STRUCTURED PUBLIC INVOLVEMENT: PROBLEMS AND PROSPECTS FOR IMPROVEMENT

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Abstract

Public involvement in transportation planning and design has a problematic history. This situation has arisen both because professionals lack access to a coherent, organized method for communicating with the public, and because some important principles of public involvement, known to community design professionals, are still being discovered by transportation professionals. This paper proposes a protocol named Structured Public Involvement (SPI), which is designed to ensure that public involvement is meaningful to the professional and the public. This paper sets forth principles of SPI and a details series of steps useful in engaging the general public in a complex design or planning problem.

SPI aims to be transparent, accountable, democratic, and efficient. SPI situates the use of technology within a public involvement framework built on community design experience. While technology, in the form of visualization tools, decision modeling, and computer-aided facilitation, can be useful, it must be placed in social context. That is, various technologies are employed for their ability to address problems in the public involvement process, such as lack of access to information, inconvenient and time-consuming meetings, confusing terms and graphics, and one-way communication. Highlights and examples are drawn from practical experience, where SPI protocols have been designed and used to solve problems of route planning, highway design and transit-oriented development. While each problem set called for a different mix of technical tools, the protocol within which those tools were used was the same, with similar encouraging results. Using SPI, public participation is less contentious and more informed and the professional has much higher quality information with which to begin the design process.

Structured Public Involvement: Problems and Prospects for Improvement

Typical Problems and Issues with Public Involvement in Transportation Planning

While public involvement in the transportation planning process is espoused as a desirable and necessary goal (*1,2*), its realization is a more complicated matter. As far back as the early 1980's, transportation professionals were predicting the inevitability of greater public involvement, and the need for better training of engineers to accommodate that potential (*3*). The contrast was drawn between the 'hard' sciences of engineering and planning and the 'soft' sciences of psychology and sociology. The problem was one of professionals being trained to develop the correct technical answer, and not being trained to solicit or process input from nonprofessionals (*4,5*). While transportation research continues to call for public involvement in large-scale planning exercises, it sometimes fails to include detailed consideration of that aspect while describing thoroughly all other phases of the planning effort (*6*). Alternatively, if there is an organized effort to gather public input on a planning design, the input may be ignored either because it is seen to somehow interfere with the process of gaining acceptance of the plan itself (*7*) or it becomes characterized as a failure in that it led to 'loss of management control' (*8*, p.98).

Once the commitment to public involvement is made, problems still persist. Sometimes the main disagreement might not be between the public and the professional, but among various members of the public, who have a variety of interests in a given project (*9*). Those disagreements can even become formalized, so that they reproduce themselves over and over again in the form of a Citizens' Advisory Committee in a form of permanent dysfunctionality (*10*). Perhaps in reaction to this, efforts have been made to identify the 'proper' public for a given project (*8*).

A significant question that emerges in practice is the question of the 'level' or 'quality' of engagement with the public. While Arnstein (*11*) famously pointed out the question of degrees of involvement many years ago, it remains a perplexing problem (*12*). Professionals face a dilemma: long-term engagement in an extended planning process taxes the patience and time reserves of most citizens, resulting in poor levels of engagement or dysfunctional interactions. Thus the recommendation is made to limit the scope of public involvement to specific recommendations and issues (*10,13,14*). However, focusing citizen attention on specific, near-term goals and projects often means the practitioner must invest more time in the details of those projects because the public demands more information and considers more issues in making a decision (*15*). Frequently, professionals are surprised that public groups do not 'run themselves', that is, the participants in a public meeting do not spontaneously arrive at a unitary decision. In these cases a frequent *post hoc* recommendation is to engage the services of a facilitator or other process leader when working with the public.

