Awwa Research Foundation

Consortium Benchmarking Methodology Guide

Project #2621A

Subject Area:
Efficient and Customer-Responsive Organization

Consortium Benchmarking Methodology Guide

About the Awwa Research Foundation

The Awwa Research Foundation (AwwaRF) is a member-supported, international, nonprofit organization that sponsors research to enable water utilities, public health agencies, and other professionals to provide safe and affordable drinking water to consumers.

The Foundation's mission is to advance the science of water to improve the quality of life. To achieve this mission, the Foundation sponsors studies on all aspects of drinking water, including supply and resources, treatment, monitoring and analysis, distribution, management, and health effects. Funding for research is provided primarily by subscription payments from approximately 1,000 utilities, consulting firms, and manufacturers in North America and abroad. Additional funding comes from collaborative partnerships with other national and international organizations, allowing for resources to be leveraged, expertise to be shared, and broad-based knowledge to be developed and disseminated. Government funding serves as a third source of research dollars.

From its headquarters in Denver, Colorado, the Foundation's staff directs and supports the efforts of more than 800 volunteers who serve on the board of trustees and various committees. These volunteers represent many facets of the water industry, and contribute their expertise to select and monitor research studies that benefit the entire drinking water community.

The results of research are disseminated through a number of channels, including reports, the Web site, conferences, and periodicals.

For subscribers, the Foundation serves as a cooperative program in which water suppliers unite to pool their resources. By applying Foundation research findings, these water suppliers can save substantial costs and stay on the leading edge of drinking water science and technology. Since its inception, AwwaRF has supplied the water community with more than $300 million in applied research.

More information about the Foundation and how to become a subscriber is available on the Web at **www.awwarf.org**.

Consortium Benchmarking Methodology Guide

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FOREWORD

The Awwa Research Foundation is a nonprofit corporation that is dedicated to the implementation of a research effort to help utilities respond to regulatory requirements and traditional high-priority concerns of the industry. The research agenda is developed through a process of consultation with participants and drinking water professionals. Under the umbrella of a Strategic Research Plan, the Research Advisory Council prioritizes the suggested projects based upon current and future needs, applicability, and past work; the recommendations are forwarded to the Board of Trustees for final selection. The foundation also sponsors research projects through the unsolicited proposal process; the Collaborative Research, Research Applications, and Tailored Collaboration programs; and various joint research efforts with organizations such as the U.S. Environmental Protection Agency, the U.S. Bureau of Reclamation, and the Association of California Water Agencies.

This publication is a result of one of these sponsored studies, and it is hoped that its findings will be applied in communities throughout the world. The following report serves not only as a means of communicating the results of the water industry's centralized research program but also as a tool to enlist the further support of the nonmember utilities and individuals.

Projects are managed closely from their inception to the final report by the foundation's staff and large cadre of volunteers who willingly contribute their time and expertise. The foundation serves a planning and management function and awards contracts to other institutions such as water utilities, universities, and engineering firms. The funding for this research effort comes primarily from the Subscription Program, through which water utilities subscribe to the research program and make an annual payment proportionate to the volume of water they deliver and consultants and manufacturers subscribe based on their annual billings. The program offers a cost-effective and fair method for funding research in the public interest.

A broad spectrum of water supply issues is addressed by the foundation's research agenda: resources, treatment and operations, distribution and storage, water quality and analysis, toxicology, economics, and management. The ultimate purpose of the coordinated effort is to assist water suppliers to provide the highest possible quality of water economically and reliably. The true benefits are realized when the results are implemented at the utility level. The foundation's trustees are pleased to offer this publication as a contribution toward that end.

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Projects of this nature depend heavily on utility participation to be successful. Only with the significant involvement of utility practitioners can we be certain that this research is relevant and useful to AwwaRF participant needs.

The authors of this report gratefully acknowledge the participation of the following organizations: Azurix/Phillip Utilities Management Corporation, City of Akron, City of Kissimmee, City of Phoenix, City of San Diego, City/County of San Francisco PUC, City of Santa Rosa Utilities Department, City of Tucson, City of Winnipeg, Colorado Springs Utilities, East Bay Municipal Utility District, EPCOR (Edmonton), Honolulu Board of Water Supply, Irvine Ranch Water District, King County-Wastewater Treatment Division, Las Vegas Valley Water District, Maui Board of Water, Memphis Light-Gas-Water, Regional Municipality of Ottawa-Carleton, Saint Paul Regional Water Services, Salt Lake City, San Antonio Water Services, Seattle Public Utilities, Washington Suburban Sanitary Commission.

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EMA researchers for the AwwaRF "Best Practices for Energy Management" project included Jack Jacobs, principal investigator and project manager, with support from Terry Brueck, Tom Kerestes, Rick Riddle and Cal Rooker, and additional research assistance from Linda Paralez, Ph.D. (Demarche Consulting Group, Inc.).

Consortium Benchmarking Methodology Guide is one of two reports completed as a part of the "Best Practices for Energy Management" study.

EXECUTIVE SUMMARY

This benchmarking methodology guide is part of a consortium study "Best Practices for Energy Management," conducted through AwwaRF's tailored collaboration research program. A consortium of water and wastewater utilities used a benchmarking approach to discover best practices for energy management. This document summarizes the consortium benchmarking methodology used for the "Best Practices for Energy Management" study and provides guidance for conducting future benchmarking studies.

This guide presents benchmarking concepts, looks at some current approaches to consortium benchmarking in water and wastewater utilities, and presents the methodology employed for the "Best Practices for Energy Management" study. This guide concludes with recommendations for improving the methodology and using it for future water industry consortium benchmarking projects.

This guide includes:

- Benchmarking Concepts Overview – an introduction to the types of benchmarking that have been applied in other businesses and industry.
- Consortium Benchmarking for Water and Wastewater Utilities – the components of a consortium benchmarking approach and brief review of the differences in some approaches.
- Methodology for the "Best Practices for Energy Management" study – application of the consortium benchmarking methodology to the topic of energy management (as it is being used for the "Best Practices for Energy Management" study).
- Benchmarking Methodology Recommendations – recommendations for adapting and improving this methodology for future water industry consortium benchmarking studies.

CHAPTER 1
BENCHMARKING CONCEPTS

OVERVIEW

This document provides benchmarking practitioners guidance and background in the following concepts:

- Establishing a focused area of study necessary to ensure that the benchmarking effort is successful.
- Soliciting participants to join in the benchmarking effort, and establishing protocols for participation.
- Designing a consortium-based approach for the benchmarking effort, and gaining the benefits of this approach.
- Developing and testing (piloting a benchmarking survey instrument/approach that is appropriate to the study in question – using process, metric, business practice or some combination of these types of methods).
- Administering a study and guiding participants to respond.
- Conducting the "findings" report meeting and facilitating understanding of the results.
- Selecting best or promising practices from the findings. Determining if case studies are helpful, facilitating site visits, and other information-sharing activities.
- Sharing of best practices, lessons-learned, and next steps for implementation of improvements with the consortium participants.

