

# Coordination of advocacy coalitions using cognitive maps

CRISTIANO SANTOS LÚCIO DE MELO<sup>1</sup>DIEGO MOTA VIEIRA<sup>1</sup><sup>1</sup> UNIVERSIDADE DE BRASÍLIA (UNB) / PROGRAMA DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO, BRASÍLIA – DF, BRAZIL

## Abstract

This theoretical essay contributes to the analysis of advocacy coalitions in processes of formulation or change of public policies, combining public policy analysis and operational research models. Jenkins-Smith, Nohrstedt, Weible et al. (2014) observe from the results of some empirical applications that the beliefs of actors alone do not tell the whole history of policy change. In addition, the authors emphasize that the degree of conflict among actors or coalitions is related to their perceptions of the extent of threats of the goals or actions of other actors, to their beliefs about a policy. The study used an approach to analyze the degree of inter and intra political coordination in institutional change processes, based on the identification of the beliefs, declared objectives and political alternatives of the actors, using Value-Focused Thinking associated to causal cognitive maps. From the combination of these methods and the comparison of cognitive maps, the expectation is to identify political coalitions, characterize collaborative or conflicting environments, and the identify political agendas with varying degrees of cooperation or conflict.

**Keywords:** Public policies. Institutional change. Advocacy coalitions. Value-Focused thinking. Cognitive maps.

## Coordenação de coalizões de defesa utilizando mapas cognitivos

### Resumo

Este artigo traz uma contribuição à análise de coalizões de defesa em processos de formulação ou mudança de políticas públicas, conjugando modelos de análise de políticas públicas e da pesquisa operacional (PO). Jenkins-Smith, Nohrstedt, Weible et al. (2014) observam, a partir dos resultados de algumas aplicações empíricas, que somente as crenças dos atores envolvidos não contam toda a história da mudança da política e ressaltam que o grau de conflito entre os atores ou as coalizões está relacionado às suas percepções quanto ao alcance das ameaças, dos objetivos ou das ações de outros atores, às suas crenças acerca de uma política. Diante do exposto, propõe-se uma abordagem para análise do grau de coordenação inter e intracoalizes políticas em processos de mudança institucional, a partir da identificação das crenças, dos objetivos declarados e das alternativas políticas dos atores, utilizando o pensamento focado no valor (*value-focused thinking* – VFT) associado aos mapas cognitivos causais. A partir da conjugação desses métodos, espera-se, por meio da comparação dos mapas cognitivos, identificar as coalizões políticas e caracterizar os ambientes colaborativos ou conflituosos, bem como identificar as agendas políticas com variados graus de cooperação ou conflito.

**Palavras-chave:** Políticas públicas. Mudança institucional. Coalizões de defesa. Pensamento focado no valor. Mapas cognitivos.

## Coordinación de coaliciones de defensa utilizando mapas cognitivos

### Resumen

Este ensayo teórico presenta una contribución al análisis de coaliciones de defensa en procesos de formulación o cambio de políticas públicas, conjugando modelos de análisis de políticas públicas y de la investigación operacional. Jenkins-Smith, Nohrstedt, Weible et al. (2014) observan, a partir de los resultados de algunas aplicaciones empíricas, que sólo las creencias de los actores involucrados no cuentan toda la historia del cambio de la política, y resaltan que el grado de conflicto, entre los actores o coaliciones, está relacionado con sus percepciones en cuanto al alcance de las amenazas, de los objetivos o acciones de otros actores, a sus creencias acerca de una política. Ante lo expuesto, se propone un enfoque para analizar el grado de coordinación inter e intracoaliciones políticas en procesos de cambio institucional, a partir de la identificación de las creencias, de los objetivos declarados y de las alternativas políticas de los actores, utilizando *value-focused thinking* asociado a los mapas cognitivos causales. A partir de la conjugación de estos métodos se espera, a través de la comparación de los mapas cognitivos, la identificación de las coaliciones políticas, la caracterización de ambientes colaborativos o conflictivos, así como la identificación de agendas políticas con variados grados de cooperación o conflicto.

**Palabras clave:** Políticas públicas. Cambio institucional. Coaliciones de defensa. Value-focused thinking. Mapas cognitivos.

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## INTRODUCTION

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The public policy field of study tries to explain how and why governments do, or do not do something that will have repercussions on the lives of individuals. Public policy analysis, therefore, is certainly a complex and challenging task.

According to Pierson (2006), public policies can be defined as a set of institutions. Institutions are cognitive, normative, and regulatory structures that confer stability and meaning on social behavior and comprise both informal restrictions and formal rules (NORTH, 1991; SCOTT, 1995).

Changes in these rules and restrictions are defined as institutional change, a time when institutions are created or reinterpreted. According to Streek and Thelen (2005), this process of change may be incremental or abrupt and, when undertaken by actors who are capable of influencing the institutional context, result in the continuity or discontinuity of institutions. According to Mahoney and Thelen (2010), how successful these actors are in bringing about institutional change depends on their skill in forming coalitions.