CHALLENGES TO PRACTITIONERS

In a recent summary, O'Connor and others (*16*) listed the following public involvement challenges to transportation professionals:

- Changing organizational cultures to embrace public involvement
- Ensuring a broad-based audience and improving communication tools
- Dealing with increasing complexity of problems

- Maintaining engagement over long term
- Developing standards and assessment tools for programs
- Developing professional standards and training programs

Clearly, the challenge is to create a long-term, deeply-rooted facet to transportation planning that includes the public in complex decision-making. To help make this happen, they list the following principles as guidance:

- The public must be involved instead of marketed to
- Dynamic two-way communication must be established
- The process must be inclusive of all stakeholders and create mutual understanding
- Respectful communication becomes the norm
- Early and continuous engagement occurs
- The decision process is defined, structured, and transparent
- Agency leadership provides resources to enable the process.

This review presents significant but clear challenges, and laudable goals that, if realized, would move us some way toward meeting those challenges. To make the next step, though, we turn our gaze to a field that has a long track record in public involvement: community design.

Community Design Principles

Community planning and design (CD) has been an active field since the 1960's, mainly focusing on urban planning and architectural design. However, CD professionals deal with the same sorts of problems as are faced in highway design and other transportation related developments i.e., large public infrastructure projects that must meet the varying needs of a broad range of user groups over many years and in many contexts. In response to these challenges, CD professionals have developed some useful observations.

No design is too complex for the public to participate in.

This is typically a difficult principle for professionals to accept. It contradicts the notion that the expert has the 'right' answer and public involvement exercises are a delay or detour on that way to that answer. Such an attitude on the part of professionals will most effectively derail public involvement. It almost inevitably generates solutions regarded as unacceptable and increases hostility towards, and mistrust of, all planning professionals and related processes. Indeed, in this regard, Arnstein's work and a range of subsequent studies point to a deep public cynicism born out of long years of experience of badly-managed or non-existent public involvement.

Users are neither in complete agreement nor complete disagreement.

People are not all the same (meaning the professional cannot assume there is a unique solution everyone will like) but they do share values and views that can form the basis for increased understanding. The professional cannot expect or demand consensus, but she can expect, with the proper techniques, to increase mutual definition and understanding of a problem. Such an approach lays the groundwork for solutions that the public can understand the rationale for, even if they don't agree to them. A corollary of this, regarding assessment and benchmarking of design processes, is to measure 'success' by the extent to which participants are included, and listened to, even when their chosen outcome is not favored - instead of trying to evaluate technically whether the ‘best’ solution was reached.

Participation requires time and effort.

Engaging repeatedly with the public over one project may make the public participation effort seem overly labor-intensive. However, this process may well head off other, more litigious futures. A successful participation effort yields the immediate project, and it enhances the ability of the community to do it again the next time. Because the general public may not see any particular reason to engage in public infrastructure questions, the sponsoring agency must invest the time and effort to include them in the discussion. Meetings with churches, civic groups, and clubs all give people a chance to ask questions first hand and develop their knowledge base. Even large and potentially unruly public meetings can be successful if they are well-planned, democratic, and efficient. The sponsor can gain legitimacy by successfully hosting such meetings, instead of having them turn into ‘karaoke night’ i.e., an event where individuals march to the microphone and berate the sponsor in front of an audience.

The public can be frightening to professionals.

Particularly when they are untrained and unprepared to pursue public involvement, professionals can be creative in finding ways to avoid it. However, professionals do have a distinct role to play in the design process. It should not be assumed that public involvement means turning the entire design problem over to the public. Indeed, one of the most significant challenges is to work with relevant coalitions to define cleanly the scope of design and planning issues that are the domain of the public, and how they should inform the design process of the professional(s). Once this domain is established, it becomes easier to frame clear and meaningful questions that can then be used to solicit genuine public input.

More participation is better, and always a struggle.

More participation is better because, if the last issue has been successfully solved, it will give the designer more information to work with and help get her closer to the most favorable designs. Gaining that participation is a struggle because people have lives that are more immediate to them than esoteric design problems. People will generally choose to become involved when either a) they see a significant potential for personal gain or damage, or b) they see that their ideas actually matter. If the personal stakes are high, they will participate even if the odds of their view prevailing are slim. If the personal stakes are lower, they will only participate if the odds of their ideas being heard are higher. Thus a process that is broad based and inclusive, and that can accommodate many participants, will gather a higher proportion of moderate, ‘person on the street’ views than a highly restrictive and inaccessible process.

