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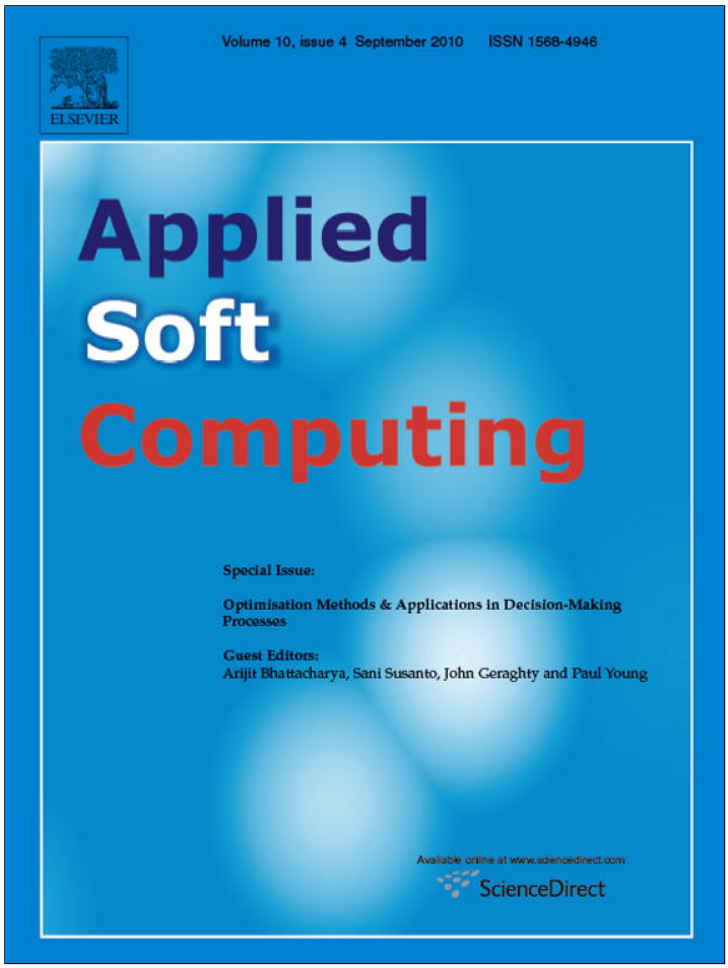

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The scope of human values and human activities in decision making

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ABSTRACT

Decision making was long in need of methods of prioritization but now needs to complete the scope of its structures to become a dependable science that can be helpful on the micro level. Most of the factors that determine the structure of a decision depend largely on the feelings and memories of the decision makers and that leaves room for doubt about the completeness of the decision. The decision makers would be helped by having available a general well-researched list of factors for some of their complex decisions in order to have greater assurance that their decisions are comprehensive and right. To do that, they must have wide exposure and be familiar with the full spectrum of human values and environmental opportunities. Our concern is about structuring decisions in a reliable way to serve the needs of decision makers. A very broad framework is provided in this paper to address this issue.

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1. Introduction

The complexity of our world and the problems that our increasing population of 6.8 billion people brings to the environment calls for comprehensive and integrated decision making. The world needs to coordinate its decisions and the actions taken about the environment such as what to do with the melting of the 7 billion cubic mile Antarctic ice cap that can cover the earth up to more than 140 feet. We need to think and decide in bigger ways than ever before and in very general ways. Decision making today depends much on intuition but it needs to be made into a dependable science. Modern science must deal with two worlds, the external world of chemistry, physics, biology and astronomy, and the internal world of psychology, thought, value, meaning and decision making. Making decisions requires that we know our goals, attributes and alternatives. Goals and attributes are mental and are entirely subjective. They are also uncertain and differ from person to person. For decision making to be a true science, it is inadequate to do what people have traditionally done by starting at the level of using quantitative techniques to elicit judgments and manipulate numbers to derive priorities and synthesize these priorities to obtain final outcomes without a very clear understanding of why those factors were chosen and how they relate to the entire system in which the decision is made. Fifty years ago decision making was focused on the maximization of profit. Friedman [3] presented the often used get-out approach where decisions were justified by the quantified benefits to the company. Today we can categorize approaches to ethics decision making into two broad themes: subjective and objective [19]. Within the subjective approach we try to evaluate the outcomes of our decision through three aspects: emotivism, egoism and relativism. We ask ourselves: How does it feel to me? (emotivism), What is my best interest? (egoism) and What is right in the reference culture? (relativism). Within the objective approach we try to evaluate the consequences of a decision using cognitive or teleological approaches or we try to apply rule-based system to help guide us in the right ethical way. One of the recent ethical decision-making models known as NORM (Neutral, Omni-partial Rule-Making) comes from Green [4]. He proposed a methodology for establishing moral rules of companies. The main advantage of this approach is that everyone is included in managing their ethical responsibilities. The guiding principle is: "an action is right if it might be reasonably thought of as being accepted by all members of society as a moral rule that is, an abiding form of conduct known by everyone and open to everyone in similar circumstances". Jones [5] integrated organizational behavior models into an ethical decision-making model and recommended that aspects of the issue-contingent variable such as social consensus influenced moral judgment and moral intent. Harrington [6] presented four common components of the major ethical decision-making models: (1) interpretation of the situation or recognition of a moral issue, (2) moral judgment about which course of action is morally right, (3) prioritization of moral values above other personal values or formation of a moral intent, and (4) perseverance

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to follow through on the persons' intention or moral behavior [6].

The importance of considering ethical issues as a decision maker is a hot issue. A decision in a human framework requires three poles of influence: a rational, a subjective and an ethical one [2]. Most of the basic models of operational research developed during the last 60 years are not considering either the ethical or the subjective pole, only the rational one. The multi-criteria decision analysis (MCDA) emphasizes the role of the subjective in the human decision-making process. In MCDA there is not only one criterion but rather a few criteria which are included in the process of evaluation of alternatives. When it comes to the socio-economic decisions, four main criteria must be considered: economical, technological, social and environmental criteria. A consequence of the decision never involves only decision makers. It influences socio-economic systems and belongs to all the people in our human environment. We can mention two methods which illustrate how we can provide a balanced decision between rationality, subjectivity and ethics. The MCDA PROMETHEE-GAIA can be adapted in a way which will include judgments of a decision maker and ethical issues in the model [2]. The Analytic Hierarchy Process (AHP) can also improve the quality of our ethical decision making. It is a methodology that combines the weighted effects of all the applicable ethical guidelines on the issue at disposal. The AHP enables evaluation of alternatives in the light of conflicting principles and deals with issues that are emotional to the stakeholders in the decision-making process [7].

The factors dealt with in decision making are frequently the result of guess work made by experts and consultants who may work for a government or a corporation and make decisions for them. The experts would be helped by having available a general well-researched list of factors for some of their complex decisions in order to have greater assurance that their decisions are comprehensive and right. To do that, they must have wide exposure and be familiar with the full spectrum of human values and environmental opportunities.

Such considerations are needed particularly when one must project ahead to ensure the viability of a decision in the face of changes in values and circumstances that may feed back to that decision to blunt or to accentuate its effectiveness as in the Analytic Hierarchy Process (AHP) or Analytic Network Process (ANP). Decision makers face a formidable task in reflecting on what to do. There have been two major attempts to document the structure of more than a thousand kinds of decisions in the AHP/ANP classified according to their area of application. The Hierarchon [12] is a book that deals with hierarchically structured decisions that descend from a goal through criteria, sub-criteria, actors, diverse kinds of influences wielded by the actors, groups affected, their objectives and the alternatives of the decision, and the two-volume Encyclicon [13,14] that deals with decisions with dependence and feedback. In a recent work there has been a firm attempt to demonstrate that hierarchies and networks of which hierarchies are special case are the only two kinds of structures one encounters in decision making [18].

But that is only a beginning because we need lists of attributes and areas of human enterprise so that governmental, regional, group and individual decision makers can have greater assurance about the completeness of their factors. Although what we have here has been the subject of a great deal of research by numerous people over a period of more than seventy years, it probably still needs further elaboration and debate to broaden its scope. It may be useful to summarize a variety of questions that arise in the development of a sound decision theory (Table 1).

It has been said that leaders must locate and integrate the knowledge available to the group when making significant decisions. Our concern here is about structuring decisions in a reliable way to serve the needs of leaders to do that.

Table 1
Questions that arise in the development of a decision theory.

Questions that arise in the development of a decision theory
(1) How do we decide that there is a decision that needs to be made and how do we choose to make that decision before other decisions?
(2) How do we know if we understand the problem well enough to structure it thoroughly enough to make a justifiable decision?
(3) Do we understand the kind and complexity of the structures we use to represent the factors and influences in a decision?
(4) What are the psychological, political, pragmatic and creative factors we need to have to get people to work together to make a decision?
(5) How do we get people to articulate judgments and preferences in response to their perception of stimuli?
(6) How should we elicit the judgments to use our knowledge and experience in the most beneficial way in making a decision?
(7) What kind of numbers or scales should be used to represent the judgments?
(8) What mathematical calculations are necessary to synthesize the information in the best way to make a decision?
(9) Is the structure flexible so that it can be revised to include more factors without nullifying the contributions already made?
(10) Is there a way to include the consequences of decisions as part of the framework used to choose those decisions?
(11) If the outcome does not reflect the decision maker's expectations, is it possible to either revise the model in its structure or quantitative inputs to better represent the real world situation or can reasons be found from the model why the original expectations were not justified?
(12) Are there sufficient applications with agreeable or sound outcomes to give us confidence that this is the right way to follow in making decisions?
(13) How can we construct group decisions from individual ones and how do the answers work out in practice?
(14) How well does the decision-making approach deal with the resolution of conflicts?
(15) Can the numbers obtained from a decision theory help people and organizations allocate their resources to projects?
(16) Is the theory sufficiently general to use in rolling planning which involves importance, preference and likelihood?
(17) Are there few or no constraints on our ability to model a complex decision problem and are there realistic axioms allowing for biological quirks in human behavior and thinking such as inconsistency?
(18) Is it clear of paradoxes that contradict its own assumptions?

2. Research questions and methodology

The most demanding task in decision making is to determine the factors which need to be considered in a hierarchy or a network of criteria that influence a decision. When we have a problem, feelings and ideas that need to be expressed in a certain way, we often have difficulty putting them all together and connecting them in an appropriate way to represent the causes and effects of the problem. To formulate an initially unstructured decision problem we need some kind of lists to deal with complexity structurally but also to be able to control whether all the necessary factors are in hierarchies/networks and whether each one is dealing with a part of the problem.

The research was organized around the following research questions:

RQ1: How to create general lists of human values and activities?
RQ2: How do general lists of human values and activities used for structuring problems into hierarchies/networks and for reviewing the created hierarchies/networks help to make a more accurate decision?

First, we defined a problem and recognized the need for a general list of human values and human activities in decision making. Secondly, we examined at length the literature of the philosophy of science and this reviewing activity directed us to three lists useful for drawing up our work: a List of Human Capabilities by M. Nuss-

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baum, a Comprehensive List of Values by K. Baier and N. Rescher and an Outline of Cultural Materials (OCM). These three lists were our starting point. The next step was reorganization of these lists. They were given as long lists of words, not tabulated or tightly organized. We ordered, rearranged and added elements to these lists as we felt was necessary and we ordered and arranged them for decision-making purposes. To evaluate the helpfulness of these lists in structuring decision-making problems we used three case studies: Case study1: to determine the optimum level of the dam by the staff of the Department of Interior in Washington, Case study 2: to hire the most qualified employee for a certain enterprise, and Case study 3: to gather information and structure the necessary networks to be used to prioritize the research methods for each aim of the project.

In the first case study the group examined the developed lists of human values and activities to produce the hierarchy. In the second case study a business manager found the ranking of the people unsatisfactory according to his instincts and wanted to revise the first hierarchy. He used the Cause-Effect List to produce a new hierarchy. In the third case study we used our lists to structure four decision networks, one for benefits, one for opportunities, the third for costs and the fourth for risks. The second author was involved in a project supported by the government to improve services in the public sector. The problem was how to gather the information and structure the necessary networks to be used for prioritizing the research methods for each aim of the project. We created the decision network model based on our two lists (the List of Values and the Cause-Effect List) to see if lists are helpful in developing new decision-making model.

3. Are words, language, and lists legitimate entities for mathematical consideration?

There has been reluctance to deal with structures for decisions in a scientific way because of insufficient understanding about where mathematics begins and where such ambitious thoughts about structures end. Mathematics is used to model and solve problems, but out of habit we tend to focus on the so-called quantitative part for its apparent precision and focused though restricted meaning. Our dexterity, ingenuity and addiction at doing manipulations delight like minded colleagues. To get to this satisfying resolution we are compelled to identify factors to include in the decision structure and to decide on the form and connections so that it can be truly regarded as sound and complete. When we create a structure to make a decision we assume that the decision maker needs to know all the important factors that go into the decision. But that may not be always true. In making a decision we learn that there can be factors inadvertently left out that could have led to a different outcome. In a separate work [15], we have proposed using the concept of "other" as a criterion to complete a set of criteria with an expert giving the judgments that would help give closure to the question of uniqueness of ranking.

The brain is a mathematical instrument that responds to stimuli imported through the senses and to feelings and thoughts produced by external stimuli or by inner feelings and thoughts, through chemistry or through internal or external communication. It operates with the electrical firings of signals and their syntheses that make up words and language, pictures, sounds and feelings represented mathematically with complex numbers. The important point is that whatever goes through the brain, whether words, emotions, art, science, or mathematics is transformed into electrical and chemical pulses and hence is at bottom quantitative. We have invented symbols and manipulations of symbols to represent mathematical ideas that can now be applied to the characteristic of neural firings. We are born mathematicians even if our brains themselves are not be versed in the use of symbols and their manipulations. Our purpose here is to help with the structures which are no less mathematical in nature than judgments and priorities that have heretofore been the main focus of people who work in decision theory.

