

**END-USERS:
TECHNOLOGY DEVELOPERS' MOST IMPORTANT STAKEHOLDERS**

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ABSTRACT

This paper describes how the DOE, Office of Science and Technology's Mixed Waste Focus Area is involving end-users in the technology development process, using stakeholder involvement principles. It discusses the integration of end-users in key steps of the technology development process, and proposes performance measures based on end-user acceptance and deployment of new technologies.

INTRODUCTION

One of the most difficult problems faced by the DOE Office of Science and Technology (OST) is engaging the primary stakeholders—end-users—in the technology development and deployment process. The affected public and regulators may fully accept a new technology, but end-user acceptance will ultimately determine whether or not OST's investment in a new technology actually pays off. A basic premise of this paper is that end-users are the principal stakeholders in the technology development process in that they are the people who most affect, or are affected by, the technology development process. The Mixed Waste Focus Area (MWFA) is attempting to increase and improve the involvement of its end-users based, in part, on principles that evolved from the practice of public involvement.

END-USERS AS STAKEHOLDERS

Not in My Front Yard

The reluctance on the part of end-users to accept new technologies might be characterized as the “NIMFY” syndrome. High visibility Waste Management or Environmental Restoration projects sit squarely in the career “front yards” of the responsible project managers. Professional reputations and perceptions of competence are at stake in the successful completion, or failure, of these projects. Most project managers recognize that the inclusion of a new technology may provide cost, or some other benefit, to the project. But they often perceive the potential risk to the project for cost or schedule overruns as outweighing whatever benefit the technology may provide. No wonder, then, that these decision-makers are often highly skeptical about the use of new technologies in their projects. In its 1994 report on the use of innovative technologies for DOE clean-up, the U.S. General Accounting Office (GAO) noted this reluctance on the part of DOE site officials to use new technologies (1.). In its most

recent report addressing the same topic, GAO also describes site officials' concerns about OST's ability to provide quality technical assistance and advice, resulting in these officials' reluctance to allow OST a role in deciding what technologies should be used at the sites (2).

These are recurring themes in stakeholder resistance to new facilities and technologies: unacceptable levels of risk (in this case, *project risk*) and lack of trust or confidence in the developing agency's competence. A primary conclusion of the most recent GAO report is that OST has not sufficiently involved end-users in the technology development process. Specifically, GAO points to lack of end-user involvement in identifying technology needs, designing technologies and monitoring their development (2).

End-User Participation Models

Public or stakeholder involvement principles and models are useful tools for technology developers to increase the probability that end-users will actually use a new technology. Numerous statements of principles and models exist. Listed below are eight public involvement principles, which have been in the author's possession for several years (source unknown). The principles are re-stated here with the term "end-user" substituted where "public" or "stakeholder" were used in the original version.

1. Consult with *end-users* early and often during the project.
2. Provide equal access to information for participants in the project.
3. Begin the project with an understandable description of the decision-making process, well-articulated expectations for *end-user* involvement in that process, and clearly defined goals for the outcome of that process.
4. Provide the necessary resources—technical and financial—to support key participants in the process and create a "level playing field" for diverse *end-users*.
5. Ensure that decision-making is open.
6. Document responses to comments and suggestions from *end-users* on key decisions and products.
7. Ensure that project schedules are realistic and sufficiently flexible to accommodate the complex dynamics of diverse *end-users'* involvement.
8. Establish and demand clear accountability for the process.

This author argues that these principles are a very good fit when applied to end-users as principal stakeholders in the technology development process. The Mixed Waste Focus Area is applying several of these principles in its efforts to improve and increase

end-user involvement in the technology development process. The remainder of this paper will discuss these efforts in the context of the principles outlined above, and the difficult issues related to end-user involvement that need to be resolved by OST and the Focus Areas.

DECISION-MAKING PROCESSES DEFINED

MWFA Technical Baseline

Among the earliest steps taken by the Focus Area to involve end-users occurred during development of its first technical baseline, which was completed in early 1996 (3), and its subsequent revision in 1997 (4). These documents describe in detail the Focus Area's meetings with mixed waste technology end-users around the Complex. Also described is the involvement of key mixed waste technology end-users from the major sites who analyzed the needs gathered during the meetings, and identified and prioritized the deficiencies in DOE's ability to manage its MLLW and MTRU inventories. The documents referenced above clearly describe the results of end-user involvement early in the life of the Focus Area, which have provided the bases for many of its subsequent decisions.