As for the formation of coalitions, among the models of public policy analysis available in the literature, the advocacy coalition framework (ACF) (SABATIER and JENKINS-SMITH, 1988) stands out, which is structured around the notion that actors are organized in coalitions based on common beliefs and act in defense of certain aspects of public policy.

In view of the above, attempts to change policies (institutional) result in complex and conflicting processes. The degree of complexity of these change processes is also influenced by the following factors: 1) the limited rationality of the actors, expressed by way of simplifying heuristics, cognitive biases and ambiguity; 2) the existence of multiple actors, coalitions and institutional arenas; 3) the coexistence of multiple political objectives and alternatives, which are often in conflict with each other; and 4) the cooperative or competitive nature of the environments, with their varying degrees of conflict (MARCH, 2009; MAHONEY and THIELEN, 2010; ALMEIDA, MORAIS, COSTA et al., 2012; KAHNEMAN, 2012; VIEIRA and GOMES, 2014).

The importance of the ideas, beliefs and conceptions of the actors with regard to a particular public policy is highlighted by the ACF. Based on the results of some empirical applications, Jenkins-Smith, Nohrstedt, Weible et al. (2014), however, stress the need to rethink the coalition formation and maintenance theory and to understand the coalition structure and the reasons for desertion and stability over time. Beliefs alone do not tell the whole story of policy change.

According to Jenkins-Smith, Nohrstedt, Weible et al. (2014), the degree of conflict has to do with the goals or actions of the actors' opponents and to the extent of the threats to the actors' fundamental beliefs about public policy that they perceive. The authors also state that the actors tend to overestimate the power and cunning of their opponents, which results in conflicts being prolonged.

Given this context, policy change processes are perceived as a problem situation with varying degrees of conflict and reduced cooperation and coordination between the actors or coalitions of a given political subsystem, influenced by the beliefs, objectives and political alternatives (MARCH, 2009; MAHONEY and THELEN, 2010; JENKINS-SMITH, NOHRSTEDT, WEIBLE et al., 2014; VIEIRA and GOMES, 2014).

One of ACF's assumptions emphasizes the limited rationality of the actors. With regard to cognitive structures, Simon (1959) states that human beings have limited cognitive capacity, in other words, they have limitations when it comes to understanding all the systems around them and/or processing all the information they receive. Kahneman (2012), on the other hand, presents new elements for understanding the judgment and choice processes and the types of heuristics and biases that condition our daily behavior.

In recent decades several research projects, which accept some of the issues expressed by Simon (1959) and Kahneman (2012), have been carried out in the Operational Research (OR) area to better understand the cognitive aspects of human beings. The purpose of such research is to support individual or group decision-making processes and conflict negotiation, since traditional OR methods have proved insufficient in isolation for solving complex problems. These methodologies, including cognitive maps, are not characterized as optimization methods. In fact, they allow problems to be structured based on the different perceptions of those involved (CLIMACO, CARDOSO and SOUZA, 2004; ALMEIDA, MORAIS, COSTA et al., 2012).

With regard to decision support methods, they generally focus on assessing the available alternatives, when their focus should be on how these alternatives are or can be established; the best way to achieve this is to think about values and

objectives. The value-focused thinking (VFT) approach focuses on the values of decision-makers that can be explained by way of objectives. The creation of better decision alternatives is one of the main benefits of this approach, which comprises two activities: deciding what is wanted and then finding out how to achieve it (KEENEY, 1992).

The objective of this study, therefore, is to propose an approach for characterizing the degree of political inter/intra-coalition coordination that exists in institutional change processes in a particular political subsystem, in accordance with the materialization of beliefs in stated objectives and political alternatives.

The justification for this essay is the need: 1) to rethink the coalition formation and maintenance theory, and understand the coalition structure and the reasons for desertion and stability over time (JENKINS-SMITH, NOHRSTEDT, WEIBLE et al., 2014); 2) to identify the beliefs and values of actors in a more defined way in empirical research that addresses ACF; and 3) to identify and outline the problem situation clearly and precisely in a particular political subsystem, since understanding the reality, which is neither easy nor consensual, has an influence on the design and, therefore, on the effectiveness of the results of public policy.

This study also aims to contribute to the analysis of political coalitions in processes involving public policy formulation or change, by proposing an alternative approach to identifying advocacy coalitions, which goes beyond determining a belief structure and also incorporates the stated objectives and political alternatives of these actors in a political subsystem.

First, concepts related to institutions, institutional changes, ACF and cognitive structures are presented. Then the VFT and cognitive maps are described, and, finally, the proposed approach to analyzing the degree of coordination of political coalitions in processes of institutional change is presented and discussed.

## INSTITUTIONS AND INSTITUTIONAL CHANGE

According to Vieira and Gomes (2014), the formation or change in a given public policy involves alterations in the institutions to which it is related. According to North (1991), institutions are humanly idealized restrictions that structure political, economic and social interactions and consist of informal restrictions (sanctions, taboos, customs, traditions and codes of conduct) and formal rules (constitutions, laws and property rights).