STRUCTURED PUBLIC INVOLVEMENT (SPI): WHAT IS IT?

The foregoing discussion helps focus our attention on issues critical to successful public involvement. As a response to these needs, this paper sets forth the principles and assumptions of *Structured Public Involvement* (SPI) and, through case studies, shows how SPI can serve as a framework for professionals.

Structured Public Involvement (SPI) is a protocol for organizing the integration of professional and non-professional input into complex infrastructure design problems. It has been developed over time through related research projects and problems that involve a wide range of stakeholder groups in transportation planning and design. As applied to the transportation problem, it consists of a set of linked processes and tools. These allow the professional to access public planning and/or design preferences to guide her in creating solutions with a high level of technical, financial, and political performance. SPI is not a single process that is applied as a template to all design problem types; rather SPI is the set of guidelines and assumptions that structure the specific combination of dialogic processes, decision modeling tools, and visualization tools most appropriate for a given problem situation. It relies on the judgment of the professional in terms of selecting its specific procedures and techniques, arranging and detailing meetings and so on.

The core principles of SPI can be described as follows:

- SPI repositions the planner/designer as a consultant and facilitator to the design process.
- Language differences across the planning/design domains are reconciled to ensure meaningful input. This is important when choosing suitable technologies.
- The planning/design domain should be completely defined and the public's position in that domain clearly delineated *before* shaping contact processes.
- Public input should be generated and documented prior to the initiation of the process of creating designs or plans.
- The combination of methods and techniques chosen should give the public ownership of the process and increase their confidence in the legitimacy of the outcomes.
- The method of generating and documenting public input should be efficient, accurate, and transparent to the public.
- Each facet or step of the plan/design should show how it is accountable to the preferences or inputs of the public, thereby demonstrating the quality of the professionals' response to public input.

SPI IMPLEMENTATION

Creating a Structured Public Involvement protocol typically involves a set of sequenced work phases.

i. Definition of the scope of the design or planning problem.

The ultimate goal to be reached, problem to be solved, or conditions of successful resolution must be clearly established and communicated effectively between all involved parties. Forester refers to this as 'making sense together' (*17*, p.125). This step is important to avoiding getting trapped in an either/or solution environment in which opposing groups increasingly define their identities through advocacy of opposing design options. In such a case, conflict can be perpetuated even after the completion of the specific project. This can be challenging and contentious, particularly with large-scale projects that require the input and cooperation of a wide range of stakeholder groups. Nevertheless, time and effort spent on an accurate and multi-stakeholder scoping is not wasted.

ii. Definition of the parameters of the design or planning problem.

If the problem is one of highway routing, for example, what is the nature of the routing problem? Is it primarily a rural, natural feature avoidance issue, or an urban environment where the built environment will be of greater concern? To the best of the professionals' knowledge, what, specifically, are those design parameter questions likely to be? While planning, design and engineering professionals have a big role to play, these professionals must also be alert, at this stage, to potential problems with their characterization of these parameters. Preliminary outreach should already be underway to sample opinion and needs. For example, if a new highway project is determined by planners and other professionals to be primarily about resolving congestion, yet the road users and communities in that location do not see this as a significant problem, there is potential for a disaster. Professionals can be alerted to these signs by taking commonsense measures, such as ensuring that a range of representative organizations has a voice in determining problem parameters.

iii. Definition of the decision terrain.

What portion of the problem is legitimately to be under public consultation? Perhaps John Q. Public cannot and should not be expected to pass analytic judgment on whether to route a road across a bridge or around a gorge based on its technical difficulty, but he can provide input on the value of the various environmental features that might be damaged by either option. While some areas will remain in the domain of the technical expert, these limitations should be identified, and explained, to the public and other concerned parties.

