Type III Error in Social Problem Solving: Application of the Analytic Hierarchy Process (AHP)

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TYPE III ERROR IN SOCIAL PROBLEM SOLVING: APPLICATION OF THE ANALYTIC HIERARCHY PROCESS (AHP)[*]

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ABSTRACT

A diverse group comprising the University of Georgia, Athens; Tuskegee University; and community-based organizations undertook to develop an organization modeled after a federal commission to address persistent poverty in the Black Belt Region (BBR). In spite of objective data describing poverty in the region, each stakeholder viewed the problem differently. As a result, two different legislative initiatives were designed to address the problem. Competition and disagreement among the stakeholders fueled a rush to formulate a solution without first investing sufficient effort to define the right problem. Failure to define the right problem could lead to a Type III error: solving the wrong problem. For the present paper, we employed problem-structuring theory to analyze, a posteriori, the activities of the Black Belt Initiative (BBI). We then used insights from that analysis to formulate an alternate approach for devising a solution that would likely reduce the probability of a Type III error.

The Black Belt Region (BBR) is a crescent-shaped region of eleven states in the Southeastern United States (Arkansas, Tennessee, Mississippi, Louisiana, Alabama, Georgia, North Carolina, South Carolina, Virginia, Texas, and Florida). The region includes 642 counties within those eleven states where persistent poverty remains a chronic problem (Wimberley and Morris 1997). The term Black Belt was first used by Booker T. Washington to describe the rich black soil of the region. Today the term is used to refer to those counties in eleven southeastern states with African-American population that is equal to, or greater than, 12 percent (Wimberley and Morris 1997). In this study, the term Black Belt Region (BBR) is used to describe this eleven-state region. In the fall of 2001, a coalition of community-based organizations (CBOs), the University of Georgia Athens (UGA), and Tuskegee University (TU) (representing 1890 institutions[1]) conceived an initiative to address chronic poverty in the BBR. This coalition was called the Black Belt Initiative (BBI). UGA was the lead institution on the study project. Upon learning of the efforts of the coalition, the U.S. Congress, under the auspices of Senator Zell Miller's office, gave UGA a grant of $250,000 to study the feasibility

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[1] The Morrill Act of 1890 established land-grant colleges to provide education for African Americans.

of creating a federal commission to address persistent poverty in the BBR. A Georgia businessman gave a matching award of $250,000.

STUDY METHODOLOGY FOR INVESTIGATING THE FEASIBILITY OF A FEDERAL COMMISSION

The plan for conducting the feasibility study, developed by UGA, focused primarily on collecting data on economic development and demographic issues and was designed to employ traditional research techniques to gather quantitative data. Further, the study plan included only seven of the eleven states making up the Black Belt Region (BBR). The BBI working group was especially ill-at-ease with the lack of strong community outreach and participatory research components, and the exclusion of people in Black Belt states from active participation in the study. In response to the concerns of the BBI members, UGA expanded the terms of the study to include both community outreach and participatory action research components, which were to be implemented by TU along with its 1890 and CBO partners in the BBI.   Tuskegee used a combination of participatory focus group, case study, and survey methodologies. The TU study focused on identifying issues (i.e., community-based efforts and infrastructure dedicated to addressing persistent poverty; education; business development; health; and community development) as well as successful programs and service delivery models. The TU study also solicited opinions regarding the need for, and design of, a federal commission that would administer federal and private resources dedicated to addressing the problem of persistent poverty in the BBR. The UGA study focused on only six of the eleven states, accounting for 242 counties, whereas the TU study covered all 642 counties.

UGA, in their portion of the study, conducted a series of state meetings with government agencies, businesses, development centers, non-government organizations, and local development districts to solicit their opinions on: the nature and impact of persistent poverty in the region, the role of a federal commission in addressing persistent poverty, and the structure and feasibility of such a commission (Carl Vinson Institute of Government 2002). UGA was to synthesize its findings along with those of TU and present a report with recommendations to Senator Miller.

In the above studies, poverty was defined to include individuals with annual earnings of less than $8,667 in 1999, or families of four with a 1999 income of less than $17,029. A poor county is one in which a high percentage of the residents are living in poverty according to this definition. And a county is described as suffering from persistent poverty if a high percentage of its residents live in poverty over a

long period, which the study delineated as covering the period from 1980 to 2000 (Carl Vinson Institute of Government 2002).

FINDINGS AND RECOMMENDATIONS OF THE TUSKEGEE UNIVERSITY AND UNIVERSITY OF GEORGIA, ATHENS STUDIES

The findings of both studies (Carl Vinson Institute of Government 2002; Tuskegee University 2003), suggested that there is persistent poverty in the Black Belt Region. As shown Table 1, the UGA study report identified three major areas that should receive flexible funding based on local census tract needs.

TABLE 1.   PRIORITY AREAS TO BE SERVED BY COMMISSION

UGA	TU
a) Human resource development	a) Education
b) Economic development	b) Health care
c) Infrastructure development	c) Transportation systems
	d) Housing
	e) Economic development
	f) Infrastructure development
	g) Access to capital and asset creation

SOURCE: Carl Vinson Institute of Government (2002); Tuskegee University (2003)

The TU report identified six areas that should receive funding based on census tract needs. It is possible to interpret the three areas identified by UGA as umbrella areas or general categories under which the more specific areas identified by TU can be subsumed. For example, it could be argued that transportation systems would fall under infrastructure development, whereas health care and education would fit under human resources development. This would then leave housing and access to capital and asset creation as areas of emphasis that differ from UGA's proposal.