Changes in these norms, procedures or rules are defined as institutional change, when institutions are created or reinterpreted. According to Streeck and Thelen (2005), this process of change can be incremental or abrupt and the results of such a change are either institutional continuity or discontinuity. Box 1 shows the types of institutional change that are in line with these processes and results.

**Box 1**

**Types of institutional change: processes and results**

		Result of change	
		Continuity	Discontinuity
Process of change	Incremental	<i>Reproduction by adaptation</i>	<i>Gradual transformation</i>
	Abrupt	<i>Survival and return</i>	<i>Breakdown and replacement</i>

Source: Adapted from Streeck and Thelen (2005).

According to Mahoney and Thelen (2010), once institutions have been created they change gradually and slowly over time and have an influence on human behavior and on policy outcomes. Total substitutions, however, which occur much less frequently, are not excluded. Despite the place of prominence of institutional analysis in contemporary social science, the literature that was consulted provides little guidance as to the institutional change processes, since there are still no tools for explaining the gradual evolution of institutions better.

Most scholars who work with institutional change point out that abrupt changes are caused by exogenous shocks, while changes based on endogenous evolution, in most cases, develop incrementally. Incremental changes, however, are often only perceptible as change when analyzed over a somewhat longer time period than found in most of the literature (MAHONEY and THELEN, 2010).

Institutional changes are undertaken by actors who are capable of influencing the institutional context by way of their demands and choices. Vieira and Gomes (2014) argue that the objective of the actors who are grouped in advocacy coalitions or interest groups and influenced by their values, preferences and expectations is to achieve the status that is convenient to them, and so they provoke institutional changes.

According to Mahoney and Thelen (2010), actors with different resources are motivated to create different types of institutions that, in fact, reflect the relative contributions of the conflicts between these actors. Institutional results do not necessarily reflect the preferences of the dominant coalition, but may be the result of conflict between coalitions, or the “ambiguous commitments” of a coordination effort between conflicting actors.

Mahoney and Thelen (2010) classify these actors, who become the agents of change, as follows: insurrectionaries, symbionts (parasites or mutualists), subversives and opportunists.

The success that the various types of agent achieve in bringing about institutional change depends on their ability to form coalitions. Although coalitions are formed for a particular issue, it is possible to generalize as to how different change agents may - or may not - form alliances with those who benefit - or not - from existing rules (MAHONEY and THELEN, 2010). Box 2 shows the logic of the alliances between each type of agent and the supporters or opponents of the existing rules.

## Box 2

### Alignments of the change agents

Types of change agent	Allied with institutional supporters	Allied with institutional opponents
Insurrectionaries	No	Yes
Symbionts	Yes	No
Subversives	No	No
Opportunists	Yes/no	Yes/no

Source: Adapted from Mahoney and Thelen (2010).

As for the formation of coalitions, among the public policy analysis models available in literature, ACF stands out (SABATIER and JENKINS-SMITH, 1988).

## ADVOCACY COALITION FRAMEWORK

The ACF is structured around the notion that the actors are organized in coalitions with common beliefs and that they defend certain aspects of public policy (SABATIER and JENKINS-SMITH, 1988). The ACF gained notoriety in 1988 with the publication of a special issue of the Policy Sciences journal. In this publication, Paul Sabatier establishes the subsystem as a unit of analysis and describes the belief structure that marks the formation of advocacy coalitions, with an emphasis on the effect of learning in the process of changing public policies (JENKINS-SMITH, NOHRSTEDT, WEIBLE et al., 2014).

Jenkins-Smith, Nohrstedt, Weible et al. (2014) present the following assumptions for ACF: 1) the political subsystem is the primary unit of analysis for understanding the political process; 2) the set of actors in a relevant subsystem includes any person who regularly tries to influence the subject matters of this subsystem; 3) the rationality of individuals is limited, their ability for processing stimuli is restricted and they are motivated by belief systems and prone to experiencing the so-called

“devil shift” (believing their opponents to be more evil and more powerful); 4) the subsystems are simplified by the actors aggregating into one or more coalitions; 5) policies and programs incorporate implicit theories, which reflect the beliefs that are translated from one or more coalitions; 6) scientific and technical information is important for understanding the subject matters of a subsystem; and 7) researchers should adopt a long-term perspective (e.g., 10 years or more) in order to understand political processes and change.

One of the central aspects of the conceptual construction of the ACF is the belief structure that defines coalitions. The belief system of the actors and coalitions, which is derived from Imre Lakatos’s description of the change in scientific theory, was conceived according to the actors’ degree of resistance to change: deep core beliefs, which are more stable with fundamental, ontological and normative demands, and; policy core beliefs, which are resistant to change, but more susceptible to verification and refutation in new experiences than deep core beliefs; and secondary beliefs, which tend to change over time (JENKINS-SMITH, NOHRSTEDT, WEIBLE et al., 2014).