We are concerned with making it easier for the diversity of individual, group, government and international organization people to include all the important factors in their decisions. We hope to contribute to the science of structuring decisions so decision makers will have less concern about whether or not they have included all the relevant factors. It is widely known that there are two types of abstract structures in decision-making: hierarchies (a naive version of some hierarchies is called a tree) and networks with dependence and feedback, of which hierarchies and trees are a special case.

In seeking generality as to what to include in a hierarchy or a network, that derives from both broad and narrow considerations of a decision, we need to identify the many human values and activities that help one select the attributes and the alternatives of a decision. Our purpose here is to help give greater closure to the concern about what to include. Unlike quantitative manipulations and measurements, we have to deal with identifying elements, groups of elements and relations among them by using language. Perhaps this too can be done symbolically by astute scholars in the future.

4. Creative thinking in structuring problems

Because of the generality of our approach to structure all sorts of decisions, we think it is worthwhile just to mention the elements of human thinking that go into creating reliable structures. In fact creative thinking and decision-making work together very closely. To make a decision one needs creative thinking at least to design a structure for the factors of that decision, and to think creatively needs one to make a variety of decisions to proceeds in depth and breadth about what to include and how and where to include it. To structure a problem needs more creativity and creativity today is being written about and taught (the first author teaches a graduate class on the subject twice a year to crowded classes of students often including students already with a PhD or an MD). There is general agreement on what has to do to create something that is original, novel, significant, elegant, grand and complete.

They are purposeful, focused and goal-oriented approaches to creativity:

1. Finding the problem and getting a feel for it.
2. Brainstorming the problem and its solution.
3. Synectics.
4. Morphological analysis.
5. Lateral thinking.

It is morphological analysis that amounts to structuring a problem after brainstorming all its aspects and relating or connecting them in a process known as synectics. Morphological analysis amounts to creating a comprehensive structure for listing, grouping and connecting the elements in a way that leads to a hierarchy or often to a network. For greater details about such considerations the reader might consult the first author's book about creative thinking and problem solving [17].

5. Observations on general structures

To structure is to build or put together smaller components into larger ones and these again into still larger ones. In his book on structuralism Jean Piaget says that a structure is a system of transformations [11]. These transformations involve laws through which the structure is preserved or enriched by its transformation laws

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which never yield results nor use elements external to the structure. Structure involves three ideas: wholeness, transformation and self-regulation. Structures give rise to the idea of formalization that concerns flows in the structure to fulfill certain functions designed to meet certain objectives of varying priorities. While the structure exists regardless of the flows within it, the flows themselves are dependent on the structure and need mathematics to describe them. Their description depends on the choice of the theoreticians involved.

Contemporary mathematics has attempted to subordinate all mathematics, and not just geometry, to the idea of structure. For example, Category Theory deals in an abstract way with mathematical structures and relationships between them. It attempts to structure the common invariant properties in related mathematical structures. It involves clarifying the concept of natural transformation and of functors, defined as processes which preserve structures in some sense.

In that spirit our concern in this paper is to construct invariant structures in decision making that take on special forms and have elements and groups of elements that represent influence in the real world. We will not pursue this abstract line of thinking because not enough is known about the true nature of decision structures except that geometrically in the AHP/ANP they take on the form of a hierarchy or network.

6. General criteria and alternatives

To develop our own general list of human values and activities we examined at length the literature of the philosophy of science and this research activity directed us to three lists useful to draw upon for our work [1,8–10]. The lists are the product of thinking in law, philosophy and anthropology. The first, done by the lawyer, a List of Human Capabilities, is from the works of the distinguished professor of philosophy and teacher at the law school of the University of Chicago, Martha Nussbaum [10], about whom it is written that "she is America's foremost philosopher, a title retired since Ralph Waldo Emerson died in 1882". She has defended cases before the US Supreme Court based on the prestige of her innovation in human values.

The second is a comprehensive List of Values by K. Baier and N. Rescher [1], world-renowned philosophers of science (Rescher is also a mathematician), that provides a collection of personal values (of character and personality) that an individual may prize in himself/herself and his/her associates, and also in what he/she prizes in his/her society, nation, culture, fellow men in general, and environment.

The third list, the eighty years old work, Outline of Cultural Materials (OCM) [8,9], began in 1937 and revised in 2004, was created by many anthropologists, originally led by G.P. Murdoch at Yale. It is a manual which presents a system for categorizing cultural data regarding all aspects of human behavior. It is an ethnological and numerical classification system that provides subject indexing for human behavior, social life, customs, material products, and ecological settings. The Outline of Cultural Materials was developed in 1937 as a tool for a cross-cultural survey by the Institute of Human Relations at Yale University. It serves as a key to assembling and classifying basic information from samples of people around the world. This kind of classification system provides ways to group concepts under relatively broad topics. The outline successfully classifies material (meant to be used by those concerned with human behavior) in broad perspective according to seven basic criteria with 79 major divisions of cultural background information. They include: (1) patterned activity, (2) circumstance, (3) subject, (4) object, (5) means, (6) purpose, and (7) result. In the fifth edition [3] of the Outline as revised by experts at Yale University, the result was a new list of 81 categories with hundreds of subcategories updated to the present day.

A most demanding task in decision making is to determine the factors to consider in a hierarchy or network. To formulate an initially unstructured decision problem we attack it by assembling its elements into sub-hierarchies, each one dealing with a part of the problem and then we arrange them into a hierarchy by in decreasing order of influence. A hierarchy is a structure for organizing influences from sources to sinks, so that each element in a level of the hierarchy, except for the single top element known as the goal of the decision, is subordinate or is a subcriterion of an element immediately above. A major purpose of structuring hierarchies in decision making is to make it possible to compare the importance of the elements (criteria and alternatives) in a given level with respect to the elements in the level above and to derive priorities from the judgments expressed numerically. A hierarchy is a special case of a network with connections going only in one direction. A network has clusters of elements, with the elements in one cluster being connected to elements in another cluster (outer dependence) or the same cluster (inner dependence). In the first one compares the influence of elements in a cluster on elements in another cluster with respect to a control criterion (the overriding criterion (like economic influences) which respect to which all the comparisons in that network are made. In inner influence one compares the influence of elements in a group on another element in the same group with respect to the overriding criterion. Hierarchies and networks occur abundantly in personal life, in businesses and corporations, and in government strategy, public policy, the health care industry, military strategy, non-profit organization strategy, planning and so on.

Here is our list of levels in the two broad kinds of hierarchies identified in the first author's work in systems and planning [16]. There is the forward hierarchy in which one projects the likely outcome, and the backward hierarchy in which one identifies the desired outcome and works backward to determine the best policies to attain those outcomes. The first structures the forward flow of existing influences from the goal downwards towards likely alternatives from which one assembles a projected likely composite scenario. This approach is useful to forecast a likely outcome. The second kind of hierarchy works backwards from desired kinds of outcome scenarios listed at the top of a hierarchy, followed by a description of what a decision maker can do to attain the best outcome or a mix of the different desired outcomes.

The two hierarchies are:

1. The forward process hierarchy:
   Project the present state of a problem into the likely or logical future (or consequence).
2. The backward process hierarchy:
   Determine control policies to help attain the desired future (or consequence).

Both types of hierarchies are used in the planning process. Planning is an iterative process combining the forward and backward processes to produce convergence of the likely towards the desired.

The levels of the forward process hierarchy are:

(a) Macro environmental constraints.
(b) Social and political constraints.
(c) Forces.
(d) Objectives.
(e) Actors.
(f) Actor objectives.
(g) Actor policies.

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(h) Contrast scenarios.
(i) Composite scenario.

The levels of the backward process hierarchy are as follows:

(a) Anticipatory scenarios.
(b) Problems and opportunities.
(c) Actors and coalitions.
(d) Actor objectives.
(e) Actor policies.
(f) Particular control policies to influence the outcome.

7. Examples

A hierarchy or network is an efficient way to deal with complexity both structurally, for organizing a system, and functionally, for controlling and passing information down the system. Here are three examples that not only show why a hierarchy/network is an efficient framework but needs knowledge of diverse influences actors and alternatives from a general source of knowledge to make it thorough and clear that priorities flow from top to bottom for example. We have observed that having our general lists that will be given later are helpful in revising some of our less worked hierarchies/networks so that a more accurate decision would have been made at the time it was needed. In other words people may think they have the knowledge and expertise to make a good decision, but that can be deceptive. The first example is a problem structured by staff of the Department of Interior in Washington to derive priorities to determine the optimum level that a dam should be maintained. If the dam is full and there is heavy rain farms downstream would be flooded and farmers would be very unhappy. If the dam is half full and there is no rain it is more difficult to generate power and power users would be unhappy to pay more for electricity. About a two hour discussion produced the hierarchy shown in Fig. 1 followed by a list (Table 2) of groups that fall indifferent levels and their corresponding elements. Here the influences at the top are the most important; they are used by the decision makers to wield their influence through a variety of factor that affect each group differently as it serves their objectives which eventually determine the optimum level of the dam. We give the example to show that it was well worked and does not need revision now that we know more about all the relevant factors. That is not the case with the two examples that follow it.

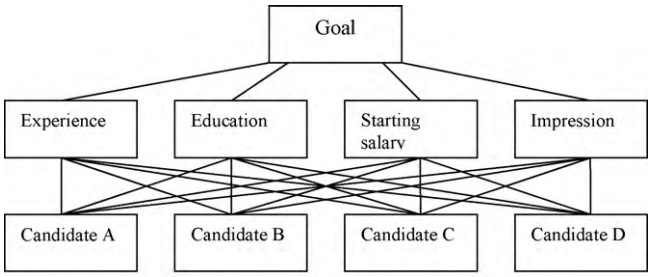

Fig. 2. Hierarchy for hiring the best candidate.

We learn several things from this practical example. At the top of the hierarchy we have the strategic criteria that influence the level of the dam. Below them we have the actors who use them to influence the level of the dam indirectly through the kind of influence they exert which is in the level below these actors. It is followed by a level of the people who have a vested interest in how high the dam should be kept. Below that level is a level of the objectives of these people. Finally we have the alternatives to keep the dam at a certain level. From this example we see that influence is distributed from the most general to most particular level passing through different agents. Applications sometimes are slightly more complex than this example. In financial applications one is often concern with scenarios of happenings involving time and place when they occur. Such scenarios fall above the strategic criteria which were at the second level in the dam decision. It is along these lines of thinking that we have organized our long list of human activities whose ingredients were taken from the prodigious work of distinguished anthropologists done over a period of 80 years. We note that they used a wide diversity of activities and values in that list without careful organization and connection among them.

Our second example deals with the hiring of the most qualified employee for a certain enterprise. The process of choosing the right person from a variety of available candidates presents a continuous challenge to the business manager, and involves a number of considerations, many of which are subjective. Selecting the right person for the position available can be long and tedious, one in which a successful choice is not guaranteed. The first hierarchy (Fig. 2) includes 4 criteria used by a manager to rank his candidates: *Experience*, *Education*, *Starting salary* and *Impression*. He found the

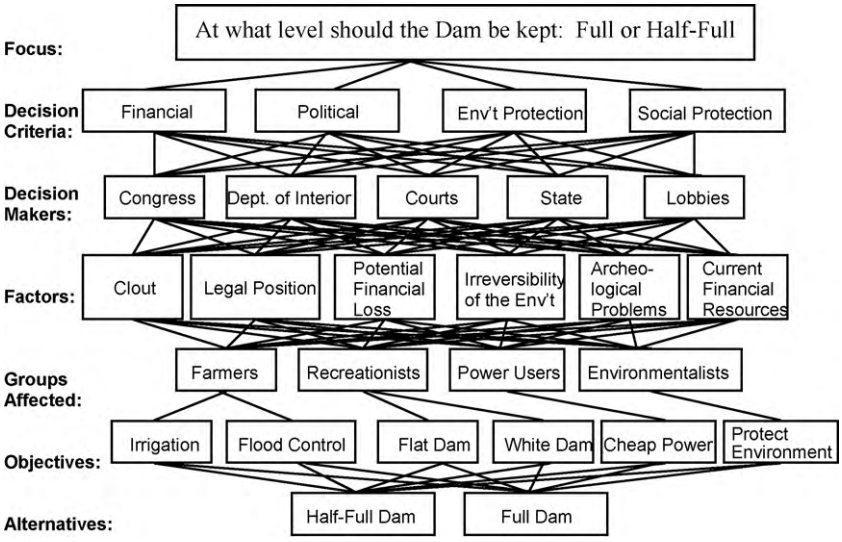

Fig. 1. A hierarchy to determine the optimum level of a dam.

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Table 2
List of groups and elements for the decision about the dam.

	Cause-Effect List	List of Values	Basic capabilities list
Decision criteria			
Financial Political Environment protection Social protection	Finance Political behavior Exploitative challenges Social challenges	Material welfare/Economic security and well-being, Material achievement and progress, Civic virtues, Domestic virtues, National prosperity and National achievement generally, Cultural and intellectual achievement and progress, Environment-oriented values and Society-oriented values/social welfare.	Control over one's environment
Decision makers			
Congress Dept. of Interior Courts State Lobbies	Government activities Territorial organization State Community		
Factors			
Clout Legal position Potential financial loss Irreversibility of the environment Archeological problems Current financial resources	Law Finance Exploitative Challenges Archaeological measures, Techniques and analyses Finance		
Groups affected			
Farmers Recreationists Power users Environmentalists	Community Territorial organization Agriculture Recreation Energy and power Exploitative activities Environmental quality		
Objectives			
Irrigation Flood control Flat dam White dam Cheap power Protect environment	Agriculture Geography Structures Energy and power Exploitative activities Environmental quality		
Alternatives			
Half-full dam Full dam			

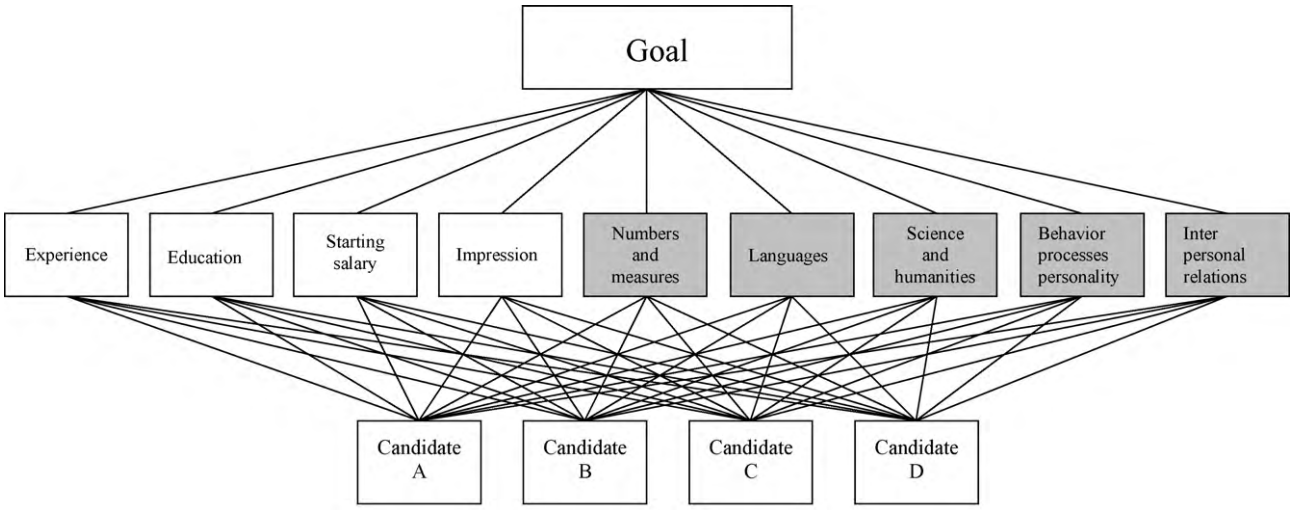

Fig. 3. Revised hierarchy for hiring the best candidate.

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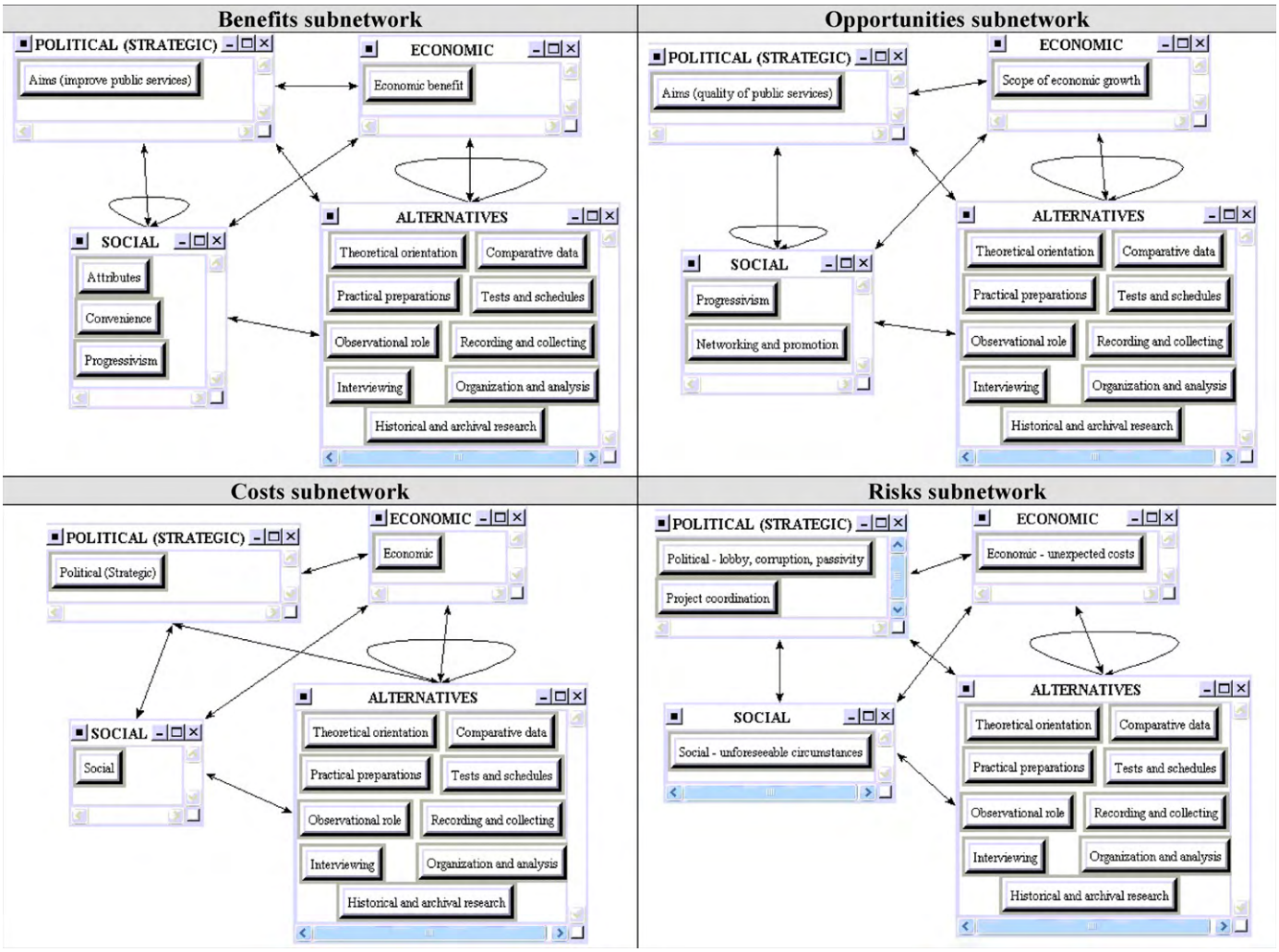

Fig. 4. Networks (BOCR) for prioritizing research methods.

ranking of the people unsatisfactory according to his instincts. He had neglected to include technical factors that have greater bearing on making distinctions among the candidates for that type of job offered. On consulting us we invited him to examine our Cause-Effect List (Table 5) and together we added five new criteria to the hierarchy (*Numbers and measures, Languages, Science and humanities, Behavior processes and personality* and *Interpersonal relations*) thus producing the hierarchy in Fig. 3 that was again used to prior-

Table 3
The list of basic biological and cultural capabilities of a human being.

Basic capabilities	Explanation
Life	Being able to live a normal length life.
Bodily health	Adequate food and shelter.
Bodily integrity	Being able to move freely from place to place; to be secure against violent assault; having opportunities for sexual satisfaction and reproduction.
Senses, imagination, and thought	Being able to use the senses, to imagine, think and reason- to do these things in a "truly human" way; Being able to use imagination and thought in connection with experiencing and producing works and events. Being able to use one's mind in ways protected by guarantees of freedom of expression with respect to both political and artistic speech, and freedom of religious exercise. Being able to have pleasurable experiences and to avoid non-beneficial pain.
Emotions	Being able to love, grieve at their absence; in general, to love, to grieve, to experience longing, gratitude and justified anger, not blighted by fear and anxiety.
Practical reason	Being able to form a conception of the good and to engage in critical reflection about the planning of one's own life.
Affiliation	A. Being able to live with and toward others, to recognize and show concern for other human beings, to engage in various forms of social interaction; B. Having the social bases of self-respect and non-humiliation; being able to be treated as a dignified being whose worth is equal to that of others.
Other species	Being able to live with concern for and in relation to animals, plants, and the world of nature.
Play	Being able to laugh, to play, to enjoy recreational activities.
Control over one's environment	A. Political. Being able to participate effectively in political choices that govern one's life; having the right of political participation, protections of free speech and association. B. Material. Being able to hold property (both land and movable goods), not just formally but in terms of real opportunity; and having property rights on an equal basis with others.

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Table 4
The comprehensive List of Values that individuals bring to society and society brings to the world.

Values	Category	Subcategory
I. Self-oriented values	"Material" welfare	Health
		Economic security and well-being
		Personal security
	Self-respect	
	Self-reliance	
	Personal liberty	
	Self-advancement	
	Self-fulfillment	
	Skill and prowess	The intellectual virtues
		The physical virtues
		The virtues of the wills
		Competence
		Inventiveness and innovativeness
		Initiative
		Well- informed ness
		Faith
		Appreciation and appreciativeness
II. Group-oriented values	Respectability	
	Rectitude and personal morality	
	Reasonableness and rationality	
	The domestic virtues	
	The civic virtues	
	Conscientiousness	Devotion to family, duty
		Personal responsibility and accountability
		Devotion to principle (especially of one's religion—"the god-fearing man")
	Friendship and friendliness	Friendship proper
		Loyalty
		Friendliness, Kindliness, Helpfulness, Cooperativeness and Courteousness
		Fellow-feeling (compassion, sympathy, and "love of one's fellows"
		Gregariousness
		Receptivity
		Personal tolerance
		Patience
	Service	
	Generosity	
	Idealism	
	Recognition	
	Forthrightness	
	Fair play	
III. Society-oriented values	Social welfare	
	Equality	Tolerance
		"Fair play", Fairness
		Civil rights
	Justice	
	Liberty	
	Order	
	Opportunity	
	Charity	
	Progressivism	
	Pride in "our culture" and "our way of life"	
IV. Nation-oriented values	Patriotic virtues	National freedom and independence
		National prosperity and national achievement
		Patriotism and national pride
		Concern for the national welfare
		Loyalty (to country)
		Chauvinism
	Democracy	
	Public service	
V. Mankind-oriented values	The "welfare of mankind"	Peace
		Material achievement and progress
		Cultural and intellectual achievement and progress
	Humanitarianism and the "brotherhood of man"	
	Internationalism	
	Pride in the achievements of "the human community"	
	Reverence for life	
	Human dignity and the "worth of the individual"	
VI. Environment-oriented values	Aesthetic values (environmental beauty)	
	Novelty	

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Table 5
The Cause-Effect List.

Cause-effect	Categories	Subcategories
Settling the environment	DEMOGRAPHY	Population, Composition of population, Birth statistics, Morbidity, Mortality, Internal migration, External migration, Population policy
	GEOGRAPHY	Location, Climate, Topography and geology, Soil, Mineral resources, Fauna, Flora, Post depositional processes
	HUMAN BIOLOGY	Anthropometry, Descriptive somatology, Genetics, Racial affinities, Ontogenetic data, Nutrition, Physiological data
	INDIVIDUATION AND MOBILITY	Personal names, Names of animals and things, Naming, Status, Role, Prestige, Talent mobility, Accumulation of wealth, Manipulative mobility, Downward mobility
	SOCIALIZATION	Techniques of inculcation, Weaning and food training, Cleanliness training, Sex training, Aggression training, Independence training, Transmission of cultural norms, Transmission of skills, Transmission of beliefs
	SOCIAL STRATIFICATION	Age stratification, Gender status, Ethnic stratification, Castes, Classes, Serfdom and peonage, Slavery
	SOCIAL CHALLENGES	Disasters, Disabilities, Alcoholism and drug addiction, Invalidism, Poverty, Dependency, Old age dependency, Delinquency
	PROPERTY	Property system, Property in movables, Real Property, Incorporeal property, Acquisition and relinquishment of property, Borrowing and lending, Renting and leasing, Inheritance, Administration
	SETTLEMENTS	Settlement patterns, Housing, Streets and traffic, Refuse disposal and sanitary facilities, Public utilities, Commercial facilities, Parks, Miscellaneous facilities, Urban and rural life
	TRAVEL AND TRANSPORTATION	Locomotion, Burden carrying, Weight moving, Travel, Travel services, Regulation of travel, Routes, Warehousing, Transportation
	LAND TRANSPORT	Highways and bridges, Animal transportation, Vehicles, Highway transportation, Auxiliary highway services, Railways, Rail transport, Terminal facilities, Highway and railway construction
	WATER AND AIR TRANSPORT	Boats, Water navigation, Waterways improvements, Port facilities, Water transport, Aircraft, Aviation, Airport facilities, Aair transport
	TOTAL CULTURE	Ethos, Functional and adaptational interpretations, Norms, Cultural participation, Cultural goals, Cultural identity and pride
	HISTORY AND CULTURE CHANGE	Comparative evidence, Prehistory, Traditional history, Historical reconstruction, History, Innovation, Acculturation and culture contact, Sociocultural trends, Economic planning and development, Cultural revitalization and ethnogenesis
People	REPRODUCTION	Menstruation, Conception, Pregnancy, Childbirth, Difficult and unusual births, Postnatal care, Abortion and infanticide, Illegitimacy
	SEX	Sexuality, Sexual stimulation, Sexual intercourse, General sex restrictions, Kinship regulation of sex, Premarital sex relations, Extramarital sex relations, Homosexuality, Miscellaneous sex behavior
	GENDER ROLES AND ISSUES	Male and female responsibilities, Participation in business, Order, Politics and the military
	KIN GROUPS	Rule of descent, Kindreds and ramages, Lineages, Sibs, Phratries, Moieties, Bilinear kin groups, Clans, Tribe and nation
	FAMILY	Residence, Household, Family relationships, Nuclear family, Polygamy, Extended families, Adoption
	MARRIAGE	Basis of marriage, Regulation of marriage, Mode of marriage, Arranging a marriage, Nuptials, Termination of marriage, Secondary marriage, Special unions and marriages, Celibacy
	KINSHIP	Kinship terminology, Kin relationships, Grandparents and grandchildren, Avuncular and nepotic relatives, Cousins, Parents-in-law and children-in-law, Siblings-in-law, Artificial kin relationships, Behavior toward nonrelatives
	INFANCY AND CHILDHOOD	Social placement, Ceremonial during infancy and childhood, Infant feeding, Infant care, Child care, Development and maturation, Childhood activities, Status of children
	ADOLESCENCE, ADULTHOOD, AND OLD AGE	Puberty and initiation, Status of adolescents, Adolescent activities, Majority, Adulthood, Senescence, Activities of the aged, Status and treatment of the aged
	HEALTH AND WELFARE	Philanthropic foundations, Medical research, Hospitals and clinics, Public health and sanitation, Social insurance, Public assistance, Private welfare agencies, Social work
	SICKNESS	Preventive medicine, Bodily injuries, Theory of disease, Sorcery, Magical and mental therapy, Psychotherapists, Medical therapy, Medical care, Medical personnel
	DEATH	Life and death, Suicide, Dying, Burial practices, Mourning, Special mortuary practices, Mortuary specialists, Social readjustments to death, Cult of the dead
Interaction of people	LANGUAGE	Speech, Vocabulary, Grammar, Phonology, Sociolinguistics, Semantics, Linguistic identification, Special languages
	COMMUNICATION	Gestures and signs, Transmission of messages, Dissemination of news and information, Press, Mail, Telephone and telegraph, Radio and television, Public opinion, Proxemics, Internet communications

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Table 5 (*Continued*)

Cause-effect	Categories	Subcategories
	INTERPERSONAL RELATIONS Social relationships and groups, Friendships, Cliques, Visiting and hospitality, Sodalities, Etiquette, Ethics, In-group antagonism, Brawls, Riots and banditry	
	BEHAVIOR PROCESSES AND PERSONALITY	Sensation and perception, Drives and emotions, Modification of behavior, Adjustment processes, Personality development, Social personality, Personality traits, Personality disorders, Life history materials
	COMMUNITY	Community structure, Community heads, Councils, Local officials, Police, Social control, Informal ingroup justice, Inter-community relations, Inter-ethnic relations
Organizing people	TERRITORIAL ORGANIZATION	Territorial hierarchy, Towns, Cities, Districts, Provinces, Dependencies
	STATE	Citizenship, Constitution, Chief executive, Executive household, Cabinet, Parliament, Administrative agencies, International relations
	GOVERNMENT ACTIVITIES	Taxation and public income, Public finance, Public works, Research and development, Government enterprises, Government regulation, Public welfare, Public education, Miscellaneous government activities
	ARMED FORCES	Military organization, Recruitment and training, Discipline and morale, Ground combat forces, Supply and commissariat, Navy, Air force, Auxiliary corps
	ECCLESIASTICAL ORGANIZATION	Magicians and diviners, Prophets and ascetics, Priesthood, Congregations, Religious denominations, Organized ceremonial, Missions, Religious intolerance
	BUSINESS AND INDUSTRIAL ORGANIZATION	Ownership and control of capital, Individual enterprise, Corporate organization, Cooperative organization, State enterprise, Mutual aid, Competition
	FOOD QUEST	Annual cycle, Collecting, Fowling, Hunting and trapping, Marine hunting, Fishing, Fishing gear, Marine industries
	AGRICULTURE	Tillage, Agricultural science, Cereal agriculture, Vegetable production, Arboriculture, Forage crops, Floriculture, Textile agriculture, Special crops
	ANIMAL HUSBANDRY	Domesticated animals, Applied animal science, Pastoral activities, Dairying, Poultry raising, Wool production, Animal by-products
	FOOD PROCESSING	Preservation and storage of food, Food preparation, Meat packing industry, Refrigeration industry, Canning industry, Cereal industry, Confectionery industries, Miscellaneous food processing and packing industries
Occupation with food and production	FOOD CONSUMPTION	Gratification and control of hunger, Diet, Condiments, Eating, Food service industries, Cannibalism
	DRINK AND DRUGS	Water and thirst, Nonalcoholic beverages, Alcoholic beverage's, Beverage industries, Drinking establishments, Recreational and non-therapeutic drugs, Tobacco industry, Pharmaceuticals
	ENERGY AND POWER	Power development, Fire, Light, Heat, Thermal power, Water power, Electric power, Atomic power, Miscellaneous power production
	MACHINES	Mechanics, Industrial machinery, Electrical machines and appliances, Household machines and appliances, weighing, measuring, and recording machines, Weigh-moving machinery, Agricultural machinery, Computer technology
	TOOLS AND APPLIANCES	Weapons, General tools, Special tools, Miscellaneous hardware, Utensils, Appliances, Apparatus
	BUILDING AND CONSTRUCTION	Construction, Earth moving, Masonry, Structural steel work, Carpentry, Plumbing, Electrical installation, Miscellaneous building trades, Building supplies industries
	EQUIPMENT AND MAINTENANCE OF BUILDINGS	Grounds, Furniture, Interior decoration and arrangement, Heating and lighting equipment, Miscellaneous building equipment, Housekeeping, Domestic service, Maintenance of nondomestic buildings
	STRUCTURES	Architecture dwellings, Outbuildings, Public structures, Recreational structures, Religious and educational structures, Business structures, Industrial structures, Miscellaneous structures
	CHEMICAL INDUSTRIES	Chemical engineering, Petroleum and coal products industries, Rubber industries, Synthetics industries, Industrial chemicals, Paint and dye manufacture, Fertilizer industry, Soap and allied products, Manufacture of explosives
	CAPITAL GOODS INDUSTRIES	Hardware manufacture, Machine industries, Electrical supplies industry, Manufacture of heating and lighting appliances, Manufacture of optical and photographic equipment, Shipbuilding, Railway equipment industry, Manufacture of vehicles, Aircraft industry
	EXPLOITATIVE CHALLENGES	Land use, Water supply, Lumbering forest products, Oil and gas wells, Mining and quarrying, Special deposits, Environmental quality
	FINANCE	Accounting, Credit, Banking, Saving and investment, Speculation, Insurance, Foreign exchange, Business cycles
	EXCHANGE	Gift giving, Buying and selling, Production and supply, Income and demand, Price and value, Medium of exchange, Exchange transactions, Domestic trade, Foreign trade

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Table 5 (*Continued*)

Cause-effect	Categories	Subcategories
Sophistication	MARKETING	Mercantile business, Wholesale marketing, Retail marketing, Retail businesses, Service industries, Sales promotion, Advertising
	MILITARY TECHNOLOGY	Military engineering, Military installations, Ordnance, Uniform and accouterment, Military vehicles, Naval vessels, Military aircraft, Special military equipment, Munitions industries
	EDUCATION	Educational system, Elementary education, Liberal arts education, Vocational education, Teachers, Educational theory and methods, Students
	SCIENCES AND HUMANITIES	Logic, Philosophy, Scientific method, Humanistic studies, Science, Applied science
	TEXTS	Texts in the speaker's language, Texts translated into English, Interlinear translations
	NUMBERS AND MEASURES	Numerology, Numeration, Mathematics, Weights and measures, Ordering of time
	RECORDS	Mnemonic devices, Writing, Printing, Publishing, Photography, Sound records, Archives, Writing and printing supplies
	RESEARCH METHODS	Theoretical orientation in research and its results, Practical preparations in conducting fieldwork, Observational role in research, Interviewing in research, Tests and schedules administered in the field, Recording and collecting in the field, Historical and archival research, Organization and analysis of results of research, Archaeological survey methods, Archaeological excavation methods, Dating methods in archaeology, Laboratory analysis of materials other than dating methods in archaeology, Comparative data
	INFORMATION SOURCES	Citations of documents in the Human Relations Area Files (HRAF) collection, Additional bibliography, Information sources listed in other works, Reviews and critiques, Informants, Complete texts of HRAF documents, Field data, Fiction, Artifact and archive collections
	ORIENTATION	Identification, Maps, Place names, Glossary, Cultural summary, Coded data, Diagnostic material attributes
	ARCHAEOLOGICAL MEASURES, TECHNIQUES, AND ANALYSES	Chronologies and culture sequences, Cultural stratigraphy, Functional specialization areas, Typologies and classifications, Archaeological inventories
	IDEAS ABOUT NATURE AND PEOPLE	Ethnometeorology, Ethnophysics, Ethnogeography, Ethnobotany, Ethnozoology, Ethnoanatomy, Ethnophysiology, Ethnopsychology, Ethnosociology
	RELIGIOUS BELIEFS	General character of religion, Cosmology, Mythology, Animism, Eschatology, Spirits and gods, Luck and chance, Sacred objects and places, Theological systems
	RELIGIOUS PRACTICES	Religious experience, Prayers and sacrifices, Purification and atonement, Avoidance and taboo, Asceticism, Ecstatic religious practices, Revelation and divination, Ritual, Magic
Order and control	JUSTICE	Litigation, Judicial authority, Legal and judicial personnel, Initiation of judicial proceedings, Trial procedure, Execution of justice, Prisons and jails, Special courts
	LAW	Legal norms, Liability, Wrongs, Crime, Contracts, Agency, Organized crime
	OFFENSES AND SANCTIONS	Sanctions, Offenses against life, Offenses against the person, Sex and marital offenses, Property offenses, Nonfulfillment of obligations, Offenses against the State, Religious offenses, Social offenses
	POLITICAL BEHAVIOR	Exploitation, Political intrigue, Public service, Pressure politics, Political parties, Elections, Political machines, Political movements, Revolution
	WAR	Instigation of war, Wartime adjustments, Strategy, Logistics, Tactics, Warfare, Aftermath of combat, Peacemaking, War veterans
Beauty, leisure and entertainment	ARTS	*Decorative art, *Representative art, Music, Musical instruments, Dance, Drama, Oratory, *Literature, *Literary texts, Verbal arts, Visual arts
	ADORNMENT	Ornament, Toilet, Manufacture of toilet accessories, Mutilation, Beauty specialists, Jewelry manufacture
	RECREATION	Conversation, Humor, Hobbies, Games, Gambling, Athletic sports, Rest days and holidays, Vacations, Recreational facilities
	COMMERCIALIZED ENTERTAINMENT	Spectacles, Commercialized sports, Exhibitions, Public lectures, Musical and theatrical productions, Motion picture industry, Night clubs and cabarets, Illegal entertainment, Art and recreational supplies industries

itize the candidates. This time the outcome was much more to his satisfaction.

For our third example we used our lists to structure four decision networks, one for benefits, one for opportunities, a third for costs and a fourth for risks. The second author was involved in a project supported by government to improve services in the public sector. The aims were: using of multi-criteria decision-making methods for the implementation of policies in the public sector, a more complete use of available information in the public sector and a higher quality use of that information, better understanding of the consequences of the actions taken to correct problems in the public sector, identifying the factors necessary for making such decisions and allocating resources to projects in the public sector optimally according to priorities.

The problem was how to gather the information and structure the necessary networks to be used to prioritize the research methods for each aim of the project. We have created the decision networks model based on our two lists (List of Values and Cause-Effect List) to show that lists can be very helpful in developing new decision-making model. We have used the List of Values in Table 4 for creating the clusters in all 4 sub-networks (benefits, opportunities, costs and risks) and the Cause-Effect List in Table 5 for creating elements in the cluster of alternatives that is repeated in all four networks. The elements (research methods) in the cluster

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of alternatives are: *Theoretical orientation in research and its results*, *Practical preparations in conducting fieldwork, Observational role in research, Interviewing in research, Tests and schedules administered in the field, Recording and collecting in the field, Historical and archival research, Organization and analysis of results of research* and *Comparative data*. Under the benefits, opportunities, costs and risks (BOCR) models, different clusters define interactions with respect to the control hierarchy established. The benefits network would indicate the alternatives that yield the most benefit and the opportunities networks would indicate the alternative that offers the most opportunities, whereas the costs and risks networks would indicate the alternatives that are the most costly or pose the most risk on each alternative (Fig. 4).

8. Our version of the three lists of human values and activities

In section three we offered information on three lists that were our starting point. These lists were given as long lists of words, not tabulated and tightly organized. We have ordered, rearranged and added elements to these lists as we felt are necessary and we have ordered and arranged them for decision-making purposes as shown in Tables 3–5. At first sight, the reader may find these lists overwhelming because they contain more then 1000 elements, but we guarantee that they give greater exposure to the scope of decision making. They are valuable to provide us with the perspective of people involved in a diversity of complex problems such politics and the environment so that our decision structures will be richer and more complete. Lists need a different way of thinking about how valuable they are. They must be read and re-read, examined, remembered and used often enough and extended when necessary so that the user's thinking grows to cope with today's changing world. To acquire this kind of familiarity, we urge the practitioner to keep them handy so they will be there when needed.

9. Conclusion

What are the answers to our research questions? RQ1: How to create general lists of human values and activities? RQ2: How do general lists of human values and activities used for structuring problems into hierarchies/networks and for reviewing the created hierarchies/networks help to make a more accurate decision?

We created our version of three lists of human values and activities: The list of basic biological and cultural capabilities of a human being, The comprehensive List of Values that individuals bring to the society and the society brings to the world and The Cause-Effect List. We rearranged and added elements to the three lists which were our starting points and we ordered and arranged them for decision-making purposes.

We presented three case studies in order to test the helpfulness of the lists. First, we gave an example to show how the hierarchy could be produced in a 2-h discussion using our lists. In the second case study the first hierarchy includes 4 criteria used by a manager to rank his candidates. Upon consultation, we invited him to examine the Cause-Effect List and he added five new criteria to the hierarchy. In the third case study, we created the decision network model based on two lists (the List of Values and the Cause-Effect List). The lists were used to structure four decision networks, one for benefits, one for opportunities, the third one for costs and the fourth for risks.

The results showed that lists are valuable in providing us with the perspective of people involved in a diversity of complex problems such as business, politics and the environment, so that our decision structures will be richer and more complete.

We have no doubt that there is much more work to be done on the subject of structures in decision making and what should go into them. We hope that we may be forgiven for what appears to be an ambitious undertaking. It was not as easy to do as we thought it would be when we started because even though we have written extensively in books that are solely concerned with structures, it is a huge and nearly intractable undertaking to cope with all of human decision making in one paper. We intend to continue to expand, refine and apply the material we have developed to ensure its usefulness and to ask colleagues involved in facilitating decisions to try out the material and suggest changes. There remains the question of the classification of policies, a concern that has not yet been dealt with systematically in the field of decision making. We intend to tackle this issue in a separate paper.

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