Notwithstanding some general level of accord on priority areas to be served, there is a fundamental difference between TU and UGA in the strategic design of the proposed federal commission (i.e., the governance structure of the commission). The TU study recommended community participation in the governance of the proposed federal commission through a constituency representation board, whereas the UGA study recommended the Appalachian Regional Commission (ARC) model, in which community participation is restricted to consulting with community and CBO leaders. Table 2 provides a contrast of both studies on this issue.

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TABLE 2.   COMPARISON OF GOVERNANCE STRUCTURE PROPOSED BY TU AND
           UGA STUDIES

TU'S PROPOSED DELTA/ BLACK BELT REGIONAL AUTHORITY (D/BBRA)	UGA'S PROPOSED SOUTHERN REGIONAL COMMISSION (SRC)
• Federal co-chair will be appointed by the president and confirmed by the Senate.	• Federal co-chair will be appointed by the president and confirmed by the Senate.
• Each governor of participating states will be a member of the board.	• Each governor of participating states will be a member of the board.
• Each governor will select an "alternate" to represent him or her in most matters.	• Each governor will select an "alternate" to represent him or her in most matters.
• Decisions must be approved by a majority of the states <u>and</u> the federal co-chair.	• Decisions must be approved by a majority of the states <u>and</u> the federal co-chair.
• The existing authority will be expanded to include a Constituency Representation Board ("CRB") of CBOs/FBOs/higher-education institutions from the distressed region.	• Various stakeholders (including non-profits, CBOs, institutions of higher learning, and the business community) are consulted during the development planning process.

SOURCE: Tuskegee University (2003)

TU and its coalition of CBOs and 1890 institutions held fervently to what they deemed to be their touchstone principle, which is to enable and empower residents to be agents of their own development, instead of being a passive object of the development process. To this end, they viewed substantive participation (representation at the highest level of decision-making, with voting rights) in the governance of the proposed federal commission as the only means for residents in persistently poor counties to achieve empowerment and become real agents of their own development.

Based on the findings and recommendations of the UGA study, Senator Zell Miller proposed the Southern Regional Commission (SRC) Act of 2003 in the 108th Congress. Almost concurrently, House Representative Artur Davis proposed the Southern Empowerment and Economic Development (SEED) Act of 2003 in the 108th Congress to form the Delta Black Belt Regional Authority (DBBRA). The SEED Act incorporated many aspects of the findings of the UGA study. However, the TU community-based perspective on governance inspired and informed the drafting of the SEED Act core provisions.

The UGA and TU studies proposed two different approaches for solving the problem of persistent poverty based on similar data gathered essentially from the same sources (U.S. Census data on the region and opinions of people living and working in the region). What phenomena are responsible for this interesting divergence of perspectives on the problem and the solutions proffered? Which of these proposed solutions is based on the right formulation of the problem? The next section of the paper attempts to answer the first question. The second question will be answered in the penultimate section of the paper, wherein a model based on the application of the principles of the analytic hierarchy process (AHP) will also be provided.

Although no heuristic device guarantees a single right formulation of an ill-structured problem such as persistent poverty, the final section of the paper will attempt to explain a process that will increase the likelihood of formulating the right problem. In attempting to formulate a problem to represent a complex situation such as persistent poverty in the BBR, misrepresenting the problem situation when dealing with multiple self-interested stakeholders is easy. Therefore, it is quite likely that neither of the two formulations of the problem is as a completely accurate representation of the existing problem situation.

COMPLEXITY AND PROBLEM REPRESENTATION

Social problems such as poverty are ill-defined or ill-structured problems. Type III-structured problems are the kinds most often encountered in everyday situations and professional practice (Fernandez and Simon 1999; Hernandez-Serrano and Jonassen 2003; Jonassen 2000; Murphy 2004). They are having conflicting goals, exhibiting complex patterns of relationships with other problems, consisting of interacting subproblems, requiring the application of multiple disciplines in crafting and implementing solutions, having no single best solution for their resolution, having multiple criteria for evaluating solutions, and having solution conditions that are not well specified (Dunn 1994; Fernandez and Simon 1999; George 1994;

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Jonassen 2000; Murphy 2004). Persistent poverty is an ill-structured problem consisting of a system of interacting subproblems as the priority areas shown in Table 1 illustrate.

Because ill-structured problems cannot be specified uniquely, and conditions for their solution are not well known, stakeholders enjoy the freedom of offering their own preferred solutions based on their particular world view. In fact, greater problem complexity leads to many potential problem representations. The many possibilities for representing the problem, in turn, have the potential to generate many different proposals for solving the problem, which explains the different legislative acts such as SEED and SRC proposed to address persistent poverty in the BBR.