The ACF provides a set of useful questions for understanding situations with a high degree of conflict, involving coalitions, learning and policy change at the level of the political subsystem that is being analyzed. In relation to advocacy coalitions, these are defined by actors who share fundamental beliefs with regard to the policy and who coordinate actions in a significant way in order to influence a policy subsystem. Political learning is associated with changes in the belief systems of coalition members, which includes not only understanding a problem and the associated solutions, but also using political strategies for achieving the goals (JENKINS-SMITH, NOHRSTEDT, WEIBLE et al., 2014).

According to Jenkins-Smith, Nohrstedt, Weible et al. (2014), one of the objectives of the ACF is to contribute to an understanding of policy change and stability, an aspect that has been the object of empirical research. Based on this research, today there is more detailed knowledge about the nature and causes of political intra/inter-subsystem policy change than a few decades ago.

Based on the results of some of the empirical applications, Jenkins-Smith, Nohrstedt, Weible et al. (2014) stress the need to rethink the theory of coalition formation and maintenance, since beliefs alone do not tell the whole story, and because of the fact that the actors’ perceptions of the consequences, objectives or actions of other actors with regard to their fundamental beliefs about public policy affect this process.

## COGNITIVE STRUCTURES AND DECISION PROCESSES

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One of the assumptions of the ACF is that individuals who have limited rationality for processing stimuli are motivated by belief systems and prone to experience “devil shift” (overvaluing their opponents). The precursor of the inclusion of limited rationality in organizational studies was American economist, Herbert Simon. Simon (1959) points out that the environment perceived by the decision-maker is different from the real environment, since humans have limited cognitive capacity. In other words, they do not understand all the systems around them and/or do not process all the information they receive.

Continuing with studies into judgments and decision making, Tversky and Kahneman (1974) describe the simplifying shortcuts of intuitive thinking and explain biases, such as manifestations of these heuristics. Kahneman (2012) presents new elements for understanding judgment and choice processes and the types of heuristics and biases that condition our daily behavior: 1) he defines two forms of thought: one that is faster, intuition, and one that is slower, reason, which are linked and support each other; and 2) he establishes the existence of two selves: the experiential self, the one that lives the experience, and the remembering self, which uses memories.

As far as decision-making processes involving multiple actors are concerned, these were the object of studies by March (2009), who proposes two representations: 1) the logic of consequences, in which the alternatives are evaluated and selected in terms of preferences and expectations of future consequences; and 2) the logic of appropriateness, in which alternatives are evaluated and selected according to identities and rules, the preferences and expectations of consequences have an influence in the background, and both are subject to the interpretative ambiguity of the decision maker.

March (2009) points out that many of the decisions do not result from the calculation of consequences due to joint preferences, nor from a joint awareness of consistent rules, but rather from the interactions of individuals and groups in pursuit of their own appropriateness and interests. He also stresses that the theories that deal with decision processes involving multiple actors differ in their premises and can be arranged in two versions: 1) classic; and 2) behavioral.

In classic versions, such as the game theory, it is assumed that individual actors are pure rational agents with perfect knowledge. The behavioral versions, on the other hand, emphasize the limitations of rationality and of the decision rules that affect the knowledge, identities and preferences of the actors. They stress the formation of coalitions and bargaining, the processes of learning about others, the importance and significance of trust and cultural understandings in discovering and supporting stable coalitions, and the indeterminacy and stability of choices (MARCH, 2009).

Methodologies developed in the scope of OR for better understanding the cognitive aspects of human beings, among them VFT and cognitive maps, favor theories whose empirical research considers the identification of beliefs and values in a better-defined way.

## VALUE-FOCUSED THINKING

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According to Keeney (1996), our values are fundamental to everything we do and should be the driving force, the basis for our decision making. Keeney (1996), however, points out that decision-support methods generally focus on the choice of available alternatives, in other words, decision-makers first focus on the alternatives and only later address the objectives or criteria in order to evaluate them. Keeney (1992) calls this the alternative-focused thinking (AFT) approach.

Instead of this, the focus should be on how these alternatives are, or can be established, and the best way to achieve this is to think about values and objectives. The VFT method emphasizes the values of the decision maker that can be explained by objectives. An objective is a declaration of something one wishes to achieve, characterized by three aspects: a decision context, an object and a preference direction (KEENEY, 1992).

In other words, AFT seeks to discover which alternatives are available and to choose the best of them; VFT, on the other hand, tries to decide what is wanted and then to discover how to achieve it (KEENEY, 1996).

Objectives can be classified as *fundamental* and *means*. Fundamental objectives characterize a reason that is essential to the interest in the problem-situation. The means, on the other hand, are of interest in a decision context, since they are resources for achieving the fundamental objectives. Various techniques are suggested for identifying the values and objectives, such as: a wish list; great, average and bad alternatives; the organization's problems and weaknesses; consequences; strategic objectives and generic objectives (KEENEY, 1992, 1996).

