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SCENARIO PLANNING: SCIENTIFIC AND EPISTEMOLOGICAL LEGITIMACY OF THE GRUMBACH METHOD

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ABSTRACT

Objective: The objective of this research is to reinforce the theoretical foundation and academic debate on scenario-based strategic planning, a methodology that has been evolving empirically since the end of World War II. This is done by proposing arguments for scientific and epistemological legitimacy. **Method:** The work was based on documentary research and a case study. Scientific legitimacy was investigated by contrasting the Cartesian and Grumbach methods of strategic planning: the theoretical framework and representation of the methodology, respectively. However, epistemological legitimacy was investigated based on the credibility of the data that supports the generation of evidence, statements of hypotheses and controls over the environment in which the activities of the case studied were developed. **Main results:** Each precept of the Cartesian method was identified in each stage of the investigated method and the completeness of the process was attested. At this point, a caveat is noted regarding the competence of experts in the Delphi survey. **Relevance/originality:** The value of this study is verified in that it increases the debate around scientificity in scenario planning. **Theoretical/methodological contributions:** The study combines the scientific methodology of René Descartes, which understands it is appropriate to be traditional, with Karl Popper's proposals for entomology, according to which it is necessary to be revolutionary. The contribution becomes more relevant to the extent that publications on the theoretical foundation of the theme represented 0.14% of the total at the time of the research.

Keywords: scenario planning, scientific method, epistemology, theoretical foundation.

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RESUMO

Objetivo: O objetivo desta pesquisa é reforçar a fundamentação teórica e o debate acadêmico sobre planejamento estratégico com base em cenários, uma metodologia que vem se desenvolvendo de forma empírica desde o final da Segunda Guerra Mundial. Isso é feito ao propor argumentos em prol de sua legitimidade científica e epistemológica. **Método:** Os trabalhos se basearam em pesquisa documental e estudo de caso. A legitimidade científica foi investigada contrapondo ao método cartesiano o método Grumbach de planejamento estratégico: referencial teórico e representante da metodologia, respectivamente. Já a legitimidade epistemológica foi investigada a partir da credibilidade dos dados que suportam a geração de evidências, dos enunciados de hipóteses e do controle sobre o ambiente em que se desenvolveu o caso estudado. **Principais Resultados:** Cada um dos preceitos do método cartesiano foi identificado em cada etapa do método investigado, e a credibilidade das fontes de dados foi atestada. A competência dos peritos na pesquisa Delphi mereceu nota oportuna. **Relevância / Originalidade:** O valor deste estudo se verifica no incremento que traz ao debate em torno da cientificidade do planejamento por cenários. **Contribuições Teóricas / Metodológicas:** O estudo combina a metodologia científica de René Descartes, onde cabe ser tradicional, com as propostas de Karl Popper para a entomologia, onde cabe revolucionar. A contribuição se torna mais relevante na medida em que publicações sobre a fundamentação teórica do tema representavam 0,14% do total no momento da pesquisa.

Palavras-chave: Planejamento por cenários, Método científico, Epistemologia, Fundamentação teórica.

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INTRODUCTION

The subject of this article is scenario-based strategic planning, a branch of what has come to be called "prospective studies" or "studies of future". The methodology approaches the future as something that can be studied and acted upon; it considers alternative futures, treats scenarios as grounded plausible hypotheses, and opposes the idea of deductive predictions head-on.

The development of scenario planning has occurred empirically since the end of World War II. Most publications on the topic focus on the creation, experimentation, or improvement of tools and methods: this was confirmed in our literature search. Thus, the small number of publications devoted to theoretical foundations sustains skeptical views regarding the scientific character of the methodology, which is understandable in fields of knowledge that have been recently shaped (Marcial & Suaiden, 2016). In turn, the perception that "the future is unknown, yet not random" (Pares, 2011) suggests non-deterministic cause-and-effect relations, in which cause-and-effect relations indicate that the subject can be studied, while non-determinism prompts reflections on how and why they occur[1].

That said, we set out to address the methodological and epistemological rigor of scenario planning. The first was more readily perceptible: it was enough to seek, in each stage of (at least) one method representative of the methodology, the premises of an established scientific method; whereas epistemology would require a non-traditional approach. Regardless of the investigation's conclusions, the study would provide objective grounds for scientific legitimacy and qualified elements for epistemological debates.

The objective of this study is to advance arguments in favor of the scientific and epistemological legitimacy of the method and, by extension, of the methodology, with the aim of strengthening the theoretical foundation and the academic debate. The question that guides the research is: what arguments can confer scientific and epistemological legitimacy to the Grumbach method of strategic planning?

1 "How" and "why" are essential philosophical questions. Along with "what" and "what for," they help investigate the essence of things.

1. SCENARIO PLANNING: WHAT IT IS, WHAT IT IS FOR, AND HOW IT IS CARRIED OUT

The first steps of the research aimed to understand scenario planning through key philosophical questions. The study revealed skeptical challenges arising from gaps in the theoretical foundation and guided the formulation of the research question.

1.1. Fundamentals

Scenario planning is a methodology supported by the construction of exploratory scenarios, alternative representations of the future. Each of them presents cause-and-effect relationships that show them as possible and (more or less) plausible. Chermack e Lynham (2002) consider that the process of planning based on scenarios alters mental models, improves decision-making, promotes learning, and enhances personal and organizational performance. Chermack e Coons (2015) and Mackay e Tambeau (2013) emphasize that scenarios are the core of the process, but not the end.

According to Marcial (2011), scenario planning serves to ensure that organizational decision-making is informed, avoiding surprises from events for which preparation is possible and aligning choices with the desired future. This understanding is corroborated by representatives of the intuitive logic, French, and probabilistic schools, such as Chermack and Coons (2015), Godet and Durance (2011) and Grumbach et al. (2020).

Regarding how the process is conducted, some authors see scenario planning as a "methodological chaos" (Martelli, 2001). Drawing on Bradfield et al. (2005), Chermack and Coons (2015) and Godet and Durance (2011), we highlight the French toolbox and the Trend Impact Analysis (TIA) and Cross-Impact Analysis (CIA) techniques used by the probabilistic school.

Iden et al. (2017), Rohrbeck et al. (2015), Varum and Melo (2010) and others point out epistemological gaps in this (still) new field of knowledge. They justify skeptical challenges, such as those raised by Soares et al. (2019): Is it possible to produce knowledge about the future? Do the results have scientific validity, or are they merely the effect of techniques? What can be said about the future? How can it be studied?

Marcial (2011) notes that research in the philosophical, scientific, and applied domains is required for a new field of knowledge to be accepted as a scientific discipline. Thus the future, as a scientific object, brings questions that challenge traditional epistemology. It is worth noting that this research was made possible by the intersection between classical paradigms and foundational concepts perceived under new approaches, such as those detailed below.

Sonk (2015) addresses the epistemology of futures studies based on fundamental elements: the laws of thought; the classical concept of knowledge; sources of justification for beliefs; and the structures of knowledge. The author concludes that the laws of thought grant the possibility of justified true beliefs about the future. The article emphasizes the third law, according to which unequivocal assumptions can only be true or false, but not indefinite, which naturally applies to futures studies: after all, events either occur or they do not.

Byerly (2013) explains the theory of explanationalism (or evidentialism), according to which: a belief is justified only if it is supported by evidence; the hypothesis chosen as the best explanation for the evidence is subjected to various tests that ensure the probability of its truthfulness; and a piece of evidence supports a proposition only if it is part of the best explanation available for the evidence. Through explanationalism, it is possible to develop justified beliefs about the future, but the author emphasizes: there are cases in which we intuitively judge people to be justified in believing certain propositions about the future, although, according to the best explanation, their evidence does not support those propositions.

Walton (2008) identifies alternative criteria for epistemological evaluation, reflects on the decision utility of scenarios, and seeks a bridge between theoretical inquiry and practical results. It addresses philosophical and foundations criteria; the ontology of scenarios; criteria for scenario construction and their epistemological status; and scenario tests against positivist standards of a "good theory". It concludes that: it is feasible to create a framework that regulates the scenario planning process and to judge, by observation, whether it meets the requirements of a good theory; the same criteria cannot be applied to the assessment of the scenarios themselves; and under the definition of knowledge as justified true belief, scenarios can, at best, meet the idea of a plausible belief, but not a true one.

Bishop (2017) understands the issues that make futures studies more fragile than other disciplines in the face of skeptical challenges, and proposes an approach based on evidence, inferences, and assumptions. While any future is possible, only a relatively small subset is plausible, he says. The process requires human judgment, but reliable bases (scenarios) can be obtained from boundaries grounded in evidence and logical analyses of assumptions — a scrutiny that other disciplines demand naturally. The result is a format for communicating and justifying the plausibility of scenarios. The capacity for evidence-based judgment and peer review can then build the foundation for the credibility and legitimacy enjoyed by other disciplines.

1.2. The Grumbach method of strategic management

The method chosen to limit the scope of the study is presented in Grumbach et al. (2020). In it, scenarios integrate cyclical processes of conception, execution, evaluation, and revision of strategic management. Its phases consist of:

- identifying the system;
- diagnosing the internal and external environments;
- building prospective scenarios;
- formulating the strategy;
- translating the strategy;
- prioritizing actions;
- managing risks;
- executing the strategy;
- reviewing the strategy.

Scenario construction begins by defining strategic questions modeled from binary variables: events may or may not occur. When no actor has full control over an event, strategic interactions occur: one actor's decision affects those of the others, even when made separately. An actor must consider the possible actions of the others[2]. Altering the balance of power among actors is necessary to promote breaks in

2 To this end, game theory uses mathematical modeling to study strategic interactions.

trends and redirection of the future. Building the future should be seen as a process of decision-making under uncertainty.

2. EPISTEMOLOGY AND THE SCIENTIFIC METHOD

2.1. Theory of Knowledge

Grayling (2003) defines epistemology as the branch of philosophy that examines the nature of knowledge, its sources, and its validity: what it is, how it is obtained, and whether it can withstand skeptical challenges. He identifies categories of knowledge, highlighting propositional knowledge — the category epistemologists are most concerned with[3].

The author proposes that knowledge can be defined as justified true belief (Plato's concept), attainable through both rationalism and empiricism. He describes perspectives on justification and recommends addressing skeptical arguments together, not in isolation. He further cites Hume's view that inductive reasoning is reliable, and Berkeley's perspective, which regards experience and reality as the same thing, and thereby rejects skepticism. The great difficulty for a true belief to be considered knowledge, he says, lies in the nature of the justification required.

2.2. The rationalism of René Descartes

Four precepts, plus a firm and constant resolve to observe them, are sufficient for the pursuit for credible judgments (Descartes, 2001). The relatively small number of precepts facilitates their application with the necessary discipline, avoiding "the multiplicity of laws that often provides excuses for vices". They are:

1. Never accept anything as true without evidently knowing it to be so.
2. Divide each difficulty into as many parts as possible, as necessary to examine and resolve them more effectively.
3. Conduct thoughts in order, beginning with the simplest and easiest objects to know; gradually ascend, as if by steps, to more complex knowledge, assuming an order even among those that do not naturally precede one another.
4. Make enumerations so complete and reviews so comprehensive that there is certainty of omitting nothing (Descartes, 2001, p. 23).

2.3. The Revolutions of Thomas Kuhn

Kuhn (2020) investigates the history of science and recognizes the importance of paradigms that guide the accumulation of new knowledge by normal science and the epistemology that supports it, but notes that the effective development of science occurs through ruptures, by replacing incompatible bodies of knowledge. These revolutions respond to the insufficiency of prevailing paradigms and are the only effective way to generate discoveries.

Perceiving new things by observing the same points with the same instruments is more important than perceiving new things with new instruments: this capacity for perception distinguishes the apprentice from the master. Scientific knowledge emerges from revolutions separated by periods of normal research, Kuhn (2020) concludes.

2.4. The Originality of Karl Popper

Miller (2010), Karl Popper's assistant, collects the texts most representative of the latter's ideas. According to those texts, Popper holds that:

- Knowledge advances by conjectures and refutations, and every argument must begin from assumptions; it is therefore unreasonable to require that all assumptions be based on arguments.
- Rational analysis of consequences does not make the decision rational, nor do consequences determine our decisions: it is always humans who decide.
- Empirical statements are distinguished by their susceptibility to revision, criticism, and being superseded by others; a critical stance is appropriate for the scientist.
- Conventionalism presents no inconsistencies, but it is unacceptable when seeking within science a system of knowledge based on definitive foundations with irrefutable implicit definitions — an unattainable goal.

3 Propositional knowledge is that expressed through statements or propositions. The remaining categories are procedural (often acquired by practice) and experiential (knowing something or someone).

- Attempting to trace our knowledge to its supreme source based solely on observation leads to infinite regress and is logically impossible.
- The fundamental error of philosophy in seeking the sources of our knowledge is failing to distinguish clearly enough between questions of origin and validity. Epistemology should change its essential question: from identifying the supreme source of knowledge to how to identify and eliminate error.
- Epistemology should align itself with the scientific method, which concerns the choice of methods, how to deal with scientific statements, and the logical analysis of the relations among them.

2.5. The Epistemological Consciousness of Edgar Morin

Morin (2005), as presented by Iná Elias de Castro (2005), addresses the need for a new epistemological paradigm that breaks the bounds of determinism and simplification and incorporates chance, probability, and uncertainty as parameters necessary to understand reality — a challenge that aligns with our study. Morin (2005) proposes turning the knowledge of complexity into the thought of complexity, and revisits the idea that it is impossible to know the parts without the whole and vice-versa. He holds that responsibility must face uncertainties; that "mathematization" and formalization have led to the disciplinary confinement of Western science; and, if the development of science occurs through the transformation of the principles that organize knowledge, those formulated by Descartes (2001) must be rethought to enable a new transdisciplinary. He proposes that reality be separated, associated, and conceived without reducing it to elementary units or general laws, against the belief that the real can be fully captured in coherent systems of ideas.

3. METODOLOGY

Bibliographic searches in the Scopus database confirmed the documentary gap mentioned in the introduction to this article. The first round used the expression "scenario planning" associated with terms related to applications of scenario planning: the objective was to identify research opportunities. Debates in foresight study groups pointed to a shortage in the field's theoretical foundation. A second round of searches, this time using the terms "scenario planning" and "epistemology," confirmed what was expected. Table 1 shows that, in 2021, 0.14% of the works devoted to the theme referred to the theoretical foundation, and the remainder to the methodological development.

The investigation of scientific legitimacy was guided by René Descartes (2001) from the outset; epistemological legitimacy, in turn, considered classical theory, Descartes (2001) himself, David Hume, Immanuel Kant and Karl Popper. Since Popper revisits these and others, we kept Popper and added the contextualization and the revolutions of Thomas Kuhn (2020) and the complexity introduced by Edgar Morin (2005): transdisciplinarity, uncertainty, contradictions, and multiple perspectives.

The study can be understood as follows: it considers that prospective scenarios and scientific hypotheses share functional and data equivalences; it proposes that, based on the processes of producing evidence and their statements, the scientific and

Table 1. Literature review on "*scenario planning*".

	Search Words	Quantity
01	"*scenario planning*" *and* ("*decision making*" *or* "*decision-making*")	6,902
02	"*scenario planning*" *and* "*strategic planning*"	4,931
03	"*scenario planning*" *and* "*human resource development*"	746
04	"*scenario planning*" *and* "*competitive intelligence*"	77
05	***"scenario planning" and "epistemology"***	**18**
06	"*scenario planning*" *and* "*organizational competitiveness*"	14

Source: Elaborated by the authors.

epistemological legitimacy of the Grumbach method should be recognized; and it structures a method for the investigation. In this sense, for the investigation of scientific legitimacy, the Grumbach method is contrasted with the precepts of the Cartesian one: the search for the precepts of evidence, analysis, order, and enumeration is conducted on the documentation that presents the method (section 2.2). For the investigation of epistemological legitimacy, the credibility of data sources in a case study is examined through the views of Karl Popper, Thomas Kuhn (2020) and Edgar Morin (2005). The essential concepts, assumptions, and presuppositions that guided it are detailed below.

3.1. Essential concepts

Actor (1): The individual, group, or organization that plays a significant role in the environment, affecting the organization or being affected by it, directly or indirectly. Examples include: governments, regulatory institutions, associations, competitors, suppliers, customers, media, interest groups, opinion leaders etc. (Marcial, 2011).

Actor (2): "What defines an actor is their homogeneity. An actor refers to a group of individuals with common objectives, projects, and response capacities" (Grumbach et al., 2020, p. 23).

Evidence: Quality or character of something that leaves no room for doubt (Oxford Languages).

Hypothesis: A proposition, true or false, that is admitted as a premise from which a given set of consequences can be deduced; supposition, conjecture, possibility of occurring, chance, option (Oxford Languages).

Scientific hypothesis: A hypothesis whose statement satisfies the criteria of the laws of thought and the scientific method (the authors).

3.2. Premises

1. Prospective scenarios are simply hypotheses about the future.
2. Hypotheses are confirmed or refuted based on statements of evidence.
3. Evidence consists of logical statements subject to the laws of thought and the scientific method and is supported by credible data.
4. Data are elements that define the identity on an individual, a being, or a thing, characterizing it as such.
5. Rules that guide the statement of evidence in scientific research likewise apply to the statement of evidence in scenarios: this condition is essential to the scientific legitimacy of scenarios.
6. Prospective scenarios and strategic options are abstract nouns — both belong to the human domain and the world of ideas.
7. Prospective scenarios are real — the alternatives exist — and are scientifically legitimized when based on evidence.
8. Strategic options are scientifically legitimized when derived from evidence-based prospective scenarios.
9. The scientific legitimacy of strategic options based on prospective scenarios extends to the Grumbach Strategic Planning Method.

The first premise situates prospective scenarios within the limits of hypotheses, discarding current scenarios. It relates to the definition of knowledge as justified true belief and to its bases, such as the laws of thought. Note that good hypotheses guide informed decision-making, even when they are wholly or partially refuted. If the reasons are known, they may become a source of knowledge, just as events that do or do not occur do.

The logical chaining of the other premises provides cohesion to the set. The second premise emphasizes evidence as an essential element of epistemological legitimacy, whereas the third integrates data and the laws of thought as harmonious and irreplaceable elements for the statement of scientifically legitimate evidence. The fourth premise emphasizes the role of data in the characterization of things. These are pillars of the scientific method, of epistemology, and of this study.

The fifth premise is a bridge between those that come before and those that come after. It reinforces the identity between hypotheses and scenarios and evokes their functional equivalence in scientific research and in prospective studies, respectively.

The sixth, seventh, and eighth premises counter the idea that prospective studies could not generate knowledge because they refer to something that does not yet exist: the future. Together with the first premise, they form what can be considered original in this study.

Each premise underlying this study is consistent with the mosaic of authors cited: starting from time-honored bases since Plato, Cartesian rationalism guides Karl Popper's critical stance to explore complexity with the courage proposed by Morin (2005), in search of new ideas, as encouraged by Kuhn (2020). Finally, the ninth premise, as a closing, positions the Grumbach method as an authentic representative of the methodology under investigation. The premises can be connected with keywords that synthesize the thinking of the main authors, as presented below:

Perceiving prospective scenarios as mere hypotheses about the future reflects Karl Popper's ideas of conjecture and supposition, and the consideration of uncertainty proposed by Edgar Morin (2005).

The relationship between hypotheses and evidence reflects the methodical rationalism of Descartes (2001), Popper's critical thinking, and the paradigm shifts that, according to Kuhn (2020), drive scientific progress.

Formulating logical statements grounded in evidence relates to the methodical rationalism of Descartes (2001), Popper's critical thinking, and the thinking of complexity proposed by Morin (2005).

Identifying beings and things from data resonates with the analytical and methodical order of Descartes (2001), the keen perception of Popper and Kuhn (2020), and the thinking of complexity evoked by Morin (2005).

Requiring that scenarios follow the same criteria applied to the statement of evidence in scientific research aligns with the analytical and methodical order of Descartes (2001), the transdisciplinary proposed by Morin (2005) and the critical thinking of Popper.

The understanding that prospective scenarios and strategic options belong to the human domain and the world of ideas refers to the supposition, conjecture, confirmation, and refutation grounded by Popper, to the transdisciplinarity of Morin (2005), and to the paradigms considered by Kuhn (2020).

The idea that prospective scenarios are real and scientifically legitimized when based on evidence connects to the principle of evidence of Descartes (2001), to the thinking of complexity under uncertainty proposed by Morin (2005), and to the critical thinking of Popper.

Finally, considering that strategic options are scientifically legitimized when grounded in evidence-based scenarios refers directly to the methodical rationalism of Descartes (2001), the epistemological pillars of Popper, and the transdisciplinarity and responsibility in the face of uncertainty required by Morin (2005).

3.3. Assumptions

1. The Cartesian method broadly guides the Grumbach Method, which relies on consistent data to signal events considered probabilistically possible according to expert opinion.
2. Scenarios have characteristic data structures. In scientific studies from traditional fields of knowledge, equivalent elements support evidence and confer scientific and epistemological legitimacy.
3. The Grumbach method uses procedures compatible with the Cartesian method and is founded on evidence and produces results that are equally based on evidence: scenarios and strategic options.
4. The Grumbach method can be enhanced by making explicit rules that ensure clarity in statements (adding the laws of thought) and consistency in the data generated.

3.4. Requirements for the investigation

The study relied on two essential references: the Cartesian method and a conventional scientific study. A case study was particularly desirable, as it would provide insight into the development of the process and its results.

The field of knowledge of the traditional scientific study needed to be scientifically recognized, to serve as a valid reference; to be preferably distinct from management areas, in order to distance itself from strategic planning approaches and thus contribute to generalizing the presupposition; to include actors, to establish an alignment with scenarios and increase the complexity of the system under investigation, according to the domains described by Snowden and Boone (2007) — simple, complicated, complex, and chaotic.

3.5. Data collection and storage and definition of variables

The documentation of the method under investigation and the case study provided the preliminary

data, collected through document analysis and supplemented by interviews with participants in the case studied. The research question was detailed in order to guide the investigation of the presuppositions and to support the results and analyses. With regard to the Grumbach method, the questions asked were:

- Does it generate consistent data for the statement of evidence that underpins the hypotheses translated into scenarios? Is this done consistently with the scientific method?
- Does it generate sufficient data for the statement of evidence that underpins the hypotheses translated into scenarios? Is this done consistently with the scientific method?
- Does it use only consistent data to formulate the evidence that underpins the hypotheses translated into scenarios? Is this done in accordance with the scientific method?
- Does it produce clear statements of alternative futures?
- In the system-identification stage, which primary and secondary data sources are used?
- In the strategic-diagnosis stage, which primary and secondary data sources are used?
- In the scenario-construction stage, which primary and secondary data sources are used?
- In the system identification stage, which datasets are generated?
- In the strategic diagnosis stage, which datasets are generated?
- In the scenario construction stage, does it follow the laws of thought when formulating hypotheses?

3.6. Investigation of scientific legitimacy

Scientific legitimacy is assessed by comparing each stage of the method under investigation with the Cartesian precepts: evidence, analysis, order, and enumeration. The search is for evidence of a knowledge-building process along the lines of the reference method. Table 2 was prepared to document the investigation data.

The "Stage" column identifies each phase presented in section 1.2 of this article. "Cartesian Precept" identifies each of the rules described in section 2.2. "Observed" has the value "yes" or "no," depending on whether the precept has been identified. And "Observed Determining Aspect" indicates the main evidence of the precept, when observed.

3.7. Investigation of epistemological legitimacy

Epistemological legitimacy is evaluated through the credibility of data sources. In the case study, each stage of the method under investigation was broken down into events and activities; the data sources were identified and categorized; based on this categorization, reliability attributes were assessed on a scale from 0 to 4; finally, the credibility of the data source was judged on a scale defining it as low, medium, high, or maximum. Table 3 organizes the data used in the process.

The "Stage" column indicates each phase presented in section 1.2 of this article; "Event" refers to facts that occurred throughout the process (workshops and others); "Activity" indicates the steps of each event;

Table 2. Evaluation of the scientific legitimacy of the Grumbach method.

Stage	Cartesian precept	Observed [Yes | No]	Determining aspect observed
Stage 1	Evidence		
	Analysis		
	Order		
	Enumeration		
Stage "n"	Evidence		
	Analysis		
	Order		
	Enumeration		

Source: Elaborated by the authors.

Table 3. Classification of the data sources used in the case study.

Stage	Event	Activity	Source	Category	Reliability	Credibility
System Identification					Authenticity	
					Competence	
					Trust	
Strategic diagnosis					Authenticity	
					Competence	
					Trust	
Scenarios construction					Authenticity	
					Competence	
					Trust	
Strategy formulation					Authenticity	
					Competence	
					Trust	

Source: Elaborated by the authors.

"Source" refers to the data sources whose content was used in definitions or decisions — i.e., data sources discarded during the activities were excluded.

The categories of data sources are: personal or documentary, internal or external, primary or secondary. The values were defined as follows:

- Personal nature refers to natural persons, and documentary nature to written records.
- The environment is internal when the data are produced within the boundaries of the organization under study, and external when they exceed its boundaries.
- The primary degree indicates data obtained in their original form, without interpretations; the secondary degree indicates data processed by intermediaries in some way.

The reliability attributes were scored on a Likert scale from 0 to 4, considering the following questions:

- Authenticity: Does the data come from the presumed source? Is it the primary source of data?
- Competence: Is the source qualified to perceive, remember, and describe the object of the data? Under what conditions of quality and integrity were the data obtained?
- Trust: What interest does the source have in providing the data? Are there known precedents regarding the reliability of the data provided by the source?

Evidence in the categories of data sources supported the assignment of values to the reliability attributes, which in turn supported the assessment of the credibility of each source. This data set provides the greatest possible objectivity to a subjective and abstract investigation — as in the validation of scientific legitimacy; just as the Cartesian method does. Although they are all qualitative indicators, through this approach the researchers seek to mitigate possible biases in this study.

4. RESULTS AND ANALYSIS

The data extracted from the documentation and the case study were examined methodically and thoroughly. Table 4 consolidates the results of the investigation on scientific legitimacy, and Table 5 those of epistemological legitimacy.

4.1. Results of the investigation of scientific legitimacy

Examination of the Grumbach method documentation reveals the presence of the four precepts of the Cartesian method. The first is the analysis of the step-by-step structure: conception and preparation for execution, system identification, strategic diagnosis, scenario construction, and stages involving strategy. The second concerns the order in the functional

Table 4. Grumbach Method versus Cartesian Method.

Grumbach Method Stage	Cartesian precept	Determining aspect observed
Design and preparation	Evidence	Concern for the accuracy, credibility, and clarity of information
	Analysis	Dividing the process into stages
	Order	Defined sequence of steps
	Enumeration	Cyclical character of the process and planning of review activities
System Identification	Evidence	Concern for the accuracy of definitions
	Analysis	Data structuring
	Order	Observation of the precedence of activities
	Enumeration	Planning Review Activities
Strategic diagnosis	Evidence	Definition of criteria, analysis of causes and consequences, reference standards
	Analysis	Data structuring
	Order	Defined sequence of activities
	Enumeration	Attention to less evident data sources; Prescription of data traceability
Scenario construction	Evidence	Attention to clarifying how and why each alternate future is possible
	Analysis	Detailed specification of the events forming the scenarios
	Order	Defined sequence of activities
	Enumeration	Expert consultation, probabilities review, scenarios simulation, and interactions analysis
Strategy steps	Evidence	Setting objectives with measurable indicators and established targets
	Analysis	Data structuring
	Order	Logical sequence of cause and effect created by the generated elements
	Enumeration	Cyclical character of the process and planning of review activities

Source: Elaborated by the authors.

coupling that the steps maintain with each other and that that gives unity to the process: the output data of one step are the input for the next. Then, there is the enumeration of the cyclical nature of the method and the explicit observation to ensure that undesired hypotheses are not "forgotten". Finally, the principle of evidence manifests itself in the concern with accuracy, credibility, and clarity of information — customization of the process, qualification of the team that will conduct it, care with internal and external communication, participation of as many collaborators as possible, and actions to mitigate resistance. Each precept can be observed in detail in each step, as demonstrated below:

Identification of the system considers the organization's historical data: origins, main moments, and changes up to the present. It seeks to precisely define the organization's business, mission, vision, values, critical success factors, policies, processes, and resources (human, technological, and infrastructure). The guidelines include: a concern with perfect definitions for the individualization of the system; an understanding that such concern guides the entire process; and awareness that it can be changed in review stages, if necessary. The structuring of data observes the precept of analysis; the precedence of guidelines before the execution of activities, in turn, observes the precept of order; the planning of review activities observes the precept of enumeration, while the concern with precision, foundation, and clarity of definitions observes the precept of evidence.

Strategic diagnosis is based on gathering and filtering facts to obtain and structure data, and in the application of criteria to generate knowledge in the form of organizational processes, resources, external variables, and actors. It is considered, from experience, that a large portion of organizational knowledge lies at the edges, mainly with employees who connect the organization with stakeholders that are

Table 5. Classification of the credibility of data sources.

Step	Event	Activity	Data Source	Category	Reliability		Credibility
System Identification	Workshop 01- System Identification and Strategic Diagnosis	1. