, Challenges, and Lessons Learned


Abstract

This paper reviews the development of a standardized measurement system for the purposes of benchmarking the performance of a group of major urban bus systems from around the world. The set of performance measures, known as Key Performance Indicators (KPIs), identifies bus systems who perform exceptionally in their operation. Developed from past benchmarking experience and a literature review, and modified based on member input, the KPIs provide a means of comparing performance and identifying best practice for the participating bus systems. Practical experience with the KPIs has identified a variety of challenges in collecting consistent and comparable data. Overcoming these challenges, producing comparable data, and conducting research to identify and understand the basis for good performance has been a process that offers lessons for other benchmarking efforts. This paper reviews (1) the principles of the group’s benchmarking process, (2) the performance measurement system’s process of development, (3) general issues with data collection and compatibility, and (4) some results of the benchmarking.
International Bus System Benchmarking:  
Performance Measurement Development, Challenges, and Lessons Learned

INTRODUCTION

This paper reviews the development of a standardized measurement system for the purposes of benchmarking the performance of major urban bus systems. The International Bus Benchmarking Group is comprised of 10 major urban bus organizations from around the world. The group has developed a set of performance measures, known as Key Performance Indicators (KPIs), to compare performance across the business. Developed from past benchmarking experience and a literature review, and modified based on member input, the KPI comparisons highlight organizations who perform exceptionally in their operation. Once these organizations are identified, case studies are undertaken so that the ‘best practices’ contributing to these high levels of performance can be shared among members of the bus benchmarking group.

Practical experience has identified a variety of challenges in collecting consistent and comparable data from the participants of the bus benchmarking group. Overcoming these challenges, producing comparable data, and conducting research to identify and understand the basis for good performance and the constraints and externalities impacting measured performance has been a process that offers lessons for other benchmarking efforts.

THE BENCHMARKING FRAMEWORK

History

RTSC, a transportation research group within the Centre for Transport Studies at Imperial College London, is involved in a number of international benchmarking projects. Since 1994, RTSC has facilitated the Community of Metros (CoMET) metro benchmarking group by providing research and analysis for the participating metros. Based on the interest generated by the CoMET group, a second metro benchmarking group, Nova was established in 1998.1

In 2004, an International Bus Benchmarking Group was founded to perform benchmarking for interested urban bus organizations from around the world. As of June 2006, the International Bus Benchmarking Group was comprised of a consortium of ten bus organizations: TMB (Barcelona), BVG (Berlin), Dublin Bus, KMB (Hong Kong), LBSL (London), EMT (Madrid), STM (Montreal), RATP (Paris), Trambus (Rome), and STA (Sydney). Together, these organizations manage over 25,000 buses transporting over 6 billion passengers each year.

The Benchmarking Process

The objectives of the bus benchmarking group are to:

- Establish a system of measures for internal management
- Use the system of measures to identify best practice
- Support decision making within the organizations
- Provide comparative information for senior management and government

Benchmarking is not merely a comparison of data or ranking of performance. The intention is to identify best practices in operations and management, stimulate productive “why” questions, and identify lines of inquiry for managers to pursue. Critical analysis is necessary to understand the constraints and external factors impacting performance and from this identify implementable results: best practices, information sharing, and potential strategies for management performance improvement strategy. In short, the group asks itself the following questions: who performs best? Can we learn from them? How much better can we be?
The characteristics of the benchmarking process are as follows:

- Standardized Key Performance Indicator (KPI) System,
- Case Studies consisting of in-depth research and analysis on specific issues,
- Clearinghouse Studies consisting of member-initiated studies of immediate interest,
- A strict Confidentiality Agreement to keep shared data within the group.

Annually, data is collected from each member of the benchmarking group according to precise definitions. A data model is then used to produce the KPI measures for performance comparisons. Organizations review trends and explain their performance. From the KPIs, topics for further study are identified.

**Case Studies**

Annually, the benchmarking group conducts two to four in-depth case studies, consisting of detailed research and analysis with the objective of providing a comprehensive and detailed analysis of the study topic. Case study topics may be identified from KPI findings that identify major differences between member organizations that justify more detailed examination or may derive from areas of particular concern. Final reports summarizing the research findings with an emphasis on practical lessons learned are distributed as a permanent resource for the use and benefit of the members.