Besides being ill-structured, a social problem is not an objective phenomenon such as a problem in chemistry, physics, or mathematics. A problem in the sphere of social endeavor is a subjective construct, which is created from the interaction of people with a "problem situation." In this sense, a problem only becomes manifest when people express their dissatisfaction with a particular situation or certain elements thereof (Dunn 1994; George 1994; Jonassen 2000). For instance, the demographic and socioeconomic data that Wimberley and Morris (1997) and the UGA Carl Vinson Institute (2002) used to define poverty in the Black Belt Region do not, in themselves, represent the problem of persistent poverty. These data only describe the problem situation. The problem of persistent poverty arises because of the experience of BBR residents with the situation as it exists in the BBR counties.

Because a problem is a social construct (an abstraction derived from a "problem situation" through the interaction of people with that situation), different individual observers or groups will often view the same problem situation differently. Thus, there are likely to be as many representations of the problem as there are stakeholders with different experiences, education levels, and values associated with a "problem situation." Therefore, with the persistent poverty problem in the BBR, each stakeholder with an interest in the problem will likely represent the problem situation differently from other stakeholders and, as a result, proffer quite different solutions for solving the problem.

In sum, the complexity of the problem situation and the fact that a problem is a social construct are two factors that offer plausible explanations for the different outcomes (the two pieces of legislation that recommend different approaches for addressing persistent poverty in the BBR) of the efforts of TU and UGA, although both used essentially the same data to describe the problem situation.

DEFINING THE RIGHT PROBLEM CAN DEFEND AGAINST TYPE III ERROR

The second question at the end of the first section asked: Which of these proposed solutions is based on the right formulation of the problem? To answer this question, the next section of the paper describes the key aspects of the problem formulation process and describes strategies for improving the odds of identifying the right problem.

The correct formulation of a problem is one that captures all the salient features of the problem situation and accurately represents the problem situation. A Type III error occurs if the problem, as formulated, fails to represent the problem situation. In more specific terms, a Type III error is committed when a problem is formulated based on a representation of the problem situation that is incorrect, incomplete, or inappropriate (George 1994). When such a situation occurs, solutions are developed to target the wrong problem. According to George, an incorrect representation of a problem fails to recognize any of the elements making up the problem situation, for instance, "poverty is caused by religious beliefs." An incomplete representation ignores several elements of the problem situation: "poverty is caused by laziness"; and an inappropriate representation fails to consider elements of the problem situation important to the targeted stakeholders: "poverty is caused by lack of political savvy." The occurrence of a Type III error in planning or problem solving is due primarily to incomplete or inappropriate representations of the problem, rather than incorrect representations (George 1994).

For the BBR, formulating the problem within the problem situation of persistent poverty would entail designing a heuristic process that both ensures that problem solving is participatory and includes a variety of perspectives about the problem situation. It would also involve the use of techniques such as dialectic discourse to pit competing perspectives against each other, forcing the winnowing and synthesis of ideas to arrive at the most comprehensive and plausible formulation.

In the BBR, the pool of stakeholders includes: policy professionals, technical experts, government agencies, nongovernmental groups, businesses, and what is most important, the CBOs that represent those who have suffered most severely and who will be beneficiaries of programs designed to address the problem. Several arguments support expanding participation in the problem formulation process. George (1994) argues that taking steps to expand the pool of ideas bearing on the problem situation is probably the best available means of defending against Type III error. Midgley and Richardson (2007) also advocate expanding or pushing the

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boundary of the problem out wide enough to include as many diverse perspectives as possible, but warn that efforts should be made to avoid over-inclusiveness that could lead to paralysis and inaction. Small (1995) suggests that stakeholders, especially those affected by the problem situation, have unique knowledge about the problem situation that can be of great value in defining the problem. Rydin and Pennington (2000) explain that one advantage of a participatory approach is that it ensures that the values and preferences embodied in society's policies align more closely with the values existing in the wider society. Thus, problem formulation initiatives that broaden the base of participation are more likely to identify the right problem and reduce the possibility of a Type III error.

There is also an ethical dimension to community problem-solving efforts such as the Black Belt Initiative. A key aspect of this ethical dimension is recognizing the rights of citizens to have a measure of control over decisions that will have lasting impacts on their lives (Chasking and Garg 1997). Public decision making entails a moral imperative with respect to its process and purpose (Cludts 1999; Collier and Esteban 1999). Collier (1998) argues that an organization is a moral agent – not only in terms of the products it produces, but also with respect to the purpose it seeks to fulfill and the processes it employs to attain that purpose. In other words, the goal of the organization, as well as the means employed in pursuit of the goal, must be good, morally desirable, and just. George (1994) reminds us, however, that although participation is the best defense against a Type III error, it does not guarantee completeness or appropriateness of the problem formulated from the problem situation. Additionally, any effort to increase participation increases the complexity of the formulation process because of the sheer number and diversity of participants as well as the increased quantity of information that needs to be processed. Therefore, if the benefits of participation in reducing the likelihood of a Type III error are to be realized, a systematic and purposeful method must be employed to manage the complexity inherent in initiatives designed to solve complex problems.

For example, as participation increases, special techniques must be used to minimize losses in the quality of group interaction and maximize the benefits accruing from high levels of participation in the formulation process. Dunn (1994) describes several techniques or normative methods for structuring complex problems to reduce the occurrence of a Type III error. Among these are: assumptional, hierarchical, classificational, multiple perspective, and boundary analyses. Yet even with the rigor of these methods, Dunn enjoins us to be mindful that these methods do not guarantee the definition of the right problem. The only

way to check the validity of a particular problem formulation or problem-structuring exercise is to implement the solution based on the formulation of the perceived problem (Nutt 1984).