Solution Development Process

In mid-1998 the MWFA documented its Solution Development Process. This is the process used by the Focus Area's Product Line Managers in developing solutions to mixed waste problems. Making the process visible to end-users allows them to see opportunities for their involvement. Figure 1. illustrates the primary steps in the process. It is important to note that the Focus Area intentionally titled this a process aimed at providing technical *solutions*, rather than technologies. By the time this process was documented, Focus Area management recognized that a new technology is not always the most useful solution to a mixed waste problem. The process allows for a greater variety of products than technologies, per se.

The process was published in the *MWFA Fiscal Year 1998 Multi-Year Program Plan* (5) in September 1998. While virtually any step in the process provides opportunities for end-user involvement, a few of the most important are highlighted here.

MWFA Management has established a policy that the preparation of End-User Involvement Plans will be part of the development of most solutions (Process Steps # 4 and 12). The End User Involvement Plans are designed to document the commitments between the MWFA, the technology developer, and the end-users for each MWFA solution being developed. Ideally, the End User Involvement Plan is established as soon as the MWFA begins to address a specific end user need. The Plan matures as the solution development process progresses, and may ultimately document the end users' implementation of a solution.

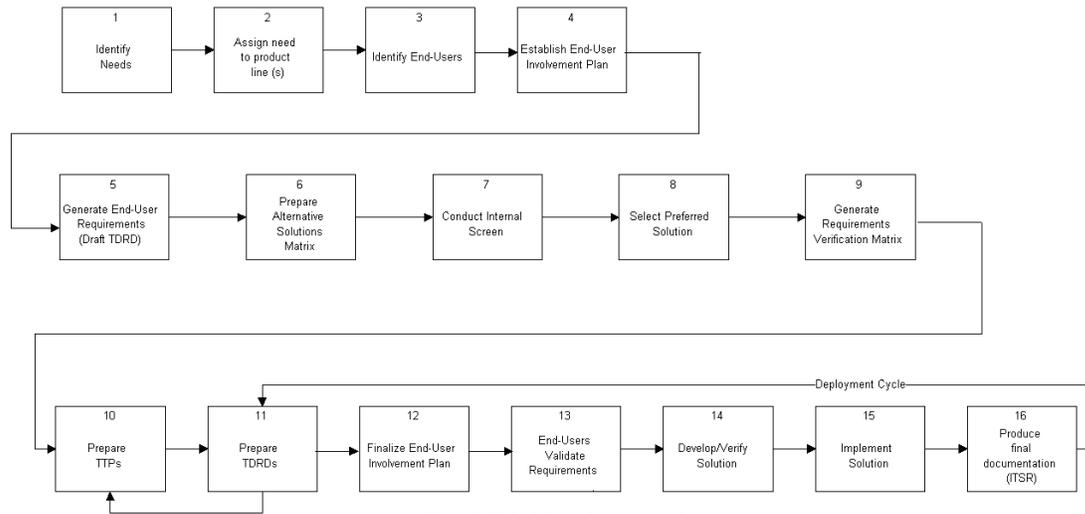


Figure 1. MWFA Solution Development Process

Each End User Involvement Plan is unique because of the varying complexity of the problems being resolved. For example, a simple plan could exist for a single end user’s implementation of a previously demonstrated technology. A more complex plan could be needed where coordination is required between the MWFA, a Cross Cut Program, Industry Program, technology developers, and one or more end users intending to demonstrate and/or deploy a technology. A key purpose is that the plan becomes an agreement for every key participant in the solution development process. This implies that development of the End User Involvement Plan is a team effort; one consideration is to have a signature page for the participants to acknowledge their commitment to the solution development activities.

In its 1998 report the GAO observed “projects in which OST and an EM operating group get involved as a joint venture seem to work well. In these cases, OST provides funding and some technical assistance, and the operating group also provides funding and implements the project. If there are also partners from industry, they further enhance the chances for success.” (2; p. 30). The Focus Area’s End-User Involvement Plans are designed to foster such joint ventures and, further, to document the roles, responsibilities and commitment of each venture participant.

End-user input is absolutely necessary in Steps #5,11 and 13 in the process. At Step #5 the initial set of end-user technical requirements are established. These requirements are more completely detailed at Step #11, and formally validated by end-users at Step #13. The Site Technology Coordination Groups’ (STCG) needs statements are not intended to communicate the detailed technical requirements that a solutions must meet in order to be acceptable or useful to end-users. The documentation of a complete set of technical requirements requires extensive and detailed discussions between Focus Area staff and the end-users. Site officials have criticized the Focus Areas for providing generic, rather than immediately useful, solutions to their problems.(2). We believe the

documentation of detailed technical requirements with a great deal of input from end-users can correct this problem.