**Clearinghouse Studies**

The clearinghouse study system is a mechanism used for quick response on issues of interest, frequently in response to questions from stakeholders or senior management. Any member organization can initiate a clearinghouse study. Examples of past studies include: fleet replacement strategies, smart card fare/ticket applications, advertising contracts, and many others.

**Sharing Experiences**

The benchmarking group typically meets twice a year, once to set the agenda for the coming twelve months and once to present and discuss the work that has been undertaken. These meetings also provide a forum for participants to share experiences and exchange information, as well as to visit the projects of the host organization. Informal discussion identifies common challenges, occasions discussion, and frequently leads to clearinghouse or case studies being conducted by the benchmarking group.

**Confidentiality**

The data provided for use within the benchmarking group is often sensitive, including labor, financial, and safety information. The guiding principle of data confidentiality is “complete openness within the benchmarking group, complete confidentiality to the outside”. All parties are obliged to adhere to an agreement that any information and reports made available outside the benchmarking group must be anonymized to protect proprietary information and data.

**DEVELOPMENT OF THE KEY PERFORMANCE INDICATOR (KPI) SYSTEM**

**Purpose and Principles of the KPI System**

The Key Performance Indicator (KPI) system is the basis for analytical measurement and direct comparison within the benchmarking group. The KPIs enable performance to be compared on a consistent and understandable basis between organizations. The KPIs are chosen to be comprehensive and yet concise. In addition, data is collected on an ongoing basis providing a time-series database that illustrates improving or declining performance. By using objective KPIs that are agreed upon by all member organizations, comparability of
business performance at an international level is achieved, identifying both best performance and high priority issues for other organizations.

The framework for the KPI system was developed based on the success dimensions identified in the Harvard Business School Balanced Scorecard model: Financial, Customer, Learning & Growth, and Business Processes (2). In addition to the four standard Balanced Scorecard Success Dimensions, it was decided that two other Success Dimensions should be included for bus benchmarking. Though overlapping both the Costumer and Internal Processes dimensions (the latter renamed from Business Processes), the importance of ‘Safety and Security’ was considered important enough to warrant its own dimension. Additionally, the importance of being environmentally–friendly was regarded as merit an independent success dimension for KPIs measuring the ‘Environment’.

KPI System Development

The objective of the KPI development process was to develop and agree on a unified set of indicators for measurement and comparison across the group. The KPI system was developed through a combination of means and sources of information, as shown in Figure 1.

FIGURE 1  KPI Development Process

While the above figure shows the initial development process, the KPI system also offers flexibility for change and evolution over time, and periodic reviews have changed both the KPIs and the relevant data items and definitions based on review and group member input. Some performance indicators have been adjusted or excluded due to the difficulties in obtaining adequate or comparable data.

Success Dimension Framework

In order to make the system specific to the bus industry, the six Success Dimensions were further divided into a number of Attribute Groups. The Success Dimensions are shown in Table 1 together with the Attribute Groups related to each.
**TABLE 1 Success Dimensions (Balanced Scorecard) and Attribute Groups**

<table>
<thead>
<tr>
<th>Success Dimension</th>
<th>Attribute Groups</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth &amp; Learning</td>
<td>• Growth</td>
<td>Measure changes in bus operation over time (Growth).</td>
</tr>
<tr>
<td></td>
<td>• Learning</td>
<td>Provide an indication of the strategic direction and ability of the company to modernize (Learning).</td>
</tr>
<tr>
<td>Customer</td>
<td>• Time</td>
<td>Measure aspects of the operation which are directly visible to customers.</td>
</tr>
<tr>
<td></td>
<td>• Service Quality</td>
<td>- Staff/Customer Care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Customer Satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Accessibility</td>
</tr>
<tr>
<td>Internal Processes</td>
<td>• Staff Productivity</td>
<td>Measure the efficiency of the organization in terms of its use of physical and labor assets.</td>
</tr>
<tr>
<td></td>
<td>• Asset Utilization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vehicle Reliability &amp; Availability</td>
<td></td>
</tr>
<tr>
<td>Safety and Security</td>
<td>• Safety – freedom from accidents.</td>
<td>Measure the degree to which the bus organization provides a safe and secure environment for:</td>
</tr>
<tr>
<td></td>
<td>• Security – freedom from crime.</td>
<td>- Customers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Non-users (e.g. motorists and pedestrians)</td>
</tr>
<tr>
<td>Financial</td>
<td>• Financial Efficiency – the level</td>
<td>Evaluate the financial performance of the organization in terms of:</td>
</tr>
<tr>
<td></td>
<td>of input required to provide a</td>
<td>- How well the expenditure is used to provide the service to passengers.</td>
</tr>
<tr>
<td></td>
<td>given level of output (capacity).</td>
<td>- How income is generated by means of fares, other commercial income and subsidy.</td>
</tr>
<tr>
<td></td>
<td>• Financial Effectiveness – how well</td>
<td></td>
</tr>
<tr>
<td></td>
<td>expenditures are used to provide the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>type of services which meets the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>needs of customers.</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>• Environmental</td>
<td>Evaluate the impact on the environment of the bus operation:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Consumption of natural resources: fuel, materials.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Pollution: vehicle emissions.</td>
</tr>
</tbody>
</table>

