

United States Water Utility Performance Assessment

Abstract

By Linda L. Paralez, Ph.D.

This report describes the status of performance assessment techniques in water utilities and provides input to an international report.

The author discusses the analysis and processes employed to gather data using a custom water utility survey, then contrasts the methods used and survey results with those of the Governmental Accounting Standards Board survey (GASB). The use of standardized procedures for performance assessment, the use of performance indicators and ISO 9000, and the cost of implementation of performance indicator systems are also addressed. Data quality control, the accessibility and use of performance measures both internally and externally, and influencing factors and trends found from the custom survey results are considered in relation to the GASB survey.

To conclude, the report addresses several aspects of performance assessment systems that need improvement and identifies key issues that can maximize the cost effectiveness of these systems.

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Overview

The objective of this National report is to provide the basis and input to an International Report on the current status of the application of performance assessment techniques to water supply and wastewater systems.

Sources of data used to compile this report include:

- First, a custom survey, referred to here as the Water and Wastewater Utility Survey (WWUS), designed around the objectives of this national report, was sent electronically to 560 water and wastewater utilities in all 50 of the United States. Response rate was small – 5% (29 respondents) to date – prompting additional research to augment the findings from that survey.
- Second, contextual correlation of the findings of this custom survey with those of 1998-99 research sponsored by the Government Accounting Standards Board (referred to as the GASB survey) of state and local governments about how and why these governments are using performance measures.¹ By extension, the prevalence and maturity of performance measures in state and local governments can be expected to influence the development of performance assessment at those water and wastewater utilities that are governed by these same entities.
- Third, the case study profile information is provided from information gained through benchmarking studies conducted by the Western Regional Water Utilities Benchmarking Group (referred to as the WRWUBG)² over a five-year period, facilitated by the author.

¹ Additional information about the GASB's research on service efforts and accomplishments and performance measurement can be obtained at the Performance Measurement for Government web site (www.seagov.org) or by contacting Wilson Campbell at wscampbell@gasb.org or 203/847-0700, ext. 228.

² WRWUBG is a consortium of water utilities that design and participate in process and metric benchmarking studies. Member participants have included: Seattle Public Utilities, Tacoma Water Department, Portland Bureau of Water Works, San Francisco Water Department, San Francisco PUD, East Bay Municipal Utility District, Alameda County Water District, Contra Costa Water District, Las Vegas Valley Water District, Long Beach Water Department, Los Angeles Water and Power Department, Metropolitan Water of Southern California, Irvine Ranch Water District, San Diego Water Department Eastern Municipal Water District, and Tucson Water Department.

Introduction

Assessing performance is not new. In 1938, International City/County Management Association issued *Measuring Municipal Activities*, suggesting various types of information that local governments might use to monitor and assess local services and how well these services were being delivered (ICMA, 1999). About 10 years later, Japan, with the help of the late Dr. W. Edwards Deming started its quality journey with benchmarking and statistical process control as the cornerstone of its rebuilding after World War II (Walton, 1986).

Some 50 years ago, at the federal level, the Hoover Commissions, worked successfully to streamline a federal government grown too large and too disorganized because of the combined impact of the Great Depression and then World War II. Today, we have Reinventing Government, supported by a series of legislative initiatives at the federal and state levels such as the 1993 Government Results and Performance Act to streamline the respective governments to work better.

During 1998 and 1999, GASB researchers conducted intensive interviews in 26 state and local governments across the country in order to learn how and why these governments are using performance measures and to understand the effects of those measures on the decision-making process. Correlation of the overall results of the GASB survey findings of the prevalence and use of performance measures in local, county, regional and state government entities compares well with the findings from the specific water and wastewater utility survey.

Since water and wastewater utilities are subsets of many of these larger government entities, we would expect some consistency of findings (see Table 1). Six of those case studies, released in April 2000, are relevant contextual comparisons of data for this survey of water and wastewater utilities. Those six include: Seattle, Washington; Austin, Texas; Houston, Texas; Richmond, Virginia; Milwaukee, Wisconsin; and Long Beach, California (see Table 5).

National status

The analysis of the water and wastewater utility survey (WWUS) results provides the basic data for framing conclusions on the national status of performance assessment work among water and wastewater utilities in the United States. This questionnaire sought information via an electronic survey from water and/or wastewater utilities across the United States about:

- whether they have developed performance measures,
- what their expected advantages are from undertaking this performance assessment work,
- the extent to which these performance indicators are used for decision-making purposes, and by whom,
- what types of quality control and reliability assessment are they are using, and
- to whom these measures are being circulated and reported.