According to Keeney (1996), the first alternatives that come to mind in a given situation are the most obvious ones, those that were previously used in similar situations, and those that are readily available. These few alternatives serve to anchor thinking about other possible alternatives. The assumptions that are implied in the identified alternatives are accepted and the generation of new alternatives tends to be limited to adjusting those that have already been identified.

Keeney (1996) points out that truly different alternatives remain hidden and inaccessible in another part of the mind. Therefore, persistent and intense thinking is necessary to shake them into the consciousness. Thus, by focusing on the values that guide decision-makers, the anchors are removed from the defined alternatives and the search for new alternatives is favored and becomes a creative and fruitful exercise.

Keeney (1992) lists several benefits of the VFT approach: discovering hidden objectives, guiding information collection, improving communication, facilitating multiple stakeholder engagement, interconnecting decisions, creating alternatives, evaluating alternatives, identifying decision opportunities and guiding strategic thinking.

Among the many benefits of the method, two in particular stand out: the recognition and identification of decision opportunities and the creation of better decision alternatives. The method consists of two activities: deciding what is wanted and then finding out how to achieve it (Keeney, 1992).

## COGNITIVE MAPS

According to Eden (1988), different people interpret the same situation in different ways; in other words, each individual has different values and interests. Cognitive maps, which are usually obtained from interviews, make it possible to portray the ideas of decision-makers and their feelings, values, beliefs and interrelationships in a decision-making process.

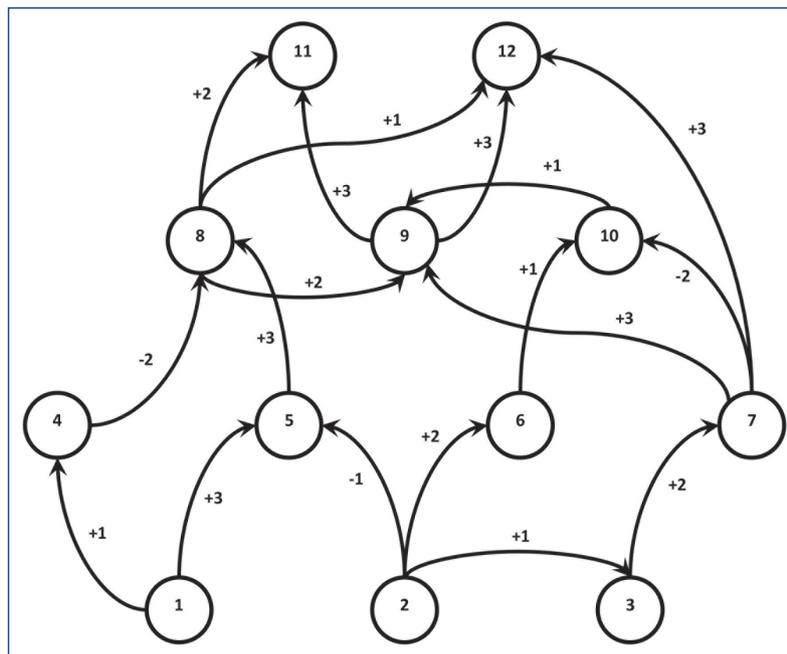
The maps represent the subjective world of the interviewee. The term ‘cognitive mapping’ describes the task of structuring or diagramming the thinking of individuals with regard to an issue or a problem. This is a formal modeling technique, whose representation of thinking about a given problem is carried out by way of cognitive maps, the formal basis of which derives from George Kelly’s personal construct theory (EDEN, 2004).

Cognitive maps are characterized by a hierarchical structure in the form of *graphs* with declarations of objectives at the top of the hierarchy. However, this hierarchical form frequently presents circularities (EDEN, 2004). The author emphasizes that when these exist, they usually play an important role in problem solving.

As a rule, a cognitive map is drawn with short statements (concepts) linked by means of one-directional arcs. Generally speaking, a statement at the tail of an arc either causes or has an influence on the statement at the tip of the arc. In other words, the map is a network of nodes (concepts) and arcs that form links (a directed graph), with the direction of the arc implying causality (EDEN, 2004).

According to Axelrod (1976), when a cognitive map is graphically portrayed, it is relatively easy to see how each of the causal concepts and relationships relate to one another.

**Figure 1**  
**Cognitive map with its causal relationships**



Source: Elaborated by the authors.

Figure 1 shows an example of a cognitive map with its causal relationships. A cognitive map representing the ideas or concepts relating to a particular problem situation can be represented by a set of nodes and arcs. The arcs between the nodes represent the causality relationships that exist between the concepts; the perceived effect of these relationships may be positive or negative, and the strength of the belief or the intensity of these relationships is represented by numbers close to the arcs (CUNHA, SILVA FILHO and MORAIS, 2013). This example considers three degrees of intensity: strong (+3 and -3); moderate (+2 and -2); and weak (+1 and -1).