But, while a generic solution probably meets no one's needs, a solution developed to a detailed set of requirements will likely meet only one end-user's needs. This brings the discussion to one of the Focus Areas' most fundamental problems. Given the co-existence of similar needs and problems at multiple sites, and insufficient OST funds to tailor several specific solutions, which need is resolved? ...the most urgent? (How would "urgent" be defined?) ...the most immediate? ...the need that, when met, promises the greatest financial or political payback? ...a need the Focus Area has the best chance of success at fulfilling? ... a need for which an end-user is willing to co-fund a solution? While there is probably no simple solution to this dilemma, a site's willingness to co-fund the solution might be a good indicator of the relative urgency of the need, as well as a good predictor of the Focus Area's probability of success in resolving it.

In Steps #7 and 8, the alternative solutions identified by the Focus Area are evaluated, and a preferred solution is selected. The Focus Area and affected end-users evaluate the alternatives against a set of criteria, most of which are provided by the end-users. And, of course, end-users participate in the selection of a preferred solution.

In Step #14 end-users provide input to test plans, or similar documents, and review demonstration data to verify test plan objectives are met. Implementation of the solution, Step #15, is primarily the end-users' responsibility with assistance from the Focus Area.

The Solution Development Process, as we have documented it, is an idealized and somewhat simplified representation of a complex and difficult set of activities. Not all solutions proceed precisely through the steps in the order they are given. But the process is a valid conceptual representation of how the Focus Area conducts its work, and it becomes more the actuality as it is discussed and better understood both internally and with end-users.

PERFORMANCE MEASURES

If there isn't one already, there should be a management axiom that says: "Define success in your own terms or someone else will do it for you." The OST learned this last year when success was defined for the organization in terms of the number of its technologies that had been put to use in the DOE Complex. The term most often applied to this measure is "deployments" or "rate of deployment."

In its September 1998 report, GAO discusses technology deployment extensively as a research and development performance measure (2). The Office notes errors and inconsistencies in OST's reporting of deployment and attributes these problems primarily to the lack of a consistently agreed upon and applied definition of "deployment.." In August 1998 OST issued a clarification of the term as "...the use of a technology or technology system toward accomplishment of one or more site-specific DOE

Environmental Management program cleanup objectives as applied to the actual waste requiring management at the site.” (6). Earlier, the MWFA developed its own definition of deployment, which is discussed below.

Also, GAO discusses the limitations of deployment as a measure of R & D success, calling it an incomplete measure of OST’s performance. According to GAO “...a deployment rate measure would be most useful when applied to more mature projects. At the same time, program managers need to assess how successful the program has been at selecting early-stage projects with high potential for future payoff.” (2; p. 27).

In mid-1998, the Mixed Waste Focus Area established a set of performance measures, which do include deployment as the end-state measure of the Focus Area’s success in developing useful solutions to meet end-users’ needs. The end-users’ acceptance and use of Focus Area-developed solutions seems to be the only rational measure of the Focus Area’s success. The magnitude of the impact of solutions, such as cost savings, is frequently mentioned as a success measure for OST, and may soon be adopted by OST management. But the end-users’ acceptance and use of a solution is a prerequisite to its having any positive impact. Also, it can be argued that the magnitude of impacts is a better measure of the end-users’ success in identifying the right need, than as a measure of OST delivering the right solution.

The MWFA performance measures, which are still being refined and tested for their effectiveness, are based on indicators of end-users’ acceptance of the Focus Area’s solutions over the course of the solution development process.

Measure: End-Users consider the solution viable

Indicator: End-user(s) include the solution in a Site-Specific Deployment Plan or Disposition Map, the MWFA End-User Steering Committee confirms; end-users co-fund or provide in-kind support for development activities.

Measure: End-users verify the solution

Indicator: End-users include the solution in a Project Baseline Summary, Site Treatment Plan, compliance agreement, Environmental Impact Statement, Record of Decision, privatization preparation and evaluation, annual operating plan, end-state definition, ASTD Proposal, use for a treatability study or establish a procurement pathway for the solution.

Measure: End-users deploy the solution

Indicator: End-users at one or more sites include the solution in a facility configuration, operating procedure, organization policy, procedure, or requirement; or establish a procurement contract for the solution.

These measures are based on a fundamental premise that MWFA solutions must be integrated into end-user planning and commitments well before the time they are needed for use, or deployment, by the end-user. The steps through viability and verification to deployment represent successively greater degrees of end-user acceptance of each Focus Area solution. The indicators are the key to the measures. For an indicator to apply to a particular solution, an end-user must include the solution in a specific action, decision, or commitment (as described in the indicators) leading to deployment.