Benchmarking, as a method for gaining insight, is expected to be used more frequently by U.S. water utilities. One reason is the pressure to improve utility performance coming from customers, politicians, and other stakeholders. This pressure is accentuated by increasing occurrence of privatization and contract operations of water utilities. Both metric and process benchmarking play key roles in improving the performance of water utilities. They could, therefore, be featured as part of routine management practice.

Using Spendolini's (1992) benchmarking definition, Paralez (1999) introduced the concept of a "benchmarking menu". Figure 1-2 illustrates this concept in diagrammatic form. As shown in Figure 1-2, benchmarking can take many forms and serve a number of purposes. By

> ***Benchmarking*** *is the process of identifying, sharing, and using knowledge and best practices. It focuses on how to improve any given business process by exploiting top-notch approaches rather than merely measuring the best performance. Finding, studying and implementing best practices provides the greatest opportunity for gaining a strategic, operational, and financial advantage.*

Figure 1-1. Benchmarking definition from APQC (American Productivity and Quality Center)

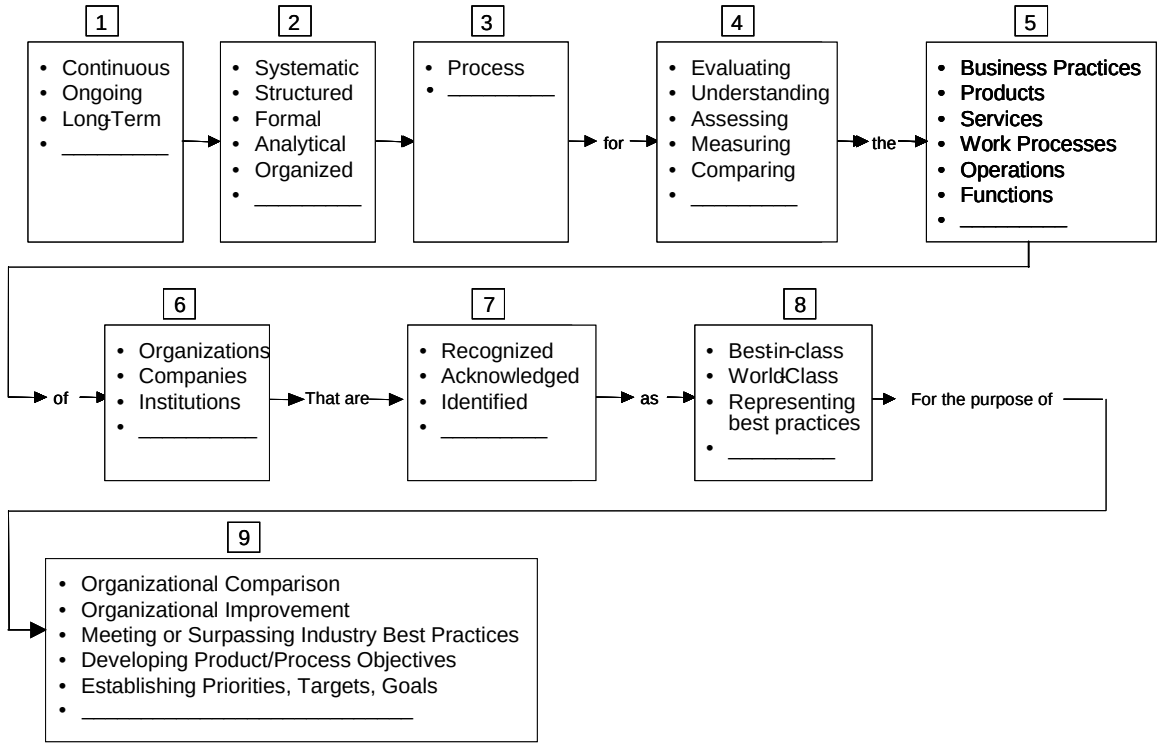


Figure 1-2. Benchmarking menu presents options for defining benchmarking

selecting one or more options from each box in the "benchmarking menu" diagram, the purpose, methods, goals, and context for benchmarking in a given organization can be defined. For consortium benchmarking to be successful, benchmarking participants must be aligned on the purpose and type of benchmarking to be undertaken.

INTRODUCTION TO BENCHMARKING

Benchmarking is designed to yield great benefits in the education of managers and executives to apply performance improvements for business operations. Benchmarking can take several forms. First, there is the focus of either "internal" or "external" to the organization. Internal benchmarking studies the practices and performance within an organization. External benchmarking determines the performance of other, preferably world-class, companies.

Second, there is the selection of the type of approach to be used to undertake the specific study. Benchmarking typically consists of separate methods such as metric benchmarking, process benchmarking, and practice benchmarking. They are briefly described below and can be undertaken either as a package or independently.

Finally, benchmarking can be used to determine strategic areas of opportunity. However, it is the application of what is learned in benchmarking that delivers the marked and impressive

results so often noted. The determination of benchmarks allows one to make comparisons. Any identified gaps are then candidate improvement areas.

All the definitions of benchmarking provided here emphasize two components: the effort to identify practices and performance that are outstanding, and second, to transfer those through adaptation and learning into another (unique) organization.

Metric Benchmarking

Metric benchmarking is a quantitative comparative assessment that enables utilities to track internal performance over time and to compare this performance against their past performance baseline or to that of similar utilities. Areas of relatively low performance, compared to that of other utilities, can be identified where there is particular room for improvement in performance. In addition, through the comparison process, target levels of performance can be established.

Current metric benchmarking in the water industry tends to focus on the use of simple performance ratios of inputs to outputs such as cost per mile of pipeline or cost per gallon treated. The diversity of topography, water sources, customer and workforce demographics, ownership and organizational structures, facility and infrastructure conditions, and environmental and financial regulations in the U.S. water industry, invalidates most attempts at comparison of utility performance using simple ratios that do not explicitly account for these "explanatory factors." While ratios may illuminate trends that can be tracked over time, they are often poor measures for inter-utility comparisons.

Ratios can be very reliable indicators of performance over time within a given utility when they are well defined, applied consistently, and set in the proper context. In addition, when metric measurements are made as an integral part of the business practice or process, the resulting metric data becomes useful because it is consistent over time and between the same practices or processes of different organizations. The challenge for the water industry is to develop meaningful "standardized" business practices or processes and associated metrics so that the resulting data becomes comparable between organizations.

Process Benchmarking

Process benchmarking involves first identifying specific work procedures to be improved through a step-by-step "process mapping," and then locating external examples of excellence in these process elements for standard setting and possible emulation. This is also known as "Xerox"-style benchmarking after work undertaken by the Xerox Corporation beginning in 1979. Process benchmarking, unlike metric benchmarking, provides a tool by which utilities can change the way they work by introducing improvements in efficiency and service by comparing and contrasting processes.

Process benchmarking is generally higher-level and less numbers-intensive than metric benchmarking. Process benchmarking studies demonstrate how top performing companies accomplish the specific process in question. Such studies can take the form of research, surveys/interviews, and site visits. By identifying how others perform the same functional task or objective, organizations gain insight and ideas they may not otherwise achieve. Such information affirms and supports quality decision-making by executives. This insight is one key benefit and value-added feature of benchmarking.

The benefits of process benchmarking are realized when participants implement recommendations and embark on a change process – making marked improvements in the productivity, costs, and revenues of the company.

There are significant opportunities for process benchmarking in water and wastewater utiliites where processes are well-defined and similar utility-to-utility. An example of some areas where process benchmarking has the potential to yield significant improvements are lab operations, pump repair, pipeline replacement, bill collection, etc. These, and similar, water and wastewater utility activities have well defined, repeatable, and specialized business processes.

Practices Benchmarking

Business practices benchmarking focuses on gathering profiles of practices and correlative metrics. Such profiles provide a means for organizations to understand what practices – from a range of expected "best" or promising practices - are being used. Companion metrics provide some indication of the results each organization is getting from the implementation of those practices. This was the method used for the AwwaRF "Best Practices for Energy Management" study. This method was similar to most of the consortium studies conducted to date by the Western Regional Water Utility Benchmarking Group (Paralez, 1999).

Business practices benchmarking is the process of seeking out and studying the best business practices that produce superior performance. The traditional metrics-focused approach is supplemented with an analysis of what or which business practices produce exceptional results. This practices-based approach also reduces some of the effort over that required for process benchmarking. It avoids the need for some level of process mapping before the benchmarking can be done. However, practices benchmarking requires subject matter expertise to identify the known or potential best practices in advance, so that survey questions can be developed based on those best practices.

The outcomes of practice benchmarking typically are histogram profiles that reveal the extent to which participants use, engage, or benefit from a given set of business practices. When metrics are associated with these business practices, the differences in metrics can often show a utilities' performance level relative to the practice. Again, a challenge is to "standardize" the business practices and associated metrics well enough so the results are truly comparable between utilities.

Using survey techniques with a consortium of participants, the resulting metrics or findings of the practices can be used to select case studies of potential best practices. From the case studies, details of the practices, associated business processes, and additional information can be gathered to be shared with consortium participants.

CHAPTER 2
CONSORTIUM BENCHMARKING FOR WATER AND WASTEWATER UTILITIES

The consortium benchmarking methodology recommended for the water and wastewater utility industry involves a high level of participation in the design and analysis of the benchmarking study. The following chapter provides an overview discussion of consortium benchmarking philosophy, goals, objectives, and methods.

CONSORTIUM BENCHMARKING APPROACH

What makes a consortium approach unique? The issue here is the high level of participation in the design of the approach to the study and the analysis of the findings so that participants accomplish three things:

- Clarity and consensus about the scope or purpose of the study – especially what the study does and does not cover. Gaining this clarity and consensus in the initial stage of the study ensures that the consortium has a compelling interest in participating and a sufficiently narrow scope of study to produce results that can be applied immediately;
- Better quality responses to the questions because members of the consortium help to create them and participate in creating the operational definitions of the terms, measures, etc. as well as the type of study to be conducted (metric only, process only, practices only or combination); and,
- Greater understanding of what the findings of the study reveal because, as a consortium, members of the group "process" those findings together in a facilitated session(s) and develop strategies for next steps that are both individual and group-directed based on those findings.

The highly interactive nature of the consortium approach is designed to ensure that the process of the study is as robust as the results. Participants are involved in understanding what data they are collecting, what it means in comparison to the chosen denominators, and to the study participants and partners, and finally, what they should choose to do as next steps in improving their operations.

COMPONENTS OF A BENCHMARKING STUDY

The components of a consortium benchmarking study include the following steps: secondary research, plan, collect, analyze, report, pilot, and adapt.

Secondary Research

This is an effort taken by the sponsoring organization and its researchers to identify potential study areas, initiate the study, and solicit the participants.

Studies are often initiated by a subgroup of the potential study participants or some other community with common interests. Interested individuals and organizations identify issues or problem areas that have particular relevance to them, and begin to discuss study potential, and gain additional participants.

These discussions help potential studies to focus and take shape. A potential study is worthy of further investigation if the initial discussions identify a "compelling need." That is, the study needs to be relevant to a large enough group of participants, it deals with urgent and pressing issues, and the potential benefits from improvements are large.

Another requirement for a successful study is enough committed participants to carry out and fund the study. This means the research phase must identify a list of potential study participants and solicit their interest in a study, willingness to be involved, and commitment to funding.

Plan

During this step of the process, defining the study scope and framing the key study question happens in concert with the solicited participants. The type of benchmarking study (process, metric, profile or combination) is determined based on the study scope.

Experience shows that the early planning stages are extremely critical in producing a successful study. This is where the participants focus the study and limit its scope to the point where the study outcomes are clearly defined and judged to be achievable. The early planning steps also clearly identify and highlight the "compelling need" to do the study.

The early planning stage should produce the following outcomes:

- Consensus among participants about what areas and topics the study includes.
- Consensus among participants about what areas and topics the study does not include.
- Consensus among participants about the expected study results.
- A level of comfort among participants that the results are achievable and will produce real benefits to them.
- An agreement by participants to conform to ethical benchmarking such as the APQC Code of Conduct.

With the outcomes above, benchmarking experts and subject matter experts are responsible for designing and administering the study, including conducting the detailed planning steps. This includes recommending the appropriate type of benchmarking study (metric, process, or practice), developing an overall study work plan, and developing a survey instrument.

The final planning step is for the participants to make a "go" or "no go" decision whether or not to be involved with the study. Participants must make this decision by weighing the potential benefits against the amount of effort they will be expected to contribute, and their share of the total study costs.

Collect

Administering the survey and performing the study happens in a centralized way using a research team to create the survey instrument and collect the data. Participants in the collection

of the data use an interactive approach within their organization to ensure submittal of quality data.

Developing and administering a successful survey – one that produces usable results relevant to study outcomes – is a science and an art. It is not easy. Developing the survey instrument would require research team members trained in statistical analysis and survey design working in conjunction with subject matter experts in the study field.

Administering the survey requires a research team experienced in survey data collection. The research team should provide a "help desk" for survey respondents and generally "troubleshoots" the survey process. This means answering respondent questions about what the survey questions mean, what units to use for entering numerical values and similar questions about how to fill out the survey. It also means resolving data errors and missing data. Finally, it means protecting respondent anonymity and distributing "raw" survey results if appropriate.

Analyze

Analyzing the survey results is a process that relies both on the research team and the members of the consortium. The consortium participates in a "findings" meeting process, which occurs after initial data analysis is completed. Following the refinements, corrections and learning's that occur in that process, a "results" meeting process of the consortium occurs.

The findings meeting presents preliminary survey data analysis findings to the study participants. It allows the research team to present and discuss significant and interesting observations, trends, and discrepancies, in the survey results relevant to the planned study outcomes. The resulting discussion with study participants adds their insights to those of the research team. It usually identifies key findings and observations, and may identify additional data problems that still need to be corrected.

After the findings meeting, the research team makes final survey data corrections (if necessary) and prepares the preliminary results of the study. The team disseminates these preliminary results to the study participants in preparation for the "results" meeting.

Case studies of organizations with "best" practices and performance are selected for further study and comparison, more detailed investigation and reporting. The emphasis again is on a process that relies both on the research team to conduct and write a case study and the consortium members who will choose to be actively involved. In addition, if none of the consortium participants are identified as leading practices in areas of interest to the consortium in terms of original study goals, outside "benchmarking partners" may be needed. If so, the research team must identify and select appropriate partners for the study and carry out the surveys and conduct case studies with these partners if warranted by survey findings.

Identifying beneficial and "best" practices occurs through all the analysis efforts seeking to identify those documented strategies and tactics employed by highly admired companies whose profiled practices have been implemented and honed to help place their practitioners as the most admired, the most profitable, and the keenest competitors in business.

Report

Reporting the study results is a step in the process that ensures that data captured and lessons-learned so far in the benchmarking process are well documented and available for others to use as reference material. In addition, participants may directly share in the case studies'

findings or best practices in a consortium workshop format. This is not, however, the end of the benchmarking process.

Pilot

Having identified practices and processes that appear to lead to high performance in other organizations, consortium members are now challenged with deciding what to change in their own operation to achieve benefits from this learning. The pilot process is designed to aid consortium participants in applying the identified best practices in their own organizations, test application of new process and business practices, and monitor changes in performance.

Adapt

Finally, deciding to adapt a process(es) or practice(s) can institutionalize the performance gains. Adaptation to the unique environment of the organization can sometimes require significant changes in technology, people skills and competencies, and organization structure and culture.

Figure 2-1 illustrates the benchmarking study components discussed previously.

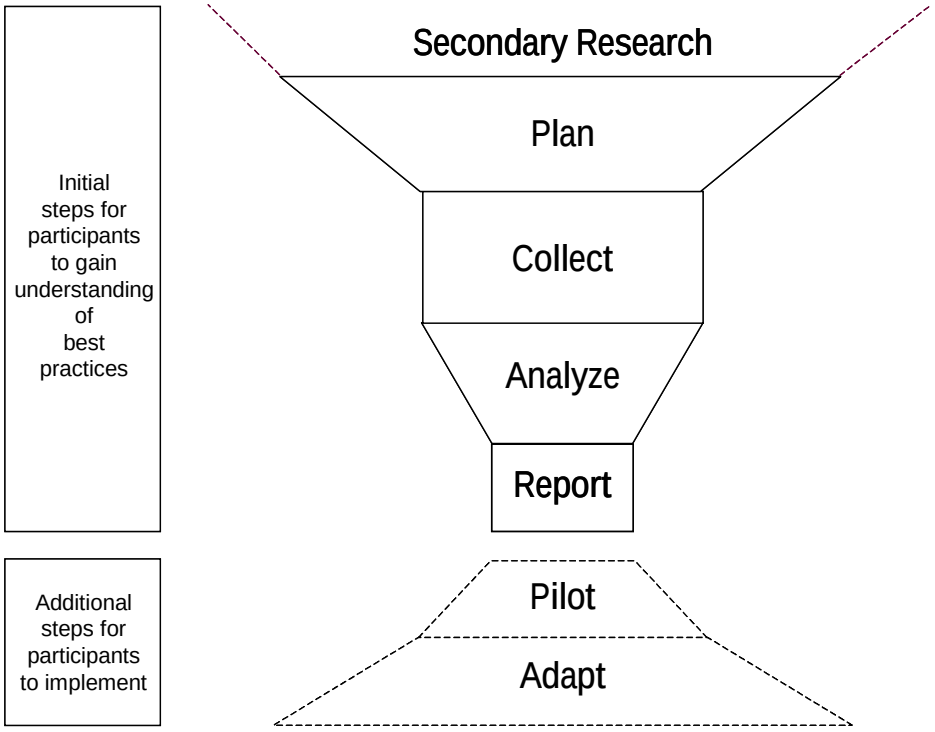


Figure 2-1. Components of a consortium benchmarking study

DIFFERING APPROACHES TO CONSORTIUM BENCHMARKING

Three different approaches to consortium benchmarking are contrasted here:

- American Productivity And Quality Center (APQC)
- Western Region Water Utilities Benchmarking Group (WRWUBG)
- AwwaRF (tailored collaboration research)

Comparing and contrasting the APQC custom study approach, the WRWUBG approach, and the AwwaRF tailored collaboration approach shows similar objectives and sequencing. Differences are in the degree of collaboration, the speed of the study completion possible (largely based on level of risk initial participants are willing to take regarding costs), and the extent to which case studies and additional partners are incorporated as part of the study.

The APQC custom study approach is a commercially based approach that entails a proven, successful model for developing and managing consortium type studies. Participants are APQC members who choose to join and fund the study. Best-practice partners are solicited based on research done by experts at the APQC once a study area is chosen. The research team then designs a survey to assay the best practices and performance of these participants and selected partners. All participants and study partners complete the survey and the research team compiles results. Participants get the benefit of comparing themselves against the best, learning from the best, and applying proven results in their organizations.

The benchmarking approach taken by the WRWUBG reflects a metrics and practices-based study method using a consortium approach. This approach, combined with an expectation that there may not be one answer that comes from the study (such as an ideal maintenance or replacement model), helps the group identify better questions that could be used by each utility for its own strategic operational planning. The best use of benchmarking, then, is not to find specific answers, but to find better questions that lead to site specific strategies that allow an organization to "leap frog" beyond those it compares against.

WRWUBG has done limited case study work, and no external partnership for best practice surveying as is the case with the "Best Practices for Energy Management" study described here. The sharing within the WRWUBG has included site visits among participating utilities to share promising practices, implement ideas among participants, and compare progress.

The AwwaRF tailored collaboration research model is not designed specifically for consortium benchmarking. However, the "Best Practices for Energy Management" benchmarking study was funded as an AwwaRF tailored collaboration project. This provides both advantages and disadvantages for utilities wishing to undertake consortium benchmarking efforts. The obvious advantage is that AwwaRF provides a portion of the project funds, and the participating utilities do not have to directly fund the entire project.

The disadvantage (from a consortium benchmarking process viewpoint) is that – to get the project accepted and funded by AwwaRF – the research team must identify the complete project scope, work plan, and budget prior to beginning the study. The research team must also identify and solicit study participants plus obtain their firm commitment before AwwaRF will approve the project.

The practical result of this planning/funding model is that the research team (and to some extent AwwaRF) must take on the entire burden of scoping, planning, and costing the study with

little or no input from the study participants. This also means the participants must decide to join the consortium study with only limited understanding of whether the study will address their unique needs.

Additional considerations for consortium benchmarking studies are presented in Appendix A.

CHAPTER 3
METHODOLOGY FOR THE "BEST PRACTICES FOR ENERGY MANAGEMENT" STUDY

This chapter describes the benchmarking methodology and project plan for the AwwaRF "Best Practices for Energy Management" consortium benchmarking study. This effort is an AwwaRF tailored collaboration project (which influenced the projects' benchmarking methodology in terms of timing of participant involvement.) As discussed in the previous section, the AwwaRF tailored collaboration planning/funding model tends to limit participation in the scoping/planning/costing phases of the project. In contrast, a true consortium benchmarking study requires direct participant involvement in all project phases.

METHODOLOGY OVERVIEW

Figure 3-1 shows an overview of the methodology used for the "Best Practices for Energy Management" study. This method follows the general benchmarking process of plan, collect, analyze and report.

The planning step initiated the study, defined its scope and objectives and solicited participants. The data collection step developed and administered the survey. The data analysis step developed preliminary findings from the survey results and gathered additional information as needed, including case studies. Finally, the reporting step identified and summarized best practices.

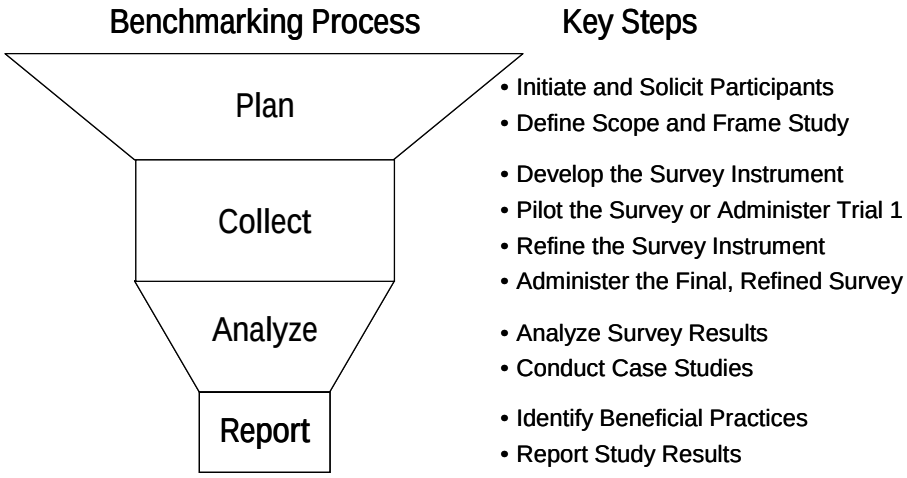


Figure 3-1. "Best Practices for Energy Management" study

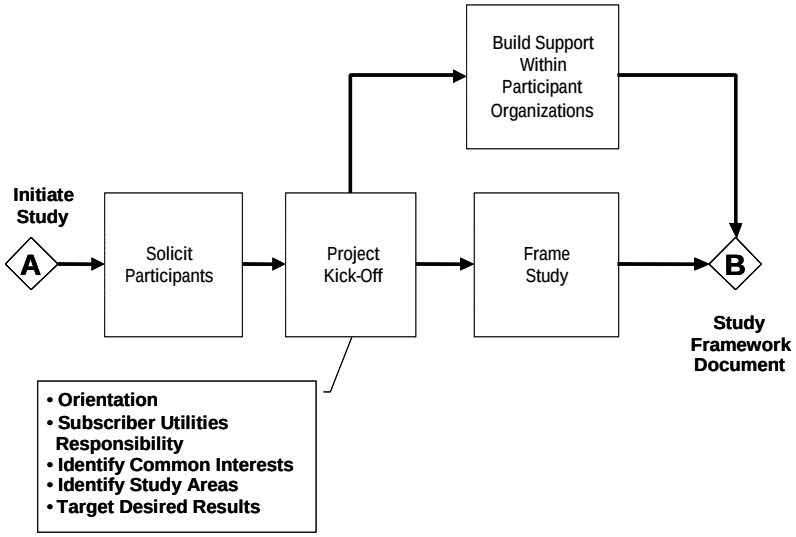


Figure 3-2. "Best Practices for Energy Management" study: Planning phase

PLANNING PHASE

Figure 3-2 shows the "Best Practices for Energy Management" study planning phase. Initially, a group of water and wastewater utilities conceived the idea of conducting a best practices benchmarking project and submitted a tailored collaboration proposal to AwwaRF to benchmark several subject areas. AwwaRF indicated they would accept the proposal if it were limited to one specific topic. AwwaRF and the research team selected the "Best Practices for Energy Management" study area. As a result, the first step was to recruit water and wastewater utilities to participate in the project and obtain their commitment to contribute both time and money to an energy management best-practices benchmarking study.

The next step was to hold a project kickoff meeting so that everyone working on the project could meet, be oriented to the project, and understand their responsibilities. The project kickoff also included facilitated discussions to identify common interests related to energy management, identify specific energy management practice areas the participants want to study, and list results the participants would like to obtain.

Following the project kickoff meeting, the utility team members' first assignment was to build support within their organizations and identify energy management experts who could contribute to the project.

The research team used the kickoff meeting discussion to frame the "Best Practices for Energy Management" study. Framing activities included composing an overall study question, selecting the energy management practice areas to investigate, and beginning to develop questions (based on known or potential best practices) to solicit energy management practice information from water and wastewater utilities.

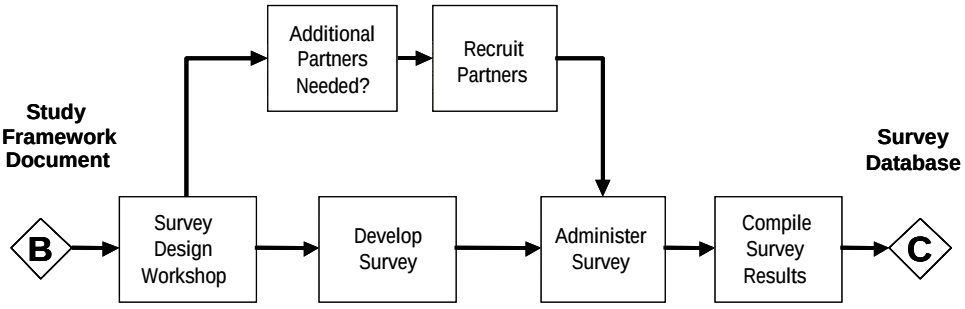


Figure 3-3. "Best Practices for Energy Management" study: Data collection phase

DATA COLLECTION PHASE

Figure 3-3 shows the "Best Practices for Energy Management" study data collection phase. The first step was to involve the utility team members in the survey design process. This served several purposes, the first being to confirm the study framework results from the planning step. Utility input also helped to ensure that the survey would cover the important business practices within the study area, and began the important information-sharing dialog between the participants.

One result of the survey design workshop was the decision to survey other organizations outside of the participating utilities as "benchmarking partners." With a "yes" decision, the research team needed to identify the appropriate organizations, contact them, explain the study objectives and the benefits they would accrue from partnering, and formally obtain their commitment to participate.

The research team then used the workshop results to design and draft the survey instrument. The team also finalized the survey administration methods and procedures, and communicated them to the participating utilities and other survey partners.

Project experience in the survey phase showed good survey design, clear communications of instructions, and good general survey administration practices to be crucial to project success. In the "Best Practices for Energy Management" study, the first survey attempt resulted in enough missing data, misreporting of data units, and other data problems to warrant clarifying and readministering the survey, to collect more accurate responses.

The research team then compiled all of the final survey responses into a database in preparation for the analysis phase.

ANALYSIS PHASE

Figure 3-4 shows the "Best Practices for Energy Management" study analysis phase. The first step was to perform statistical analysis of the survey results. The primary goal was to find correlations between various practices and metric indicators of utility performance. This began to reveal which practices provided quantifiable benefits to utilities in actual practice. The analysis step also began to identify higher-performing utilities, which become candidates for case study visits. The analysis step uncovered unexpected or unexplained results that warranted further investigation, leading to additional possibilities for site visits.

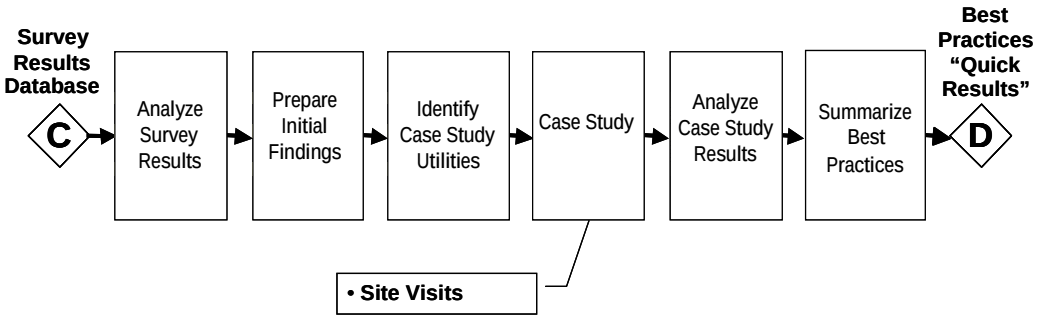


Figure 3-4. "Best Practices for Energy Management" study: Data analysis phase

Next, the research team summarized the survey analysis results into an "Initial Findings" presentation. The team circulated the initial findings to all organizations participating in the survey, solicited comments, and presented recommendations for case study sites and other further data gathering activities.

Based on review comments from the survey participants, the research team selected organizations and practice areas for case study, identified case study plans and objectives, and arranged the case study visits.

The case studies were an additional data-gathering process, and consisted of in-depth observations and staff interviews on site. The purpose of the case studies was to confirm and further explain high-performance resulting from a business practice, or to further investigate unexpected results. Generally, they provided enough additional information to select which particular business practices were considered "best" (i.e. beneficial to most utilities) practice.

After reviewing and compiling the case study results, the research team prepared a first draft summary of "best practices" from the case studies and circulated it to the survey participants for review and comment.

REPORTING PHASE

Figure 3-5 shows the "Best Practices for Energy Management" study reporting phase. A workshop was conducted for presentation of best practices and case studies to all participants. The workshop proved to be vital for utilities to share and discuss their own current practices in relation to the research team's initial summary of "best practices". This resulted in the group identifying and clarifying the "best practice" concepts and coming to a consensus and common understanding of the most important energy management practices. The workshop results solidified the key "best practices" for the study report. In addition, through sharing of energy management experiences at the workshop, utilities took away a prioritized list of the best practices most appropriate for applying in their own organization.

Following the workshop, the research team assembled all of the findings, case studies, workshop results, and final recommendations into a best practices report for publication.

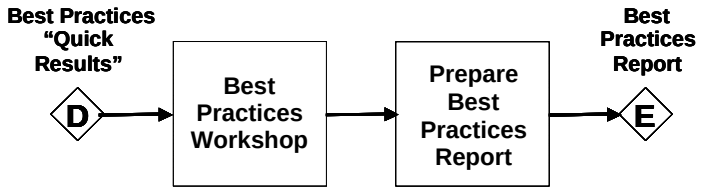


Figure 3-5. "Best Practices for Energy Management" study: Reporting phase

CHAPTER 4
BENCHMARKING METHODOLOGY RECOMMENDATIONS

GENERAL RECOMMENDATIONS

These recommendations reflect lessons learned from using a consortium benchmarking methodology for the "Best Practices for Energy Management" study. Recommendations are intended to be applicable for use of the consortium benchmarking methodology to study other subject areas.

- The general benchmarking approach and work processes documented in Chapters 2 and 3 are valid for consortium benchmarking projects on a variety of subjects. They provide a good roadmap to follow for future consortium benchmarking projects.
- Recognize that benchmarking methodology is an art as well as a science. The research team has to be flexible enough to adapt and shape their benchmarking process to suit unique study and participant characteristics.

RECOMMENDATIONS FOR THE PLANNING PHASE

- Defining the study scope, framing the study question and soliciting active and enthusiastic participants are the most essential elements of a successful study.
- Directly involve participants in the study scoping and planning steps, especially in framing the overall study based on goals and participant expectations.
- Consortium benchmarking only works if the participants have a compelling reason to improve and share information. For this reason, future water industry benchmarking efforts should focus on areas that are a significant portion of a typical utility's operating budget or have a significant strategic impact such as customer satisfaction or water quality. The large potential dollar payback provides a compelling reason for participants to enter into a study.
- Keep the study scope as tightly focused as possible. Focus on areas of utility operation that are well-bounded and well-defined, but again, have bottom-line or customer impact.
- Consider a phased approach to developing and planning benchmarking studies. Step 1 would be for utilities themselves to identify common interests and potential study areas. Step 2 would be for utilities to band together and fund a study planning process where a research team helps them develop an appropriate study scope, expected study outcomes, potential benefits, study plan, and cost. Step 3 would be for the participating utilities to make a "go, no go" decision based on study cost versus expected outcomes and benefits.

RECOMMENDATIONS FOR THE DATA COLLECTION PHASE

- Recognize that the water industry is just beginning to use benchmarking as an improvement tool. At this stage, metrics are important for individual utilities to track their own internal improvements over time. However, our current metric concepts are

relatively unsophisticated and loosely defined – which makes it very difficult to compare metrics between utilities.

- Developing a good survey instrument is key to running an efficient and cost-effective benchmarking study. However, survey development is itself an art and a science. The survey development team should include survey development experts as well as industry subject matter experts.
- Some specific suggestions for developing a good survey are:

    1. Make sure the requested data items are well defined. Stick to data items that all utilities could (and should) have readily available.
    2. Make sure the data reporting units for the same or similar information are consistent throughout the entire survey.
    3. Keep the survey questions as short and simple as possible. Where appropriate, use multiple choice range selection for data entry instead of having participants enter a specific number.
    4. Expect, and plan for, misunderstandings and data entry errors. It may be prudent to plan for two survey cycles – one for initial data gathering, learning, and error-checking and one for final data collection.

- Out-of-industry survey partners are very important, especially when the water industry's practices are viewed to be lacking in "best practices".

RECOMMENDATIONS FOR THE DATA ANALYSIS PHASE

- Expect and plan for errors in the survey data. Some data errors will not be evident before at least a preliminary analysis or comparative analysis with other utility data.
- Case studies are essential and provide the most useful information about best practices. Plan on-site time for the case studies sufficient to cover all areas where the benchmarking partner is believed to be "best practice."
- Select case study sites from within the study participants based on survey responses that show measurable improvements for various practices.
- Out-of-industry case studies are very important, particularly for areas in the water industry that are lacking in best practices. Look for industries who's needs relative to the study area are the same or similar to the water industry. Then look for case study sites that have demonstrated "best practices" within their industry.
- From the data analysis findings and case study results recommended best practices should be formulated by abstracting the practices from case studies so they can be applied to any given utility. This takes an experienced research team with subject matter experts.

RECOMMENDATIONS FOR THE REPORTING PHASE

- Internet web-conferencing techniques are potentially effective for disseminating preliminary results and are cost-effective compared to face-to-face meetings. However, the "Best Practices for Energy Management" study showed some disadvantages as well – principally the difficulty of comprehending large amounts of

data with a web browser style interface and limited computer experience of some participants.

- The study should include at least one face-to-face meeting for the participants to review, discuss and consolidate best practice findings and share case studies. Additionally, the participants should identify which best practices are most applicable or beneficial to their specific situations, leading to their own action plans.

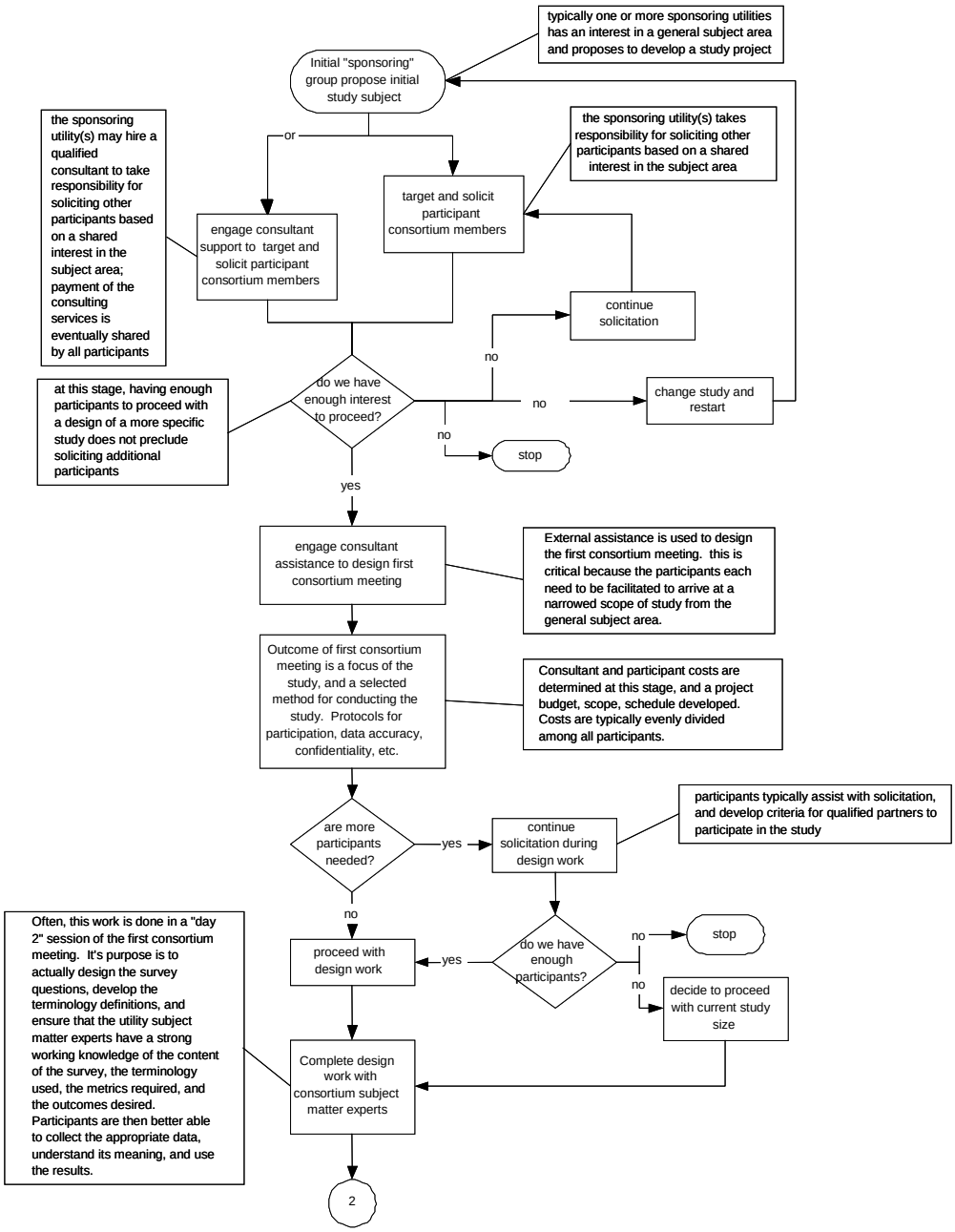
RECOMMENDATIONS FOR ADDITIONAL PHASES

As individual utilities pilot and adapt best practices in their own situations, participants can continue to benefit from the consortium by sharing their experiences and results. Opportunities to continue this information sharing should include:

- Presentation materials on the subject of best practices to be shared with top management and other appropriate business units (e.g., O&M, Engineering, Planning, etc.) for the entire organization to begin to understand and be ready to apply best practices.
- A web site (or team room) for ongoing discussions regarding specific best practice applications by utilities with subject matter facilitators to gather additional information as required. Individual utilities may also wish to conduct site visits to other consortium participants to learn best practices first-hand.
- Additional face-to-face or web conference presentations of utility results and benefits or other best practice examples as utilities begin to apply the results of the best practice study to their own organizations.
- Re-surveying of participants at yearly intervals to track progress and further identify new or emerging best practices based on survey findings. New or additional case studies could also be identified with subsequent on-site investigation and reporting.

APPENDIX A
CONSIDERATIONS FOR CONSORTIUM BENCHMARKING STUDIES

The following flowchart, Figure A-1, shows considerations for conducting a water/wastewater industry consortium benchmarking study. Alternative courses of action and criteria for choosing one course over another need to be clearly identified by consortium participants.



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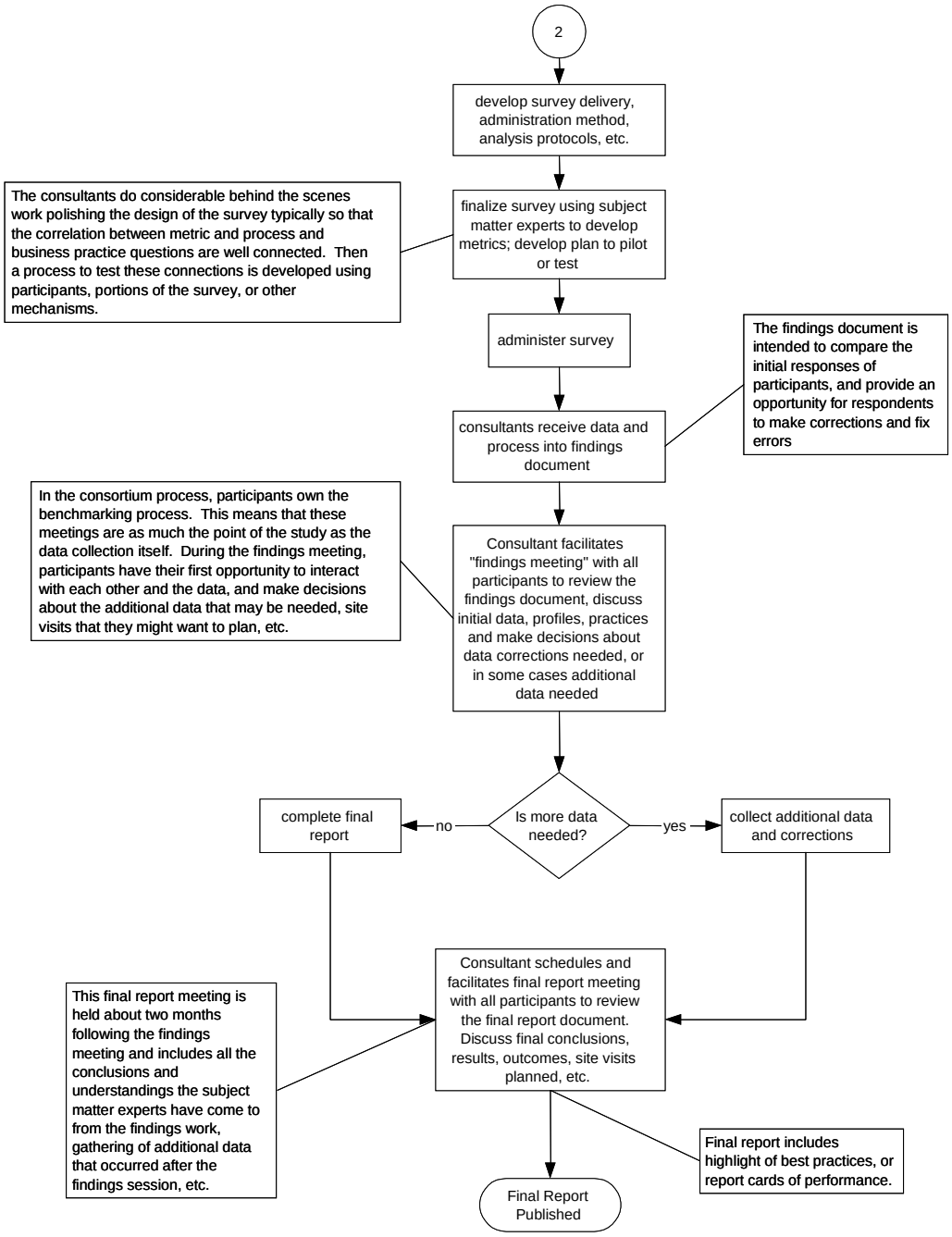

Figure A-1. Flowchart to design an approach for a water/wastewater consortium benchmarking study

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ABBREVIATIONS

APQC	American Productivity and Quality Center
AWWA	American Water Works Association
AwwaRF	American Water Works Association Research Foundation
WERF	Water Environment Research Foundation
WRWUBG	Western Regional Water Utilities Benchmarking Group

Awwa
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