**Literature Review**

A literature review of multiple sources was conducted to identify other experiences in bus benchmarking and relevant standards and guidelines. Three primary sources provided much of the external basis for the bus benchmarking group KPIs: the EN13816 standard (3), the
work on bus transit performance evaluation by Fielding, Babitsky, and Brenner (4), and the EQUIP project report (5).

The European Committee for Standardization (CEN) EN 13816 standard was produced with the aim of promoting a quality approach to public transport operations, and to focus interest on the needs and expectations of customers. Areas of measurement based on the categories in the European Standard EN 13816 were integrated into the KPI system. In addition, many of the benchmarking group members are adopting this standard within their business.

The primary work on measuring the financial performance of bus public transport was identified as *Performance Evaluation for Bus Transit* (Fielding et al). Three areas of measurement for evaluating productivity and cost performance are identified in this work:

- **Cost Efficiency** – how efficiently an operator is able to provide a certain level of service (e.g. in terms of vehicle km) for a given cost. It does not relate to whether that service provides what customers require (or whether they use it). Therefore a service which is efficient, may not always be an effective service if that which is produced efficiently is not what is demanded (and therefore probably not consumed).
- **Cost Effectiveness** – relates the level of service consumption by customers to the cost of the service inputs.
- **Service Effectiveness** – relates to how effectively the service provided meets the need of customers.

The measures used by Fielding were reviewed and provided the basis for the financial efficiency and effectiveness KPIs.

The most comprehensive list of performance measures found during the literature review was that developed for the EQUIP project. The list covers all aspects of bus operations and was used to ensure coverage across all of the balanced scorecard areas by the bus benchmarking group KPI system.

**Lessons from Previous Benchmarking Studies**

There have been a few one-off international benchmarking studies related to buses. In general, these have largely focused on one of the following aspects:

- Describing the differences between bus operations in different cities in terms of the general city characteristics (such as population density and mode splits) and high-level characteristics of the bus services (e.g. load factors) (6).
- Specific comparisons to compare a particular characteristic (7) or to compare organizational structures (8).

These studies differ from the goal of the bus benchmarking group because they did not cover all aspects of bus operation, and were focused on answering specific questions rather than providing a framework for the identification of best practice. What these benchmarking studies do highlight however, are the significant difficulties in obtaining consistent and comparable data from different operators. These difficulties largely relate to three main areas:

- Problems with obtaining data from operators
- Differences in categorization between operators (e.g., cost allocation)
- Differences in definitions of specific indicators (e.g., service punctuality)

Part of the problems behind the difficulties with data comparability appear to have been due the fact that these were all 'one-off' studies with limited timescales. This did not allow for the processes to be refined once initial inconsistencies and data shortages were identified. It also does not enable trend analysis or identification of improvement or negative developments overtime.

**Summary of Member Bus Organizations’ KPIs**

As part of the Key Performance Indicator (KPI) development process, each bus benchmarking group member was asked to provide details of the performance measures currently used by
their organization; both internally and externally (to government or other stakeholders). These measures were then used as one of the primary inputs for the development of the proposed KPI system for the group.

The number of performance measures used ranges from around 20 in KMB (Hong Kong) and Trambus (Rome) to over 40 in LBSL (London) and STM (Montreal). Overall, the group members generally focus their performance measures on the Success Dimensions of ‘Customer’ and ‘Internal Processes’.

Within the ‘Customer’ Success Dimension, almost all organizations measure the degree to which the actual service they operated conforms to the scheduled service, both in terms of the vehicle km operated (reliability) and the on-time performance (punctuality). Within ‘Internal Processes’, common indicators include reliability and availability of the fleet as well as the proportion of the fleet used in the peak hour.

‘Safety’, when covered, is usually represented by ‘accidents per 10,000 vehicle km’, while ‘Security’ is almost never covered by the members’ performance measures. ‘Growth & Learning’ and ‘Environmental’ are the two Success Dimensions least covered within the performance measures of the group members. The greatest variation was found within the ‘Financial’ Success Dimension. Some bus organizations record a high number of financial performance measures, while others have comparatively few, in one case measuring only revenue performance and not measuring internal cost performance at all.

KEY PERFORMANCE INDICATOR (KPI) SYSTEM: DATA COLLECTION AND COMPARABILITY

The KPI measures are calculated from data items collected annually. Upon data being incorporated into the data model, initial comparisons are made. This process inevitably highlights possible discrepancies which require investigation. Issues with data collection and comparability span a number of areas of data. The following section highlights some of these areas and the general issues experienced during data collection. At a higher-level, the varying nature of the business of bus public transport can have some important impacts; these are discussed as well for their influence on data comparability.

KPI Data Collection Issues

**Service Outputs (Kilometers and Hours)**

The KPI system calculates output measures using both kilometers and hours, broken down in several ways. Within the KPIs, data is requested for total, deadhead, and revenue (i.e., “doors open”) kilometers and for total, deadhead, revenue, and layover (i.e., time between trips) hours. Both scheduled and actual data are requested as well, to enable measurement of actual vs. planned performance.

During the initial KPI data collection, it was found that not every organization collected all kilometer data. More importantly, the full range of hours data is only collected by approximately half of the members, though hours are generally recognized as being the primary cost factor for bus operation (9). In addition, organizations that still use manual methods for data collection had data that was generally less comprehensive and less accurate. Hours data especially tends to require investigation and follow up questions with the supplying benchmarking group members.
Labor Hours
Data requested for labor hours is divided between time spent on primary duties for major functional categories and paid time for other reasons, both work and non-work related. The labor data is used for labor productivity comparisons of several types. However, several organizations have labor structures, whether due to work requirements or compensation schemes, that limit the collection of comparable data. For example, TMB (Barcelona) pays drivers a flat fee for fare revenue turn-in, and the time expended for this duty is not tracked. Other organizations fail to distinguish between overtime hours for work (i.e., due to a late return to the garage) and overtime paid for statutory reasons such as weekend or holiday work. Overtime records are also questionable; for instance, one organization typically records and pays an hour of overtime for any driver more than 15 minutes late back to the garage.

Safety
Safety data availability and comparability vary considerably. One organization has very strict requirements for safety reporting with any vehicle scratch recorded. For passengers, the organization has drivers distribute a claim ticket that will give the passenger priority service at a hospital. For these reasons, reported vehicle and passenger accidents rates are considerably higher for this particular organization.

Service Quality
Very few common comparators were found across the member organizations in measuring service quality. While it was expected that more subjective indicators, in the areas of information, driver courtesy, comfort and cleanliness, etc, would vary, it was surprising to find little commonality in measurement of time-based performance.

Measurement of time-based performance is heavily influenced by the method of service operation. Many of the larger cities have much of their bus service operated on a frequency or headway rather than timetabled basis. Thus, such standard indicators as percent of trips on time are not recorded. Technology was a second important difference, with three of the benchmarking bus organizations fully equipped with AVL systems, which provide much better data in both quantity and quality.

Other indicators for measuring service to customers included lost kilometers - the most common data element recorded. But again, not all organizations record this data. Another common indicator, missed trips, is measured by only half of the bus organizations.

Capacity Normalization
In subsequent KPI development, it was decided that variation in vehicle size among the member organizations was influencing performance measures. Specifically, Dublin Bus, LBSL (London), and KMB (Hong Kong) operate fleets consisting largely of double-decker buses. A variety of comparisons considering passengers per vehicle and fuel consumption were therefore skewed by failing to consider vehicle size. Additional data collection on numbers of vehicles, kilometers traveled, and seated and total person capacities was carried out to improve KPI comparability.

KPI Data Comparability Issues
While data collection is an issue in terms of availability and definitions of the specific data items, the types of data that bus organizations generate and their comparability is impacted by a number of more strategic factors.

Financial Data and PPP Conversions
To perform international financial comparisons, the World Bank’s Purchasing Power Parity (PPP) figures are used to convert different currencies into common monetary figures and eliminate error relating to exchange rates, inflation, and growth over time. The PPP figures incorporate the relative purchasing power of different currencies over equivalent goods and
services by eliminating the differences in price levels between countries. However, they only cover overall national data. Conditions in major cities can be substantially different, with different labor prices and other factors. These will not be reflected in the PPP conversions, sometimes making the resulting financial measures appear lower than anticipated.

Outsourcing / Contracting
Outsourcing impacts data comparability among the members, requiring the collection or at least estimation of the resources used for common functions if comparability is to be worthwhile. Outsourced or contracted functions range from advertising, fare media production and sales, and advanced technology support / maintenance, to general and administrative support services. Productivity measures require comparable labor data across the bus organizations; outsourced or contracted labor time is thus requested for the KPI data.

Surprisingly, relatively few organizations appear to require productivity data or estimate resource needs for outsourced or contracted functions. Given the diversity in these activities across public transport organizations, high-level labor productivity studies and cost comparisons are impacted by weaknesses in comparability.

National Rules & Regulations
The impact of national laws and market conditions must be considered in understanding some of the data comparison results. Labor productivity is impacted by legal limits of work days and days per year. Taxation, medical and pension systems are also determined by national conditions. The variation from Europe on the one hand, where national governments provide almost universal public coverage for health and pension, to Asia or North America where businesses are responsible for comparatively modest benefits, has considerable impact on the costs of employment.

In addition, the intent of the measurement system must be considered. Value Added Tax (VAT) regimes are common throughout Europe, with passengers paying VAT for the fares they purchase. However, typically bus organizations leave the impact of VAT out of all accounting, including figures for fare revenue. The questions this poses are: is the measurement system supposed to look at fare revenue that the bus organizations are collecting as income? Or the money that passengers in each city have to pay for their fares (for instance as a percentage of average wages)? Depending upon the purpose of the benchmarking analysis, either figure may be appropriate.

Technology & Data Retrieval
The continuing development of technological tools and databases continues to provide new resources for collecting information. Over time, there have been significant improvements in the quantity, accuracy, and availability of data, significantly improving the benchmarking. At the same time, however, continuous software changes and updates have created challenges in accessing legacy data for trend analysis, which quite often limits data history when time-series data is required.

Business Environment
Competition, regulation, and corporate structure are changing the responsibilities and functions of bus organizations. Restructuring can impact financial and performance data, including such items as infrastructure ownership and property rents, cost allocation among functional units, and commercial income. Externally, a parent transport agency or authority may also assume responsibilities common to other bus organizations, such as responsibility for bus stop and shelter upkeep. Functions such as advertising or fare media production, distribution, and sales may also be performed by a separate party, limiting the bus organization’s access to data requested in the benchmarking process and impacting data availability and comparability.
RESULTS AND LESSONS LEARNED

Results of the KPI Development Process

While many factors impact the comparability of international performance measures, the KPI measures frequently demonstrate differences that are clear in identifying best performers. The data comparisons still enable further research to understand and disseminate best practices, without the need for perfect data comparability. A typical KPI is that shown in figure 2, which displays the percentage of fleet used in peak service for some of the benchmarking bus organizations.

FIGURE 2  Fleet in Use During Peak (%)

Alternatively, KPI data can be shown in different ways. Key to this is testing various methods for evaluating the data collected; ‘choosing the right denominator’ can by crucial in normalizing for different types of bus operations and in comparing across the different urban environments.

FIGURE 3  Passenger Boardings and Passenger Kilometers 2005 (millions)
Both passenger boardings and passenger kilometers are data items that are part of the Growth success dimension of the KPIs. Contrasting the two measures can demonstrate additional information, as shown in Figure 3 for the year 2005. Bus organizations in Dublin, Hong Kong, and Sydney have relatively longer passenger trips than Berlin, London, or especially Paris. This customer utilization of the bus services has consequences for operations and planning of bus service in each city.

Other measures involve the use of data that is anonymised for confidentiality. Figure 4 shows the results of a the KPI collecting for absenteeism of bus drivers. Though absenteeism is largely a product of work place rules and culture, trends or changes in performance that may provide lessons learned for other bus organizations are evident.

![FIGURE 4 KPI Driver Absenteeism (%)](image)

The KPI results can be used to provide internal motivation within an organization, proving that things can be done better. Studies and sharing of experiences provide information for the member organizations. For this purpose, variations in data accuracy are generally minor and immaterial.

**Conclusions on the Benchmarking Process**

Benchmarking is a long term process. Continuous development in performance measurement is necessary, both to ensure KPIs are relevant and to continuously improve data definition, collection, and comparability. In general, the first two years of the bus benchmarking group have focused on improvement in the definition and comparability of the KPI data. It has taken much effort to achieve a comprehensive and comparable set of performance measures with consistent data. Analysis of comparative performance in some cases has identified external factors or managerial polices and procedures as the primary factors in explaining performance; in other cases, data has been found to be reported to differing definitions and has been revised.

The results of the benchmarking to date have focused on success in each success dimension in turn. No one organization is the best – or even second best – in all business areas. Some key findings from the KPI analysis include:

- Only one of the member bus organizations has reduced real unit costs over the least five years. In addition, this organization also increased ridership while reducing
revenue hours and kilometers. Other organizations, however, attribute increasing unit costs to the increasing complexity – and hence cost – of providing increasingly higher-quality bus service.

- Several organizations have seen ridership increases greater than any increases in revenue kilometers. However, these organizations are also witnessing increases in revenue hours greater than any increases in revenue kilometers (i.e., reduced commercial speed). This has contributed to support for case studies in the fields of service control and bus priority as the bus organizations assess how to influence their external operating environment.

- Staff training has generally been increasing. Organizations must train staff on new technology, and are also seeking to improve customer relations and safety. The overall, long-term results of this increased investment in “human capital” remain to be seen, though isolated examples are positive. On the other hand, the increased outsourcing of more technically complex tasks (i.e., IT support, fare systems maintenance) is reducing training needs for the technical staff of several organizations.

- Vehicle availability and use in the peak has been improving for most bus organizations. This is attributed to increases in vehicle reliability and the maturing of several technologies, as well as significant fleet investments lowering the average fleet age for many organizations.

Now that the group has started a third annual phase, it is expected that best practices will be identified and shared with increasing ease and to greater benefit from the KPIs. However, just as important to member organizations is being able to understand – and explain – their reasons for relative performance. This understanding is key in international comparisons, due to the variation in practices and regulations in many areas. Additionally, the members have also benefitted from the other aspects of the benchmarking, sharing information through the in-depth case studies and the multiple clearinghouse studies commissioned.

Comparing the Bus Benchmarking Project

Within the United States, the largest depository of information is the Federal Transit Administration’s National Transit Database. The published reports and databases make available a considerable amount of data; however, the NTD is not specifically designed for comprehensive performance comparisons across the transit industry, though it is used extensively for this purpose. Several important areas lacking from the published NTD information include data on capacity provision (i.e. passenger space (seat/stand) miles) and subcontracted or outsourced labor and costs, while safety & security data (which is collected under a separate process) is not published.

The Transit Cooperative Research Program (TCRP) Report 88, “A Guidebook for Developing a Transit Performance-Measurement System” provides a comprehensive summary of performance measures possible for all aspects of public transport. Also profiled are experiences from the U.S. and around the world on implementation and use of performance measurement systems at sample organizations. Most of the International Bus Benchmarking Group’s KPIs can be found within the list of almost 400 measures (10). However, the guidebook does not provide specific definitions for the data measures. Development, agreement on, and adherence to the data item definitions has been a considerable part of the work of the international bus benchmarking group.

REFERENCES