In the case of an urban transit-oriented design problem, architects and project sponsors realized that fundamental questions of housing density, building height, and open space style were important to the residents of the neighborhood. The careful solicitation of public preferences and the multi-dimensional modeling of those preferences gave architects a much clearer set of parameters within which to begin their designs (*18*).

Also, at this stage, benchmarking and evaluation procedures should be established that allow the professionals to gauge the extent to which their solutions satisfy the declared objectives. Without this feedback mechanism, professionals cannot hope to know where the involved parties believe process improvements can and should be made. We believe that all parties will welcome such benchmarking: it helps professionals to improve the process, and at the same time it gives the public confidence that professionals are truly responding to their input, rather than the reverse.

iv. Creation of the public solicitation and decision modeling process.

Once the designer has determined what kind of public input she wants, then the building of a process to gather that information can be pursued. It necessitates careful engagement with the design professional to define the terms with which she will solicit input from the public. In the case of a highway routing problem, that takes the form of a series of workshops where the public can offer the landscape features that are relevant to the routing decision, and then supply the valuation information about those features (*19*). In another problem context, it may be the development of a design language that allows architects to show and discuss design options to the public, and then gather preference information from them after that discussion (*18*). In each case, appropriate and advanced technologies can be identified and integrated into processes for which they offer maximum benefit.

In common with many professionals, we believe that advanced technologies of visual and spatial analysis, decision modeling, facilitation and so forth can make significant contributions to improving public decision making. But they must be made responsive to, and not be determinative of, public involvement processes. We note that because this SPI approach begins with identifying the decision environment and specifying the design question at hand, and then selecting the appropriate technology and methods to suit these factors, it can be contrasted with what we term 'uncritical technological advocacy': that is, the blanket adoption and use of a specific technology, usually in response to a perceived pressure from peer groups of professionals. This uncritical advocacy rarely improves public involvement processes. Instead it tends to reinforce knowledge divisions between professionals and participants. For example, the uncritical adoption and use of GIS during the 1980s and 1990s by planning professionals has been roundly criticized by social scientists and practitioners for exactly this reason (*20,21,22*). But without genuine public involvement in determining the context within which GIS is to be used, it should not be so surprising that its capacities for improving public involvement and decision making have remained largely unrealized (*23,24*). SPI's flexible approach to technologies means that professionals should not be frightened to make use of apparently low-tech means where these are appropriate: for example, whiteboards, stickies, magnetic wall cards and lines on pieces of paper can all be effective decision support aids.

SPI emphasizes the social context of technology. The technologies must be embedded in public involvement processes that are appropriate to the needs of the community being served. For example, in low-income, minority urban communities, it is not helpful to arrange daytime public meetings at City Hall. Residents may not have the time or the means to attend: more likely, they work low-wage jobs with inflexible hours and overtime/night shifts. This does not mean that they do not want to participate in deciding how their neighborhood is to be transformed, or whether such a transformation is necessary. Ethically, a public involvement process in such neighborhoods should recognize these realities. Professionals can respond by designing the process to minimize time demands on participants, subject to obtaining necessary design information, and by making these forums available in local community meeting places, such as churches, middle and high schools, and other public locations found in the neighborhood to maximize incentive and opportunity for public involvement. This geographic requirement means that the technologies must be made portable and also that efficient ways to use them in small forums must be found. For example, in the case of the visual modeling case study, laptops, projectors and a portable electronic voting system were used to allow small meetings to be held repeatedly, easily and effectively in a variety of locations (*18*).

v. Generation and documentation of the public input for use by the design team.

It is critical to the SPI process that the public input be rendered transparently and the design team be able to show clearly how their designs reflect publicly documented input. This does not mean that the public inputs necessarily define the entire solution. In most cases, the guidelines provided by public input help to focus the solution set and help the design team recognize and avoid unpopular solutions. In fact, as the problem becomes more complex, the designer may appreciate some guidance in narrowing the range of options and thus avoiding embarrassing public meetings where honestly developed alternatives are unexpectedly condemned. Such documentation is useful for assessment and evaluation purposes as well as for knowledge transmission to other professionals and concerned parties. Where possible, such documentation should be made publicly available in multiple formats: web sites, printed information and other visual media can all play a role.

vi. Design of preliminary alternatives.