The WWUS survey instrument was sent electronically to 560 entities, identified through the American Water Works Association. Responses were received from 29, or 5%. Of those responding, 55% indicated they have developed some type of performance measures (See Table 1).

Of those that do have some type of performance measures, those factors most frequently cited as a necessary or absolutely essential requirement of utilities investment in performance assessment measurement were:

- 75% indicated that improved process performance (efficiency and effectiveness) of the utility
- 63% indicated improved customer service performance
- 56% indicated enhanced operational decision-making
- 50% indicated financial performance
- 50% indicated greater management/leadership accountability
- 38% indicated improved strategic planning.

Of the utilities responding, 38% fall into a medium size category, serving a population size of 10,000 to 100,000; 42% serve large to very large populations (see Table 2). In contrast, the GASB survey sought information from 26 state and local governments across the United States about whether they have developed performance measures, whether they are using them for decision-making purposes, what types of performance measures they are using, what aspects of management these measures are being used for, to whom they are being reported, whether measures are being verified, specific programs for which performance measures are being used, whether the use of performance measures is required, and whether entities are planning to continue or begin using them in the future.

Table 3 shows the contrast of findings between the GASB survey at the state and local government level against the WWUS responses on those questions that match. While there is an almost identical prevalence of the existence and use of performance measures, it appears that utilities have a slightly higher preference for using these measures in decision-making and strategic planning than government respondents.

Lessons-learned from the WRWUBG data

Performance measurement only gathers data and just measuring something does not improve it. Performance measurement is a planning, an improvement, or management tool. Using the data is a key element of effective investment in performance assessment work. Lessons-learned from the five-year benchmarking research effort of the WRWUBG maintenance studies revealed some universal challenges among participating utilities in use of data.

WRWUBG members learned that those that gather the data don't necessarily use the data. Findings from five component surveys asked participants to what extent labor make decisions about whether to repair or replace failed components in the field, and then asked a companion question about to what extent labor have access to the historical data about the performance and maintenance of that component. All respondents indicated routine, disciplined data collection about activity performed on components (Table 4).

These results led to a search for a comparison among participating utilities for promising practices in the use of field incident data (maintenance, repair, refurbishment, etc.) as part of a whole performance picture. Indicators such as mean time before first failure, mean time between failures (repairs), and mean time before replacement or refurbishment for each of the components studied were identified as desirable performance and planning indicators. With the

exception of pumps and drivers, the data for these indicators for other components was difficult for WRWUBG members to provide, including mean time before first failure (measured from date of installation to date of first repair). Reasons given were primarily the lack of data accessibility, indicating that these data are not commonly used for planning or analysis. Our interviews with engineering and planning groups at several participating utilities confirm that use of field data is rarely used in creating models for replacement, selection of materials, or systems design. From the planning perspective the field data is probably most useful to the field crews – who, according to the field responses believe the data is primarily collected for the benefit of engineers and systems designers.

Improvements have been made as a result of this research. In several utilities, the implementation of Maintenance Management Information Systems to manage work flow and work order control has also provided an opportunity to both access and analyze the history of maintenance and repair on a given component or area of the system before making decisions about repair versus replace or refurbish. This information is now becoming more useful to engineering for longer-term systems planning as well. Performance data about the component, the system, processes within the system, work groups, crews, and so forth are also more feasible with automated access and manipulation³. Several of these participating utilities are using this information as a springboard to begin the development of strategic asset management plans (Paralez and Muto, 2001).

Use of standardized procedures for performance assessment

Respondents to the WWUS that have performance measures indicate that these measures are “typically,” “often,” or “always” used by:

- 69% the undertakings (those who create the measures),
- 50% the policy making entities
- 25% the regulators
- 25% the financial agencies
- 25% the customers
- 6% and finally, the international agencies.

Comparatively, at the GASB study level outcome measures are reported:

- 25% to internal management
- 24% to elected officials, and
- 21% to citizens and the media.

The use of performance indicators and ISO 9000

In the water and wastewater utility survey, a full 100% of respondents indicated no use of the ISO 14000 environmental standard, and 90% indicated no use of the ISO 9000 quality standard for any aspect of the water or wastewater utility operation. Respondents were also asked to rate the extent to which their performance measures are used in implementing the ISO 9000 or 14000 framework as a standard for any aspect of the water or waste water utility operations, for which 56% indicated these standards are never used, and 19% indicated they are used on an as-needed basis for critical programs and activities.

³ WRWUBG SPU, Tacoma, East Bay MUD, Portland, Alameda, San Diego

The cost of implementation of performance indicators systems

Among WWUS respondents that indicated they have established performance measures some 69% indicated that the cost of the implementation of the performance indicators system matched the planned budget for implementing the system. Another 13% said the cost exceeded the budget every year of the implementation.

The technical and social investment for implementing the performance indicators system exceeded or significantly exceeded expectations for 75% of WWUS respondents. Only 13% said that the technical and social investment of implementing these performance indicators matched expectations. The GASB survey did not measure a comparison factors for cost of implementation.

Data quality control

Current performance indicators are subject to routine data quality control procedures at responding water and wastewater utilities “typically” to “always” for 44% of the respondents. For 13% of respondents, quality control procedures are never applied. Another 25% apply quality control procedures on an as-needed basis for critical measures, programs and activities, and 19% make quality control a standard procedure of numerous measures, programs and activities for WWUS respondents.

The GASB survey asked participants to indicate whether the performance measures they used were subjected to some type of verification process and to describe the type of verification and who performed it. Of the GASB respondents using performance measures, 53% said they were subjected to some type of verification process.

Internal acceptability and use

When asked to indicate the extent to which the performance measures have internal acceptability and use, 63% of WWUS respondents noted that performance assessment information is circulated within the utility “typically,” “often,” or “always.” Otherwise this information is circulated primarily on an as-needed basis (31%).

When asked to indicate the extent to which the performance measures have internal acceptability of the results by the staff, 56% of WWUS respondents noted that this is true “typically,” “often,” or “always.”

When asked to indicate the extent to which the performance measures have practical use of this information, 56% of WWUS respondents who have performance measures noted that this is true “typically,” “often,” or “always.”

Reporting and external results accessibility

Circulation of performance assessment information outside the utility in the scope of regulatory or contract requirements is “typically,” “often,” “always,” circulated by 13% of the WWUS respondents who have performance indicators. This information is circulated on an “as-needed” basis for critical programs and activities by 75% of respondents.

Customer information is “typically,” “often,” “always,” circulated by 19% of the WWUS respondents who have performance indicators. This information is never circulated by 63% of respondents who have performance measures.

Benchmarking initiatives are “typically,” “often,” “always,” circulated by 25% of the WWUS respondents who have performance indicators. This information is circulated on an “as-needed” basis for critical programs and activities by 63% of respondents.

Influencing factors and trends

Of the 270 responding to the GASB survey stating that they are required to use performance measures, 90% of those required to use performance measures currently do so. This means that 10% of those that are required to use performance measures are not presently using them. Another 178 (20% of all of those responding) are using performance measures but are not required to do so by law, ordinance, or policy. State departments are more frequently required to use (and do use) performance measures, with 93% -- 61% of all state departments responding-- of those that are required to use performance measures actually using them. For municipalities, 81% of those that are required to use performance measures are doing so; the number for counties is 97%.

Conclusions

Based on the results of the water and wastewater utility questionnaire compared with the findings from the GASB survey of local and state governments on the development, use, and reporting of performance measures, the primary indication is at least among those responding that there is a slight majority using performance measures now, with 55% and 53%, respectively, saying they are using them in some way. Additionally, of those that have performance measures, 47% (WWUS) and 58% (GASB) report using those measures for decision-making.

But the gap between those who *have* performance measures and those who *use and report* them is apparent from both sets of data, and is supported by the case study benchmarking. In the GASB there were 421 that use performance measures and 216 that report them to elected officials, a difference of 205 (23% of those responding) and 25% report outcome measures to internal management. In the water and wastewater utility survey, 44% of the utilities indicate that their measurement efforts don't enjoy practical use, or aren't accepted by the staff.

When it comes to circulation of the information, performance assessment information for utilities is typically circulated on an “as-needed” basis only. For those with performance indicators, customer information is “never” circulated externally by 63% of WWUS utility respondents. Finally, information from benchmarking initiatives, which can be a key basis of learning, is only typically circulated externally by 25% of WWUS utilities responding.

This appears to indicate a reticence on the part of many of those responding to proceed with the reporting of this information about some of the essential aspects of utility or government performance.