Earlier in this paper, it was noted that the definition of “deployment” is crucial to OST’s ability to generate reliable performance data across its programs. Much of the OST’s performance measurement nomenclature is based on the assumption that the organization’s products are self-contained hardware systems or sub-systems—a conventional view of a “technology”. The whole “Gates” process rests on that assumption (7). But the solutions to several mixed and TRU waste needs are not conventionally defined technologies. For example, the MWFA has completed experimental and modeling activities directed at increasing the amount of TRU waste that can be transported in the TRUPACT-II shipping container. Of such TRU waste that is currently not transportable to the Waste Isolation Pilot Plant, up to 70% will be transportable once the Focus Area’s results are implemented in the shipping container’s safety analysis report. In this case, the solution is an improved modeling technique and the resulting data.

The MWFA should be able to take credit for a “deployment” when the end-user adopts this solution as part of the TRUPACT-II safety analysis report. Therefore the Focus Area has defined “deployment” broadly enough to accommodate a variety of solutions including those not conventionally defined as technologies.

MWFA PERFORMANCE

The Focus Area initially gathered data for the performance measures in June 1998. Each Product Line Manager analyzed the solutions for which he or she is responsible against the indicators. Each solution was categorized as “viable”, “verified” “deployed”, or as fitting in none of the three categories. Figure 2. provides a profile of the results. The profile’s bottom tier represents 100% of the Focus Area’s solutions. In June 1998, 72% of those could be tied to at least one of the indicators for end-users considering them viable. End users had taken actions toward 26% of the total that allowed those solutions to be categorized as verified. And 14% had been deployed as defined above. In establishing the baseline, if a solution could be categorized as verified, it was also placed in the viable category. If a solution has been deployed, it was also assumed to have been verified and considered viable by end-users. It may be worth noting that the Focus Area’s determination of 14% of its solutions having been deployed is consistent with GAO’s estimate of OST’s overall deployment rate at 12-18%.

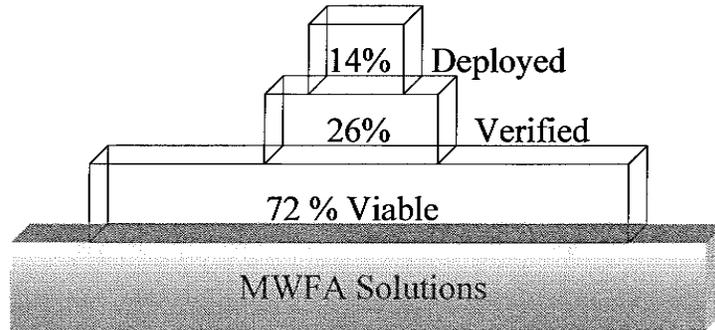


Figure 2. MWFA Performance Measure Data as of June 1998

The purpose of taking these measures periodically is to give the Product Line Managers a way to visualize the change in status of solutions over time in terms of end-user acceptance. The profile established in June 1998 shows a relatively large “gap” between the proportion of solutions considered viable and the proportion that had been verified by end-users. This focuses management attention on where time and energy should be expended to sustain momentum toward deployment. What Focus Area or end-user actions are necessary to get a solution included in the appropriate Project Baseline Summary, or one of the other indicators of end-user verification? Improving this gap requires Product Line Managers to work closely with end-users to increase their knowledge of and confidence in solutions that may be viable but have not been verified

The purpose is not to establish a cumulative track record of performance. The periodic snapshot of performance also directs management attention toward those solutions that are not moving up in the tiers of end-user acceptance. Solution development projects that sit too long at a tier are candidates for elimination. If the need still exists, however, a new more acceptable solution should take its place in the development process.

CONCLUSIONS

The Mixed Waste Focus Area views end-users as its most important stakeholders. This is not a new idea in the program; end-users were heavily involved in establishing the program's initial technical baseline and its subsequent revision. The technical baseline activities aimed primarily at identifying and prioritizing DOE's most important mixed low-level waste and mixed TRU waste problems. With emphasis now shifted toward solving the problems, the Focus Area is inviting end-users to become engaged in the solution development process. The Focus Area's efforts to better engage and involve end-users are consistent with stakeholder involvement principles. In keeping with these principles, the Focus Area has documented how it makes decisions and conducts its work, and invites end-users to become involved. End-users have the opportunity to become involved early in the development process, in activities such as alternatives selection and requirements development.

Focus Area Management has established a policy requiring project-specific plans for involving end-users in the Focus Area's activities. End-users are engaged in developing these plans, which describe the roles and responsibilities of the Focus Area, the end-users, and other entities in developing solutions to mixed waste problems.

Finally, the MWFA is defining success based on end-users' acceptance and use of its solutions. In order to succeed as gauged by these measures, Focus Area product line managers must work closely with end-users to ensure that Focus Area solutions are integrated into end-users' planning and decision processes.

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