Our search of the relevant literature has turned up very little recent work concerning empirical evaluation of normative methods of problem formulation. However, earlier evaluations of the efficacy of normative methods of problem formulation have produced mixed results. George (1994) reports that some studies have shown that normative techniques have improved the problem formulation abilities of individuals and groups, whereas others have shown conflicting results. Nonetheless, this lack of positive and unequivocal support for the problem formulation process should not detract from its value as a heuristic device for identifying the right problem within a problem situation. The value of normative methods of problem formulation is that the process offers a theoretical framework for developing procedures for evaluating and progressively improving problem formulation methods. Though not flawless, it is possible to judge the quality of the problem formulation process based on factors such as the number and diversity of stakeholders engaged in the process, the extent of the search for competing ideas or perspectives on the problem situation, the application of appropriate problem formulation methods, and the effort made in preparing stakeholders to participate in the process.

Given the preceding discussion, giving a definitive answer to the question previously asked is not possible. That is, which formulation of the problem is the best representation of the problem situation in the BBR? To decide, data would be needed from the implementation of solutions developed from the studies conducted by TU and UGA, which served as source documents for drafting of the proposed legislations, i.e., the SRC, and SEED Acts. Although making a definitive judgment without hard empirical evidence is not possible, making a preliminary assessment of the extent to which each study represented the problem situation is still possible based on the quality of the formulation process each employed.

For TU and UA, two parallel processes each focused on different stakeholder groups. TU focused on CBOs while UGA focused on business, government agencies, and regional development agencies. The separation of key stakeholders into different groups did not allow for the pitting of rival ideas against each other, the questioning of assumptions, or the checking of errors in an interactive group process. Failure to bring both groups together to resolve differences precluded the use of normative methods that could have marshaled the differences between the

groups to produce a creative solution. This shortcoming led TU and UGA to support different representations of the problem (See Table 3).

TABLE 3. COMPARISON OF TU AND UGA INTERPRETATION OF PROBLEM SITUATION ON FOUR ISSUES

ISSUES	TU	UGA
Governance.	Participatory, with community representation	Modeled after the Appalachian Regional Commission, no community participation
Jurisdiction.	Eleven southeastern States	Seven southeastern States
Strategic Areas............	Community planning, education, access to capital, and community economic development (expenditure on infrastructure limited to 25% of commissions budget)	No specific areas identified
Sources of Input.	Primarily community-based	Primarily academia, government agencies and NGOs

Tuskegee University's representation of the problem situation showed evidence of incomplete representation–excluding the perspectives of business, government agencies, and non-governmental agencies (see Table 3). UGA's representation of the problem was also incomplete–excluding the perspectives of CBOs and 1890 institutions. UGA's representation was also inappropriate; it excluded CBO's concerns about governance structure, which is important to the target group. Instead, UGA relied on and emphasized the perspectives of a cadre of academicians, civil servants, regional development agencies, and professionalized NGOs. TU, in setting out in specific terms the problems that the community experienced (shown in Table 1), was clearly identifying a set of core values for the proposed commission—unambiguous strategic beacons that would guide the commission in achieving its overall goal of alleviating persistent poverty. These problem or issue areas were more than mere priority or strategic markers; they represented the path that communities believed would lead them out of persistent poverty into prosperity. They were not merely abstract categories specified by some technocrat. The specificity of the areas indicates that they are part of the lived experience of the stakeholders—they are the deficiencies felt and experienced by stakeholders as part of their everyday existence.

In contrast, UGA's interpretation of the problem situation was couched in general terms that were subject to interpretation about what specific action or problem should be addressed to alleviate the complex problem of persistent poverty. This being the case, it could be argued that UGA's representation was also incomplete, because it failed to specify a clear strategic direction for the proposed commission. Consequently, based on two different perspectives, two different legislative solutions were proposed.

A MODEL RECOMMENDATION

As mentioned above, a diverse group consisting of University of Georgia, Athens; Tuskegee University; and community-based organizations worked to define an organizational framework that would provide the institutional support for stakeholders working to alleviate persistent poverty in the Black Belt Region (BBR). Since stakeholders do not have a single perspective regarding the development of a solution to the problem of persistent poverty, designing a process to combine their judgments about the overall goal of establishing an organizational structure that will provide institutional support needed to address the problem of persistent poverty is necessary. Below we provide an example that illustrates how to develop the AHP process.

The analytic hierarchy process (AHP) (Saaty 1980) is a decision-support tool designed to cope with complex multi-criteria problems. It is a subjective tool for analyzing qualitative criteria to generate priorities and preferences among decision alternatives. The method helps to structure and analyze decision problems by breaking down the complex problem in a hierarchical order and by employing pairwise comparisons of its elements to determine the preferences among a set of decision alternatives. The AHP is used in various decision-making areas, such as planning, choosing the best policy alternative, determining requirements, predicting outcomes, analyzing benefit/cost decisions and resource allocations, measuring performance, determining consumer preferences, and optimizing and resolving decision conflicts (Saaty 2006; 2008).

DEFINING THE AHP MODEL FOR STRUCTURING THE COMMISSION

For the persistent poverty problem, the overall goal is to establish a commission that will provide the vision and leadership needed to solve the poverty problem. The decision to be made is how the commission should be structured, and what the relative responsibility of each of the four stakeholder groups should be: CBOs, government agencies, businesses, and academicians. These stakeholder groups

represent the decision alternatives. The decision criteria would be how important each of the relevant subproblems (i.e., education, housing, health care, transportation, access to capital, and relieving underemployment) is in contributing to solving the problem of persistent poverty. That is, respondents, who are residents of the BBR, will decide: (1) the relative importance of each subproblem in solving the problem of persistent poverty, and (2) their preference for the extent to which each stakeholder group should participate in solving each subproblem.

A step-by-step example of an AHP model using hypothetical data for accomplishing this task is illustrated below. The data for the illustration were collected from a few faculty members at North Carolina A&T State University, who were purposively selected based on their knowledge of the BBR and their efforts to address the problem of persistent poverty. Note that in the model, the decision makers are respondents (BBR residents), the decision criteria are the subproblems, and the decision alternatives are the stakeholder groups.

Each stakeholder views the problem of persistent poverty differently in terms of which subproblem should receive priority attention. The first step in the AHP is to identify the subproblem with the highest priority rating by combining the perspectives of each stakeholder about which problem should receive priority attention. Second, because each stakeholder group (CBOs, government agencies, businesses, and academia) offers different skills, insights, and experiences relative to each subproblem, the AHP is used to identify the optimum level at which each stakeholder group should participate in solving each subproblem based on its potential to contribute to a solution. The final AHP output, determining the role of the stakeholders groups in the commission, is derived by combining respondents' perspectives on the importance of each subproblem with their preference for the extent to which each stakeholder group should participate in solving that subproblem.

Developing the Hierarchy

The top level of the hierarchy represents the overall goal: determining the optimal role of the stakeholders in the organization to be established to provide institutional support for solving the problem of persistent poverty. The lowest level consists of the decision criteria (subproblems) and all possible alternatives (stakeholder subgroups). The six subproblems identified by the stakeholders – education, health care, transportation, underemployment, housing, and access to capital and asset creation – are our model criteria. The four stakeholder groups involved in the problem solving process are CBOs, government agencies,

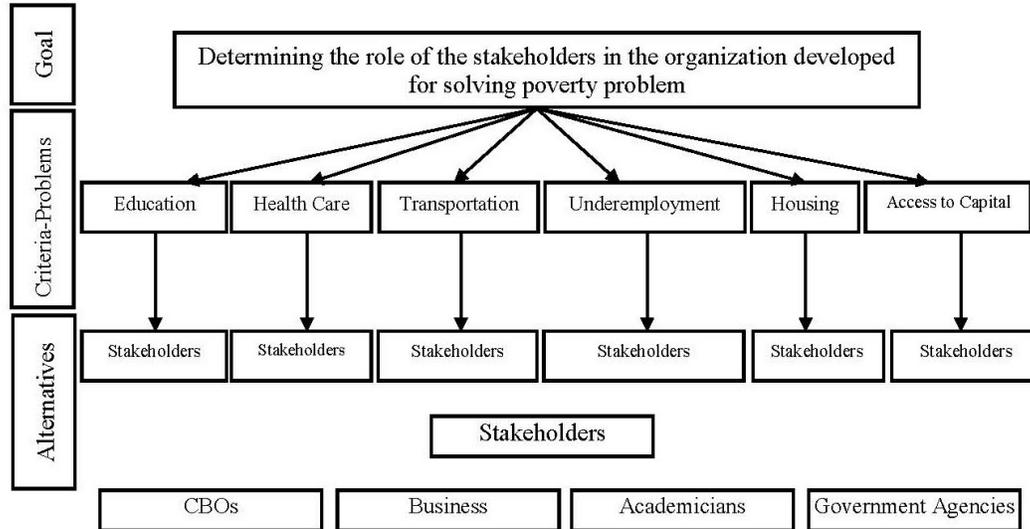businesses, and academicians. These groups are included in the model as decision alternatives. (See Figure 1).

FIGURE 1. HIERARCHY FOR SOLVING THE POVERTY PROBLEM IN BBR

AHP SOLUTION PROCEDURES

Pair Wise Comparisons

The most accurate way to compare decision alternatives is by using pairs (Saaty and Peniwati 2008). The AHP uses pairwise comparisons to establish measures for both the importance of each subproblem in solving the overall problem and the preference of respondents as to the potential of each stakeholder group to contribute to solving each subproblem. Using the AHP model, we determined:

1. the importance of six subproblems given the overall goal
2. the respondents' preferences for the four stakeholders as to their potential contribution to solving the education subproblem
3. the respondents' preferences for the four stakeholders as to their potential contribution to solving the health care subproblem
4. the respondents' preferences for the four stakeholders as to their potential contribution to solving the transportation subproblem
5. the respondents' preferences for the four stakeholders as to their potential contribution to solving the underemployment subproblem
6. the respondents' preferences for the four stakeholders as to their potential contribution to solving the housing subproblem

7. the respondents' preferences for the four stakeholders as to their potential contribution to solving the access to capital and asset creation subproblem

The AHP utilizes a nine-point scale with values 1-9 to rate the relative priority of pairs of items. Table 4 presents the fundamental scale for pairwise comparisons (Saaty 2008).

TABLE 4. THE FUNDAMENTAL SCALE FOR PAIRWISE COMPARISONS

INTENSITY OF IMPORTANCE	DEFINITION	EXPLANATION
1.	Equal importance	Two activities contribute equally to the goal
3.	Moderate importance	Experience and judgment slightly favor one activity over another
5.	Strong importance	Experience and judgment strongly favor one activity over another
7.	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
9.	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8.	For compromise between the above values	Sometimes one needs to interpolate a compromise judgment numerically because there is no good word to describe it
Reciprocals of above.	If activity i has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i	A comparison mandated by choosing the smaller element as the unit to estimate the larger one as a multiple of that unit

The potential contribution of the stakeholders to solving the education, health care, transportation, underemployment, housing, and access to capital and asset creation subproblems will be rated by residents of the BBR. The respondents in the

region will be asked to compare each pair of stakeholder groups and rate them about which stakeholder group they would prefer to solve the education, health care, transportation, underemployment, housing, and access to capital and asset creation subproblems separately at the community level. Also, the respondents will be asked to rate each pair of the subproblems as to the importance of each in contributing to solving the overall problem of persistent poverty at the community level.

This questionnaire is used for making paired comparisons as described above (Saaty and Peniwati 2008). We will ask respondents to compare two stakeholders on either side of the scale about which stakeholder the respondents would prefer to be involved in solving the subproblems at the community level. For example, if the respondents put an "X" in the box at (1) it means the respondents are indifferent to the potential contribution of either stakeholder group. If the respondents put an X in the box at "9" on the left, this indicates the respondents' extreme preference for the potential contribution of that stakeholder group on the left over that on the right. If the respondents put an X in the box at "9" on the right that indicates the respondents' extreme preference for the potential contribution of the stakeholder group on the right over that on the left. If the respondents mark a value closer to a stakeholder group on the left, this indicates the respondents prefer this stakeholder group to the one on the right and vice versa (Table 5).

The second stage of the questionnaire deals with the six subproblems as to the importance of each in contributing to solving the problem of persistent poverty at the community level (Table 6). Following the procedure described above, the respondents will be asked to rate the two subproblems on either side of the scale based on which they would consider to be more important to address in solving the problem of persistent poverty.

Pairwise Comparison Matrix

This step constructs a pairwise comparison matrix of the relative contribution of each element toward each governing criterion in the next higher level. In this matrix, pairs of elements are compared with respect to criterion in the superior level. In our example, the pairwise comparison matrix indicates respondents' preferences for the potential contributions of the various stakeholder groups in

TABLE 5. COMPARE EACH PAIR OF STAKEHOLDER GROUPS AND RATE EACH BASED ON YOUR PREFERENCE FOR ITS POTENTIAL CONTRIBUTION TO SOLVING THE PROBLEM AT THE COMMUNITY LEVEL

	Extreme		Very strong		Strong		Moderate		Equal		Moderate		Strong		Very strong		Extreme	
CBOs	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Business
CBOs	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Academicians
CBOs	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Gov. Agencies
Business	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Academicians
Business	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Gov. Agencies
Academicians	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Gov. Agencies

TABLE 6.   RATE THE TWO PROBLEMS ON EITHER SIDE OF THE SCALE ON THE BASIS OF WHICH PROBLEM YOU WOULD CONSIDER TO BE MORE IMPORTANT TO ADDRESS IN SOLVING THE PROBLEM OF PERSISTENT POVERTY AT THE COMMUNITY LEVEL.

	Extreme		Very strong		Strong		Moderate		Equal		Moderate		Strong		Very strong		Extreme	
Education	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Health care
Education	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Transportation
Education	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Underemployment
Education	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Housing
Education	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Access to capital
Health care	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Transportation
Health care	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Underemployment
Health care	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Housing
Health care	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Access to capital
Transportation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Underemployment
Transportation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Housing
Transportation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Access to capital
Underemployment	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Housing
Underemployment	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Access to capital
Housing	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Access to capital

solving the health care subproblem (Table 7). The matrix has one position to enter the number showing the respondents' preference for the contribution of a stakeholder group and another to enter its reciprocal. That means that if one stakeholder group contributes more than another, the other must contribute less, and vice versa. This number is entered into the appropriate position in the matrix and its reciprocal is entered into the other position. For example, in Table 7, when respondents compare the contribution of CBOs with businesses in solving the health care subproblem, their preference for CBOs over businesses is rated a 6. This means that the contribution of businesses in solving the health care subproblem is one-sixth that of CBOs.

TABLE 7. AN EXAMPLE OF PAIRWISE COMPARISON MATRIX SHOWING THE PREFERENCE RATINGS OF THE STAKEHOLDERS IN TERMS OF THE PERCEIVED IMPORTANCE OF THEIR CONTRIBUTION TO SOLVING THE HEALTH CARE PROBLEM

	CBOs	BUSINESS	ACADEMICIANS	GOVERNMENT AGENCIES
CBOs.............................	1	6	8	1
Business.	1/6	1	5	1/3
Academicians.	1/8	1/5	1	1/7
Government Agencies.	1	3	7	1

Setting Priorities and Synthesizing

After developing the matrix of pairwise comparisons, the preference rating of each stakeholder being compared can be calculated. This step of the AHP is called synthesization. The example in Table 8 illustrates how we might measure the preferences for the stakeholders with respect to the health care subproblem. Basically, the synthesized preferences can be calculated by using the following three-step procedure. First, each column total of the pairwise comparison matrix is computed. Second, each element in the pairwise comparison matrix is divided by its column total. The result thus obtained is the normalized pairwise comparison matrix (Table 8). Third, the average of the elements in each row of the normalized matrix is computed. These averages enable us to obtain an estimate of the relative preference ratings for the stakeholder groups being evaluated on their role in solving the health care subproblem.

Consistency in the AHP is an important issue as to the quality of the decisions. However, perfect consistency for preferences is hard to achieve due to real life circumstances. The AHP measures the overall consistency of judgments by using

TABLE 8. THE NORMALIZED MATRIX AND THE RELATIVE PREFERENCES OF THE RESPONDENTS FOR THE STAKEHOLDER GROUP CONTRIBUTION TO SOLVING THE HEALTH CARE PROBLEM

	CBOs	BUSINESS	ACADEMICIANS	GOVERNMENT AGENCIES	PRIORITIES
CBOs..............	0.436	0.588	0.381	0.404	0.452
Business.	0.073	0.098	0.238	0.135	0.136
Academicians	0.055	0.020	0.048	0.058	0.045
Government Agencies........	0.436	0.294	0.333	0.404	0.367

a consistency ratio. The value of the consistency ratio of the hierarchy for the poverty problem should be 10 percent or less. If it is more than 10 percent, the quality of information or the judgments should be revised (Saaty 2008).

We will use the same procedure used previously to determine the preference rating for the health care subproblem to calculate the preference ratings for the education, transportation, underemployment, housing, and access to capital problems (see Table 9).

The AHP procedure applied above is used to obtain the importance ratings for the six poverty subproblems as to their contribution to solving the problem of persistent poverty at the community level. The importance ratings for each subproblem are presented in Table 10.

Final Decision

To finalize the estimation procedure, we would combine the importance ratings of the subproblems and the preference ratings obtained for each stakeholder group contribution to solving the subproblems. The results would provide the overall respondents' preference for the role of each stakeholder group in the commission. Table 11 shows the three outcomes generated by the AHP model: (1) the importance ratings of the subproblems in the BBR; (2) respondents' preferences based on the contribution of each stakeholder group to solving each subproblem; and (3) the respondents' decision with respect to the overall goal.

Importance ratings of the subproblems in the BBR. From our hypothetical data (bold figures in parentheses in top row of Table 11), the most important problem in the region is health care (0.404), followed by education (0.273). Respondents' preferences based on the contribution of each stakeholder group to solving each subproblem are shown in the columns of Table 11. According to the first column, academicians (0.337) and government agencies (0.312) are the most preferred

TABLE 9.   THE PRIORITIES OF THE STAKEHOLDERS IN TERMS OF THE PROBLEMS

STAKEHOLDERS	EDUCATION	HEALTHCARE	TRANSPORTATION	UNDER-EMPLOYMENT	HOUSING	ACCESS TO CAPITAL
CBOs................................	0.300	0.452	0.151	0.329	0.449	0.273
Business.	0.051	0.136	0.424	0.316	0.247	0.323
Academicians.	0.337	0.045	0.044	0.053	0.069	0.105
Government Agencies.	0.312	0.367	0.381	0.302	0.234	0.298
Consistency Ratio (CR)	0.008	0.069	0.075	0.004	0.075	0.017

TABLE 10. IMPORTANCE RATINGS OF THE SUB-PROBLEMS IN SOLVING THE
PROBLEM OF PERSISTENT POVERTY AT THE COMMUNITY LEVEL

SUB-PROBLEMS	IMPORTANCE RATINGS SUB-PROBLEMS
Education.	0.273
Health care.	0.404
Transportation.	0.044
Underemployment.	0.114
Housing.	0.092
Access to capital.	0.073
Consistency Ratio (CR).	0.065

stakeholder groups for solving the education subproblem. The second column shows that the most preferred stakeholders for solving the health care subproblem are CBOs (0.452) and government agencies (0.367). Results in the third column demonstrate that business leaders (0.424) and government agencies (0.381) are the most preferred stakeholders for solving the transportation problem. As for underemployment, the fourth column indicates that CBOs (0.329) and business leaders (0.316) are most preferred stakeholders for solving that subproblem. The fifth column indicates a preference for CBOs (0.449) and business leaders (0.247) as the most qualified stakeholders for solving the housing subproblem. Column six shows that respondents prefer that business leaders (0.323) and government agencies (0.298) work toward solving the access to capital and asset creation subproblem.

Respondents' decision with respect to the overall goal. The values in the far right column of Table 11 are the overall preference ratings (weights). They are the final output of the AHP process, which indicate respondents' overall judgment concerning the relative role of each stakeholder group in the commission. These weights could be applied to apportion seats among stakeholder groups on the commission's governing board as well as to assign responsibilities to them for the operation of the commission. For instance, we could interpret these weights to mean that the optimum structure of the BBR commission would be 37 percent CBO representatives, 32.8 percent government agency representatives, 17 percent business owners and operators, and 13.2 percent academicians.

CONCLUSION

Preliminary evidence seems to indicate that efforts to address persistent poverty in the BBR were plagued by a Type III error. This is probably due to the failure of leaders to recognize the complexity of the process and the requirements for managing the process to reduce the likelihood of a Type III error. For example, the

TABLE 11. OVERALL RESPONDENTS' PREFERENCE FOR THE ROLE OF EACH STAKEHOLDER GROUP IN THE COMMISSION

	EDUCATION	HEALTH CARE	TRANSPORTATION	UNDER-employment	HOUSING	ACCESS TO CAPITAL	OVERALL PREFERENCE
	[0.273]	[0.404]	[0.044]	[0.114]	[0.092]	[0.073]	
CBOs...............	0.300	0.452	0.151	0.329	0.449	0.273	0.370
Business.	0.051	0.136	0.424	0.316	0.247	0.323	0.170
Academicians.	0.337	0.045	0.044	0.053	0.069	0.105	0.132
Government Agencies.........	0.312	0.367	0.381	0.302	0.234	0.298	0.328

participation of many self-interested groups and individuals in a problem-solving process will often lead groups and individuals to behave in a way that protects their interests. For the BBI, the UGA group was interested in adopting the existing Appalachian governance model, which had no direct community representation at the level of the governing board. On the other hand, the TU/CBO group wanted a participatory governance model that included community members on the governing board. Both groups were convinced that their approach to governance of the proposed commission was the most appropriate. This is essentially a collective action problem, which requires resources and organizational capacity to manage so that differences in perspectives are channeled into productive problem solving. The other problem was the tendency to focus on crafting a solution even before the problem was adequately defined. The propensity to rush headlong into formulating a solution before the problem is adequately understood and defined is usually the primary source of a Type III error. The result of this haste is a solution designed for the wrong problem. Here, Ackoff's (1974) cogent remarks are quite instructive: "Successful problem solving requires finding the right solution to the right problem. We fail more often because we solve the wrong problem than because we get the wrong solution to the right problem" (p. 8). Thus, one way to avoid a Type III error is to ensure that enough time is invested in identifying the right problem.

The essential first step in solving complex problems is to develop an accurate representation of the problem situation to reduce the likelihood of a Type III error. To achieve this goal, practitioners should design a problem-formulation process to foster: trust, participation, mutual respect, and free access to information related to the problem situation and its wider context.

Participants should be educated about, and fully engaged in, the formulation process. All stakeholders should be fully involved from the very beginning in setting the ground rules for conducting dialogue and in determining what data will be needed, how these data will be collected, and how and by whom the data will be processed. A serious source of contention in the problem-solving process is usually about whose data are being used and how the data were generated (Innes and Booher 2004). For instance, the UGA group relied on quantitative data and the opinions of technocrats to describe and define persistent poverty, while the TU/CBO group believed that rich qualitative data that captured the lived experience of those directly affected by persistent poverty would provide a more robust and appropriate description of the realities of persistent poverty in the BBR.

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To achieve the standards of engagement described above, both listening sessions/focus groups and the AHP could be applied to ensure that data, opinions, and judgments are drawn from the most diverse group of stakeholders possible. The use of listening sessions or focus groups to identify important subproblems and stakeholder groups could precede the application of the AHP. The AHP as illustrated above would enable community leaders and policy makers to draw on the judgment of the largest possible number of stakeholders systematically in making a decision about the structure of the commission's governing board and in apportioning responsibilities among stakeholder groups. The AHP would also facilitate the consensus of diverse groups in what may be a highly charged political climate.

Selecting the appropriate problem-structuring technique for guiding dialogue is critical to airing all perspectives and to processing the multitude of perspectives that will be generated about the problem situation. Resolving conflicting ideas does not mean that everyone agrees with the outcome, or that a useless nondescript compromise is reached in which the result is a hodgepodge of everyone's ideas. To handle conflicting ideas in this situation and still nurture creativity is the essence of communicating ethically. Ethical communication requires the exercise of moral judgment in decision-making to ensure that morally correct outcomes are realized. In participative decision-making, no overarching moral principles inform all judgments. A "collaborative" employing the participative decision-making model must become a "community of discernment" in which freedom and creativity are focused on searching for what is right and just in an atmosphere of conflicting value positions (Cludts 1999; Collier and Estaban 1999). In such instances, Habermas (1993) suggests that conflicting value positions can be resolved through the development of appropriate search procedures that will enable the attainment of consensus without converting any group to the value position of other groups. This means that dialogue and search in an atmosphere of respect creates understanding and respect for a competing point of view and an appreciation for the solution reached through the efforts of everyone. This process builds what Innes and Booher (1999) classify as: (1) social capital, which is trust and long term relationships; (2) intellectual capital, which is mutual understanding, a shared perspective of the problem, and agreed upon data; and (3) political capital, which is the ability to work together for agreed-upon ends. They believe that achieving consensus under such nourishing conditions promotes the development of innovative strategies and high quality agreements. The Guilford Crisis Resolution Council (GCRC) in bringing together several diverse community-based organizations in successfully resettling

evacuees of Hurricane Katrina demonstrates that working together in harmony is possible if a nurturing and facilitative atmosphere is created, and if groups are led to commit to the process, and if time and resources are dedicated to planning the process.

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