While it is becoming more common for utilities to have performance measurement systems in place, the use access and sharing of the information could be significantly improved. The areas

that appear to be common shortcomings as identified in this research that should be actively integrated into the use and implementation of performance assessment systems include:

- those that gather the data should be those using the data
- field staff (labor) should be involved in both gathering and using data; i.e., maintenance repair, refurbishment decision-making
- increase the distribution and understanding of performance data
- system integration; i.e., Maintenance Management Information System implementation
- maximizing data availability and use should be emphasized
- appropriate Quality Control should be applied to all data
- increasing the acceptability and practical use of information

In summary, much progress has been made to date by utilities, supported it seems by the efforts at the local and state government level. Maximizing the return on investment in performance assessment systems can occur by actively addressing and considering the issues identified above.

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Tables

Table 1 Comparison Utility/Government Entity		
Responses		Has your utility undertaken any performance assessment work that includes establishing and using performance indicators?
GASB: Have you developed some type of performance measures?		
53%	yes	55%
47%	no	45%

Table 2 2001 Water Wastewater Utility Performance Assessment			
system size	population size	number of utilities responding	percent
small	<10,000	2	7%
medium	10,000 to 100,000	11	38%
large	100,000 to 150,000	6	21%
very large	>150,000	6	21%
	unknown size	4	14%
total		29	

Table 3 Comparison of		
Facto	GASB Survey US State Local	Water and Utility Survey in
Number	500	560
Number	900	29
Response	18	5%
Percent that have	53	55
Percent that use measures for strategic	28	38
Percent that use measures for decision	47	56

Table 4 WRWUBG Findings on Collection and Use of Field Data

Component Studied	Utilities with formal, well documented processes where team leaders on the crew have access to all performance data	Utilities with formal, well documented processes where team leaders on the crew have decision-making authority	Utilities with, well documented processes where team leaders on the crew make decisions to rebuild or replace assets during maintenance work
Pressure Reducing Valves⁴	(1 of 7) 14%	(4 of 7) 57%	(4 of 7) 57%
Hydrants	(2 of 10) 20%	(8 of 10) 80%	(6 of 10) 60%
Pipes	(2 of 12) 17%	(6 of 12) 50%	(4 of 12) 33%
Line Valves	(3 of 9) 33%	(6 of 9) 66%	(6 of 9) 66%
Meters	(4 of 7) 57%	(6 of 7) 86%	(5 of 7) 71%

⁴ Western Regional Water Utilities Benchmarking Group, April 1998 report

Table 5 Six City Comparisons⁵

	Seattle	Richmond	Milwaukee	Long Beach	Houston	Austin
Government Performance Project 2000 Report Card	B	C+	B	B	C+	A-
Human Resources	B	C	C+	C	C	A-
Financial Management	B+	B	B+	A-	B+	A
Information Technology	B	C	B-	B	C-	B
Capital Management	B+	C-	B+	B	B-	A-
Managing for Results	B	C+	A-	B-	B-	A-
2001 Water Wastewater Utility Performance Assessment Survey						
size	large	very large	very large	large	very large	very large
establish & use perfm indicators?	yes	yes	no	yes	yes	yes
Expected advantages that are necessary or absolutely essential:						
customerservice improvements:	yes	yes	-	no	yes	yes
improved financial performance	yes	yes	-	no	no	yes
improved process performance	yes	yes	-	yes	yes	yes
greater management accountability	no	yes	-	yes	no	yes
improved strategic planning	yes	yes	-	yes	no	no
Extent perf. Indicators are typically, often or always used by						
the undertakings	yes	yes	-	no	no	yes
policy making entities	no	yes	-	yes	no	yes
regulators	no	no	-	no	no	yes
financial agencies	yes	no	-	no	no	yes
customers	no	no	-	no	yes	yes
international agencies	no	no	-	no	no	yes
Do you use the ISO 14000 framework as a standard for water or waste water utility operation	no	no	no	no	no	no
Do you use the ISO 9000 framework as a standard for water or waste water utility operation	no	yes	no	no	no	no
The extent to which current performance indicators are typically to always subject to routine data quality control procedures	yes	no	-	no	no	yes
Indicate the extent to which the performance measures typically to always enjoy internal acceptability and use by...						
perf. assessmnt info circulated w/h the org	yes	yes	-	yes	yes	yes
acceptability of the results by the staff	yes	yes	-	yes	no	yes
practical use of this information	yes	yes	-	yes	no	yes
Reporting and external results that are typically to always accessible...						
Circulation of perf. assessmnt info outside the org in the scope of regulatory or contract requirements,	yes	no	-	no	no	yes
Customer information	no	no	-	no	yes	yes
Benchmarking Initiatives	no	no	-	no	no	yes

⁵ Government Accounting Standards Board’s State and Local Government Case Studies: The Use and the Effects of Using Performance Measures for Budgeting, Management, and Reporting.