Unfortunately many public involvement processes begin with presentation of design alternatives. By contrast SPI holds that the design process can only begin once the public aspect of the design problem is understood. With SPI, participants will already have documented much of their input and preference information, and, while some design may seem superior to others, the underlying rationale for the designs can be linked back to the public participants and evaluated by them. This sequencing means that involved parties cannot disassociate themselves from solutions they had a hand in identifying, and even then, if they still do not like what they see, this opens the door for discussion and reconsideration before significant sunk costs and other organizational inertias begin to take control of the design process. It is true that communities can sometimes be surprised that they do not like what they had a hand in shaping in the first instance. However, this realization can provide an excellent springboard to a higher level of engagement by making explicit the reasons they do not like a design, and then establishing a more effective set of design criteria.

vii. Review, revise, redesign.

Once the initial designs are available, they can form the focus of the conversation between the professional and the public. Rather than the professional defending her designs, she can discuss with the public how well each of them meets different needs documented for the public and introduce her skill as a designer in helping to meet those needs creatively. Revisions can be made in partnership with participants. This process inevitably involves a significant degree of iteration. These repeated engagements with the community allow meaningful design refinement but they also establish trust in the process.

One potential hazard here is too great an attachment on the part of the professionals to the initial design solution. This attachment can impede further dialog and introduce friction into community focus groups if participants sense professional resistance to ‘their’ ideas. People can sense when a design process begins to slip down Arnstein’s ladder. It is therefore very important that the professionals accept this necessity up front and design a process that accommodates significant public iteration even after the first potential solution sets have been identified. This brings us to one final but significant point. As a more holistic approach that can (sometimes) challenge the established way of doing business, either in its sequencing, or in the participant mix assembled at each stage, SPI requires careful explanation of each step, not only to the public but to all other involved parties including professionals. We have observed significant attitudinal shifts in professionals once they understood and accepted the information the SPI process was providing them. Public preferences simply became one more aspect of the overall design problem.

CASE STUDY LESSONS

Three case studies illustrate how several of these SPI principles were applied to the use of specific technologies and how the lessons learned were applied to subsequent improved SPI implementations. Although issues of scale, timeframe and other aspects of the question at hand gave public involvement a different shape in each case study, each project dealt with a representative challenge for transportation planners. Each project lasted approximately a year and involved a wide cross-section of the transportation user community: State officials, community organizations, residents, interest groups, commercial entities, commuters and so on

(*1,2*). These cases highlight important aspects of the use of technologies. They reflect the team's growing understanding of the principles demanded for sucessful SPI implementation.

The first case study describes the design, evolution and application of a GIS/multicriteria corridor route planning methodology called Analytic Minimum Impedance Surface (AMIS) (*25*). AMIS situates both GIS and multicriteria decision theory as enabling technologies in participatory highway corridor evaluation. The capacities and previous uses of the two significant technologies are evaluated together with their theoretical shortcomings. Dialogic principles of the process that were intended to facilitate public involvement are discussed, the modeling process is described and the weaknesses are identified.

A local State Highway Agency (SHA) requested a decision support methodology to facilitate choice of a route corridor for a proposed Interstate highway connector in the southeastern U.S. The task appeared challenging because highway corridor alignment presents a highly complex decision environment in which a variety of social, environmental and economic factors must be defined and weighted and tradeoffs evaluated. These data vary widely in format and quality. It was considered important to structure and incorporate useful input from a range of stakeholders, including SHA employees from various divisions with separate but necessary remits, such as Design and Environmental, and other transportation professionals from the public and private sectors and public forums. The chosen decision support methodology was intended to assist participants, often with competing interests, to determine criteria of significance, assess the importance of each criterion, quantify tradeoffs between criteria and then locate these criteria geographically in relation to one another. GIS was used, and in conjunction with a multicriteria decision method, it functioned both as the analytic engine for computation of the 'minimum impedance path' and the display medium.

The process began by establishing a specification for the corridor-planning method. A range of SHA officials from various divisions then participated in a series of facilitated meetings to discuss the goals of route planning and the objectives of this new development, and to determine how the Interstate would accomplish this. Participants required that these goals be derived from the FHWA Purpose and Need framework (*26*). Meetings of this type are not customarily held between lower-level functionaries in these departments. This sharing of views allowed each department to appreciate fully the value systems and challenges faced by other departments in the same organization. The list of environmental features was drawn up by asking each department which elements were important to them, aggregating these and tabling them for group discussion so that overlapping choices could be removed.

The weighting of the elements was a two-phase operation. First the mean elemental impedance was computed on a scale from 0-10 points using linear scales, then the elements were clustered into affinity groupings and the relative importance of the affinity groupings was gauged. The Analytic Hierarchy Process (AHP) multicriteria decision methodology was used to trade-off relative affinity grouping importance (*27,28*). HIPRE web-based Java client software was used. This allowed dynamic sensitivity analysis. Participants were able to ask 'what if' on the spot, and by changing the relative priorities they could observe the results changing in real time. Seeing the outputs vary in real time helped all participants understand how AHP worked and what it could accomplish. This iterative priority setting process led some officials to modify their preference hierarchies, believing that weightings traditionally assigned to various factors through custom and practice were inappropriate to this application.

At each meeting the results of the previous meeting were reviewed and commented on before moving to the agenda. To the surprise of many participants, one significant outcome of the group dialog sessions was the revelation that almost every division considered National Historic Register properties to be the most undevelopable feature. This was not predicted before the structured group process began.

In this case both the technologies were made responsive to the group situation. In large and diverse groups, whose members possess widely differing backgrounds and levels of training, it is not helpful to demand that all participants understand the methods intimately. Instead, the data requirements and operation of the advanced technologies must be managed in such a way that input is facilitated and output can be easily (if possible, intutively) understood. Both the GIS output and the AHP software performed an iterative function. Although the alternative route analysis was generated analytically, the output was in the form of a geovisual path through the GIS-created decision landscape. Since the data layers could be included selectively, this allowed officials to view where the minimum impedance path was located relative to topographical and physical geographical features contained in their own mental maps. This helped them understand the implications of their selections and led to further discussion about the goals and priorities of highway routing.

The second case study situated computer visualization as an enabling technology within an SPI framework. Potential highway improvements in a rural context were to be assessed using computer visualizations. A methodology to provide guidance was developed and used to present and analyze sets of visualizations. Initially, the Virtual Reality (or VR) visualization mode was selected for its dynamic, real-time simulation potential. It was proposed to use this mode to evaluate a range of highway corridor design options. However it became clear from focus group feedback that consideration of visualization properties was more complex than the research team had anticipated. This discovery led us to examine the efficiency of visualization as a participatory technology in more detail. In turn this analysis allowed us to identify a set of factors that affect the efficiency of visualization when implementing SPI protocols that rely on this technology: for example, the participants' previous experience with visualization affected the way they understood the scenario being presented, and it affected their comprehension of the design options being shown in each case. In one case, people with no previous visualization experience preferred the 3D renderings while those with more computer visualization expertise preferred the more computationally demanding, but visually less precise, Virtual Reality format. Accordingly, the team redesigned the process. First we tested preference for visualization mode (as opposed to design scenarios), used this information to select the preferred visualization mode (3D) and then used this mode to evaluate potential designs. A small range of visualizations was presented and analyzed using the Casewise Visual Evaluation (CAVE) methodology.

Although the CAVE methodology demonstrated its feasiblity and performance, one problem was that several of the parameters for highway design were governed within narrow ranges (by the AASHTO Green Book).[1] Based on the premise that it is more effective to give participants as much ownership of the decision domain as practicable, the team believed that a more effective and appealing overall process would result if elements of importance were solicited from participants and used as input parameters. Logistical constraints prevented this being achieved during this project; however this lesson was applied to the subsequent SPI implementation.

A third SPI process involved a complex decision environment in an urban context. A metropolitan transit organization wanted to involve local residents in determining preferred

[1] See the team's earlier reference for more details on the technical aspects of this process and more information about the relevant highway design characteristics.

design characteristics for a forthcoming light rail transit-oriented development (TOD). The CAVE methodology was selected.

The TOD locality comprised a low-income, minority community. The team determined that meetings at city hall, or other downtown venues, would be exclusionary because many of the residents worked low-wage shift jobs and could not afford the time or the money to attend. The process was required to gather the maximum useful information in the shortest realistic time. Therefore, in consultation with the sponsors, a flexible outreach and public involvement process was designed. A variety of local and highly accessible venues were used to host a series of relatively small public focus groups consisting of between 12 and 28 participants. Meetings were held after working hours. A portable computer with projection screen was used to present a range of stock TOD images and an electronic voting system was used to gather preference feedback on each image. Out of respect for participants' lives the total meeting time was kept to two hours for each meeting, and the number of meetings was restricted. The process was required to gather the maximum useful information in the shortest realistic time.

The electronic polling system allowed input to be gathered rapidly, fairly and anonymously. While electronic voting systems by themselves do not enhance democracy, they do allow meetings to be held in certain ways that would otherwise be impossible. During the two hour meetings demographic information such as age and residence was collected, and over 20 preference votes were held. With 28 participants, this allowed collection of over 600 data points in a two hour meeting even with the majority of the time dedicated to discussion rather than polling. Also, the system showed participants their voting results immediately on the screen. This immediacy averted classic suspicions of 'black box' policy making in which citizens spend time and energy offering inputs at forums, only for this data to disappear for an unspecified time, and then be used in unspecified ways by unknown analysts and policymakers.

Following the series of meetings the results were aggregated and input into the CAVE model. Architectural experts and planners were consulted and the most significant design parameters were identified by means of a participatory group process. These primary design elements were used as model inputs: building height, density, open space type, architectural building character and parking space. The CAVE preference modeling methodology allowed the team to define how public preference responded to any possible combination of these elements. Participants were also asked to identify important parameters that they felt the research team had not considered. These comments were taken on board at the meetings using flip charts and, where possible, these parameters were incorporated into the visualization model. For example, the research team had not considered that the building material would be a key preference determinant. However, almost all participants at several forums voiced the opinion that because brick was the predominant material in the neighborhood, any new construction should follow suit. Therefore the final visualizations were created using brick facades. The combination of quantitative decision modeling methods and qualitative, verbal input maximized the participants' sense of involvement and control of the process.[2]

For all public processes that extend over time and require several meetings, perhaps in different locations, it is not realistic or practical to assume that the same members can or will participate each time. Although every meeting is part of a cascade that forms a larger process, it is also incumbent on professionals to design meetings so that they can function effectively taken singly. Therefore, obtaining useful and meaningful input from participants must not depend totally on their previous attendance. To accomplish this the team designed each meeting as if it

[2] The technical details of the CAVE methodology are explained in another paper (*19*)

were the central data-gathering opportunity. No previous knowledge of goals or methods was assumed. Also, the team ensured that each meeting began with a summary of the previous meeting and an explanation of its results. The meeting closed with an explanation of what would happen at the next meeting and where the team had reached in the design process. A written report detailing the previous meeting was distributed to all participants. These measures, while straightforward, were appreciated and helped the design team achieve its objectives.

In their post-process evaluations the attendees noted how much they appreciated the research team keeping participation demands to a minimum (*18*). In this demographic context the team's SPI approach maximized public access, and equally importantly, it reinforced the participants' opinions that the technical experts and the chosen technologies were serving their interests rather than vice versa. It also made maximal use of the sophisticated decision theoretic and visual analytic methods developed previously.