The works by Hart (1977) and Axelrod (1976) on analyzing cognitive maps were forerunners in the subject and are references even today. In these works, the basic concepts of the subject are presented, such as balancing the path on the cognitive map and assessing the consistency, frequency and density of the cognitive map (CUNHA, SILVA FILHO and MORAIS, 2013).

According to Montibeller and Belton (2006), cognitive maps are widely used in problem structuring analyses and enable ideas to be richly represented by modeling complex arguments in the form of networks. The seminal text by Montibeller and Belton (2006) reviews the concepts and proposes a taxonomy for approaches that help with the analysis of cognitive maps. It also discusses the advantages and disadvantages of each of them.

According to Cunha, Silva Filho and Morais (2013), cognitive maps are originally resources of a qualitative nature, but efforts have been devoted to developing means for quantitatively comparing individual maps. Cunha, Silva Filho and Morais (2013) point to the works of Langfield-Smith and Wirth (1992) and Septer, Dijkstra and Stokman (2012).

According to Langfield-Smith and Wirth (1992), maps may differ as to: 1) the existence - or not - of nodes; 2) the existence - or not - of a causal relationship between two nodes; 3) the effect of the relationships (positive or negative); or 4) the intensity of the relationships.

Langfield-Smith and Wirth (1992) propose a measure for the distance between a pair of cognitive maps; the larger this measure, the greater the difference between the two maps. Maps are represented by  $n \times n$  matrices, where  $n$  is the number of nodes (concepts, ideas) in a cognitive map, and where the elements of the matrix represent the meaning and intensity of the causal relationships. For example, Element  $a_{15}$  of Matrix A represents the causal relationship of node 1 to node 5, while Element  $a_{51}$  is the causal relationship of node 5 to node 1. In the absence of a causal relationship, the value of the element will be zero. In the example in Figure 2, Element  $a_{15}$  would be +3 and  $a_{51}$  0.

The distance, therefore, between a pair of causal cognitive maps, A and B, is obtained, according to Langfield-Smith and Wirth (1992), from Equation 1:

$$d(A,B) = \sum_{i=1}^p \sum_{j=1}^p |a_{ij} - b_{ij}| \tag{1}$$

where causal maps A and B are represented by the square matrices  $A[a_{ij}]$  and  $B[b_{ij}]$ , respectively, where  $1 \leq i, j \leq p$ , and  $p$  is the number of nodes resulting from the union of the nodes of the two cognitive maps.

However, Langfield-Smith and Wirth (1992) point out that since cognitive maps may have a number of different nodes (i.e., concepts, ideas), in other words, matrices of different sizes, the distance between a pair of maps cannot be directly compared with another pair that is of a different size. Langfield-Smith and Wirth (1992), therefore, propose an adjustment to the formula to relativize the distances between causal maps:

$$d(A,B) = \frac{\sum_{i=1}^p \sum_{j=1}^p |a_{ij} - b_{ij}|}{6pc^2 + 2pc(pu_1 + pu_2) + pu_1^2 + pu_2^2 - (6pc + pu_1 + pu_2)} \tag{2}$$

where  $p$  is the number of nodes (concepts, ideas) resulting from the union of the elements of two cognitive maps,  $pc$  is the number of nodes common to both matrices, A and B,  $pu_1$  is the number of single nodes in Matrix A, and  $pu_2$  is the number of single nodes in Matrix B.

Langfield-Smith and Wirth (1992) also propose another adjustment to the degree of causal relationships of the nodes considered by just one of the actors. In causal relationships in which one of the nodes is not common to both maps, whose scale varies between [+3, -3], it starts varying between [+1, -1]:

$$a_{ij} = \begin{cases} 1, \text{ se } a_{ij} > 0 \text{ e } i \text{ ou } j \notin Pc \\ -1, \text{ se } a_{ij} < 0 \text{ e } i \text{ ou } j \notin Pc \\ a_{ij}, \text{ noutros casos} \end{cases}$$

where  $Pc$  is the set of nodes common to the two matrices.

In carrying out a comparative analysis of cognitive maps, Cunha, Silva Filho and Morais (2013) also consider that the classifications of the types of nodes identified in the map elicitation process to be important information: 1) nodes about which there is global consensus - those that are considered by all actors; 2) relative consensus nodes - those that are considered to be important by the actors; and 3) nodes of restricted importance - those that are considered in only one cognitive map. According to Cunha, Silva Filho and Morais (2013), the presence of nodes of restricted importance may show the antagonism that exists between the actors.

Septer, Dijkstra, and Stokman (2012) propose an approach based on a comparison of cognitive maps for identifying and measuring the differences between the perceptions and opinions of the individuals as to achieving goals. They also introduce the critical path concept. The idea is to identify the causal relationships, or the set of causal relationships between cognitive maps that contribute most to the diversity of opinions, according to three concepts: partial effect (PE), which represents the intensity of the path that connects two nodes; total effect (TE), which can be defined as the weighted average of the PEs, which connects two nodes; and total result (TR), which represents the average importance of each path that leaves an issuing node and goes to a receiving node.

Septer, Dijkstra and Stokman (2012) define the critical path as a connection or set of connections, whose alignment of opinions contributes to achieving consensus. Considering the two nodes,  $v_i$  and  $v_j$ , therefore,  $P$  will be a path that begins in  $v_i$  and ends in  $v_j$ , and  $l$  is the number of connections along this path.

PE, which represents the intensity of a path  $q$  among possible paths between nodes  $v_i$  and  $v_j$ , can be obtained from Equation 3, adapted mathematically from Septer, Dijkstra and Stokman (2012) by Cunha, Silva Filho and Morais (2013):

$$EP(P_{ij}^q) = \frac{1}{3^{l_q-1}} \prod a_{ij} \tag{3}$$

TE, on the other hand, is defined as the weighted average of the partial effects that comprise it, including incorporating all the null importance paths, which is obtained by Equation 4 (SEPTER, DIJKSTRA and STOKMAN, 2012):

$$ET(P_{ij}) = \frac{1}{n_{P_{ij}}} \sum_{q=1}^{n_q} EP(P_{ij}^q) \tag{4}$$

where  $n_{P_{ij}}$  is the number of all possible  $q$  paths between nodes  $v_i$  and  $v_j$ .

To identify the critical path, however, the TR needs to be found, which represents the average importance of each path that begins in an issuing node  $v$  and ends in a receiving or objective node  $g_i$ . This is done by way of Equation 5 (SEPTER, DIJKSTRA and STOKMAN, 2012):

$$RT(v) = \frac{\sum_{i=1}^{n_g} s_{g_i} \cdot ET(P_{v,g_i})}{\sum_{i=1}^{n_g} s_{g_i}} \tag{5}$$

where  $s_{g_i}$  represents the relative importance to an actor of objective  $g_i$ .

Based on TR, a divergence measure can be formulated for identifying the causal relationships, or set of causal relationships, in other words, the paths between the cognitive maps that contribute most to the diversity of opinions between the actors. This divergence measure is the variation in all the results, as defined by Equation 6:

$$\sigma^2(RT) = \frac{1}{n} \sum_{\alpha=1}^n \left( RT^\alpha - \frac{1}{n} \sum_{\alpha=1}^n RT^\alpha \right)^2 \tag{6}$$

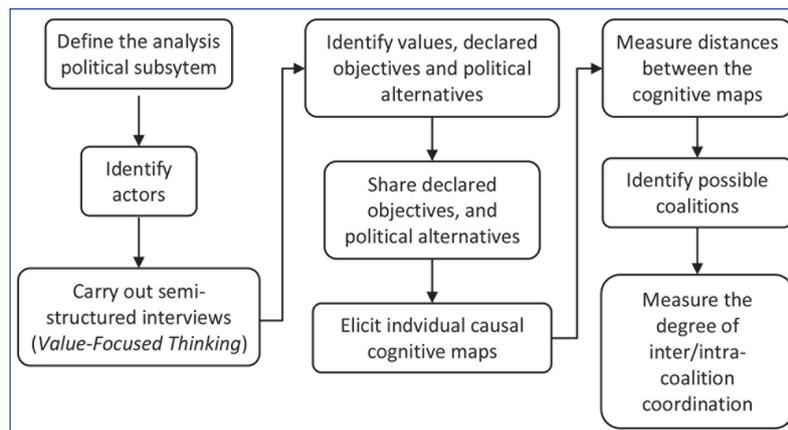
where  $RT^\alpha$  represents the TR of actor  $\alpha$ .

The smaller the result of the variation in a particular path, the smaller will be the divergence between the actors relative to this path, enabling political agendas to be identified with varying degrees of consensus or impasse.

## THE PROPOSED APPROACH

The approach proposed in this paper for analyzing the coordination of political coalitions in institutional change processes in a political subsystem, based on identifying the beliefs, declared objectives and political alternatives of the actors involved, combines methods of public policy analysis and OR. Figure 2 shows the flowchart of the stages in the approach.

**Figure 2**  
**Flowchart of the stages in the approach**



Source: Elaborated by the authors.

Initially, 1) the political subsystem that is the object of analysis is defined, and then 2) the actors interested in this subsystem are identified. These 3) actors are interviewed for 4) identifying values, stated objectives and political alternatives for the problem situation under analysis, using some of the techniques suggested by VFT, such as: wish list; alternatives; the problems and weaknesses of the organization; consequences; strategic objectives or generic objectives.

Prior to requesting the cognitive maps from the actors, 5) the declared objectives and the political alternatives discovered are shared between all of them without identifying the authors. *A posteriori*, 6) individual cognitive maps are prepared, based on defining the causal relationships and their effects and intensities between the objectives and the alternatives obtained in the interviews. This process of multi-methodological elicitation is an adaptation of what was proposed by Almeida, Morais and Almeida (2014), which aims at problems being structured by different stakeholders, using the VFT, associated with cognitive maps, without the need to initially establish a direct process of interaction within the group.

In this phase of preparing the cognitive maps, the actors express their opinions and reveal their perceptions regarding the causal relationships between the elements, thus enabling beliefs to be identified. The cognitive maps are subsequently compared.

This comparison makes it possible to identify possible differences of opinion between the actors, based on differences between the sets of nodes and their respective causal relationships. Recalling Langfield-Smith and Wirth (1992), maps may differ as to: i) the existence of nodes, or not; ii) the existence of a causal relationship between two nodes, or not; iii) the effect of the relationships, whether positive or negative; or iv) the intensity of the relationships.

Initially, 7) the measure proposed by Langfield-Smith and Wirth (1992) is calculated to establish the distance between two cognitive maps, consequently assessing the difference in beliefs in the relationships between the nodes of different cognitive maps. According to Cunha, Silva Filho and Morais (2013), this measure can be used to identify congruences and divergences between the judgments of the actors in a decision process. Based on this measure of distance between the maps and beliefs, 8) possible coalitions are identified for the problem-situation, which is the object of analysis in a given political subsystem.

Also with regard to the comparison of the causal cognitive maps and based on the approach proposed by Septer, Dijkstra and Stokman (2012), it is expected that it is possible to 9) measure the degree of inter/intra-political coordination. Based on the comparison between the cognitive maps, a connection or set of connections is identified whose alignment of opinions contributes towards identifying political agendas with varying degrees of consensus or impasse.

According to the ACF, actors are organized in coalitions formed from common beliefs. In addition to beliefs, the approach proposed in this paper considers the declared objectives and the alternatives of the actors, incorporating the reach of the threats to their beliefs by way of the causal relationships, as perceived by the actors.

The proposed model considers the problematic of the process of policy change and how limited rationality, simplifying heuristics and cognitive biases influence the degree of complexity of the change in policy. It shows how VFT, associated with cognitive maps, helps identify the beliefs and objectives of the actors involved and creates new political alternatives.

Finally, the proposed approach consists of: 1) significant production of information about the problem situation, allowing for a better understanding of the expectations regarding the change in public policy; 2) identification of the institutional changes (objectives and political alternatives) desired by the actors; 3) distinction of the coalitions that are present in the political subsystem, based on a characterization of their beliefs by way of cognitive maps; and 4) inference of the degree of cooperation or conflict based on comparing cognitive maps.

## FINAL CONSIDERATIONS

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This essay contributes to the analysis of advocacy coalitions in processes of formulating or changing public policies, combining methods of public policy analysis and OR. The proposed approach analyses the degree of coordination of political coalitions in processes of institutional change, based on identifying the beliefs, declared objectives and political alternatives of the actors, using VFT associated with cognitive maps.

However, the approach has its limitations. The existence of circularity in causal relationships in cognitive maps makes it impossible to calculate the measure proposed by Septer, Dijkstra and Stokman (2012) for identifying the differences between the actors (CUNHA, SILVA FILHO and MORAIS, 2013). Eden (2004) argues that the existence of circularity may be a coding accident that requires correction or implies the possible existence of dynamic considerations of the problem under analysis recognized by cognition.

From combining these methods and comparing the cognitive maps, it is expected that it will be possible to identify advocacy coalitions, to characterize collaborative or conflicting environments and prepare scenarios with varying degrees of cooperation or intra/inter-coalition conflicts in processes of institutional change.

The actors' reflections as to the effects (positive or negative) and degrees of intensity (strong, moderate or weak) of causality relationships between stated objectives and political alternatives shed light on issues they have not yet considered, which makes it possible, to a certain extent, to come up with a more complete characterization of their beliefs in order to mitigate the effects of the limited rationality presented by Simon (1959) in the decision-making processes in public policy contexts.

In the public policy field, it is essential to identify and clearly and precisely set out the problem situation in a given political subsystem, since the understanding of reality, which is neither easy nor consensual, has an influence on the design or formulation of public policies and, consequently, their effectiveness.

However, it is important to emphasize that the process of policy change can be dynamic and sequential and, according to March (2009), coalitions, alliances and political agreements entered into when discussing a particular political subsystem may be linked to agreements in other subsystems.

Finally, for future empirical studies, for example, of fiscal, infrastructure and environmental policy subsystems, it is suggested that the saliency of stakeholders and objectives should be incorporated, as well as the elicitation of cognitive maps indirectly by way of analysis of the content of the discourse of the actors in a given political subsystem.

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Cristiano Santos Lúcio de Melo

ORCID: <https://orcid.org/0000-0002-7615-9398>MSc in Business Administration from the Postgraduate Program in Administration of the University of Brasília (PPGA/UnB), Brasília – DF, Brazil.  
E mail: cristiano.melo.bsb@gmail.com

Diego Mota Vieira

ORCID: <https://orcid.org/0000-0003-1275-1648>

PhD in Business Administration from the Postgraduate Program in Administration of the University of Brasília (PPGA/UnB); Adjunct Professor at the University of Brasília (UnB), Brasília – DF, Brazil. E mail: diego1mv@yahoo.com.br