In these projects and others, SPI has indicated clearly its potentials (18,19,29). It is seen to improve the quality of specific design decisions, but more importantly, it actively builds civic capacity (that is, willingness to participate in public decision-making) by increasing confidence in the professionals and the processes undertaken. This is particularly important since confidence in technologies and their properties cannot be separated from the mode of their deployment. After all, a 'good design' is not one that maximizes use of technologies for their own sake nor is it one which is only responsive to a small cadre of professionals and their criteria; it is one in which as many participants as possible feel that they have been treated fairly and equitably by the professionals, and in which the final design is seen by all involved parties to be a direct product of such a process. Given the highly problematic history of public involvement in the transportation field, SPI is intended to move one step towards this desirable and highly challenging goal.

SUMMARY

This protocol answers a number of the issues raised in reviews of public involvement problems. Its strengths lie in the structured, yet flexible approach to involving the public. The word 'structured' in the term SPI should not be taken to represent inflexibility or a strategic control of the goals of public involvement; rather, it structures the professionals' role in the process. SPI subtends a shaped, formalized process that specifies agreed analytic objectives and proposes concrete and suitable means to maximize real public input and improve the quality of the engagement forums. SPI can be contrasted to 'unstructured' public involvement, which almost all practitioners and other involved parties can recognize as an unfocused and untheorized response to calls for increased public involvement i.e., more public involvement equals more meetings, but with the same people using the same methods this often generates the same undesirable results that prompted the calls for 'more' in the first place.

Rather than dictating a rigid set of procedures to follow, SPI specifies a minimum performance standard to be attained regardless of the procedures being considered. It can thus be applied successfully to a wide range of problems using traditional or high-technology-assisted dialogic techniques, with a variety of decision and preference modeling approaches, and with a mixture of two-, three-, and four-dimensional presentation tools. Table 1 highlights some outcomes of an SPI protocol.

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List of Tables and Figures

TABLE 1 SPI Outcomes

Outcome	Rationale for outcome
Fosters broadbased participation by explicitly accommodating large and diverse input	SPI allows large numbers of people to be involved in the process through the facilitated preference mapping and scoring exercises. SPI accommodates complexity, yet does not abdicate design responsibility unduly to the public.
Predicated on early engagement	Early involvement of the public is necessary to give professionals adequate guidance in the creation of first designs.
Provides accountability by tracking shifts in public preferences	The ability to efficiently and accurately track public preference means that public input cannot be easily ignored or confused. Just as other specifications of a design problem are documented, so is public input and preference.
Enhances two-way communication by requiring a dialogic approach to problem understanding and solution development. Helps eliminate language differences.	It requires the professional to explicitly develop an interface and methodology for engaging the public and quantitatively documenting their input. The problem of language is often cited and seldom addressed. SPI takes this as a central problem and builds the public input process around the creation of common languages, verbal and visual (see below). This is essential for the professional to understand what the public is trying to say and to give the professionals meaningful design guidance. In other words, simply discovering and documenting that the public finds one design option ‘unacceptable’ is not very helpful. We must try to understand *why*, or what, specifically, is the feature within the design option that participants do not like, and to what extent they do not like it, and further, to what extent do other design aspects mitigate or exacerbate this preference?
Uses a variety of communication/analysis tools	Because communication is typically a major barrier between professionals and the public, SPI protocols employ tools to provide more intuitive understanding of the nature of the design problem and the solutions. GIS, photography, models, and virtual reality can all be used to help explain and query the public regarding the nature and impact of various problems and solutions. In one case a GIS may help portray the complexity of landscape features under consideration. In another, the use of rendered 3D landscape images or even Virtual Reality (VR) models of a design problem are most appropriate. Nevertheless, in all cases, the professional(s) must recognize the value of meeting the public on the terms they understand, instead of expecting them to interpret engineering drawings, architects’ plans, or marker drawings on an aerial photo.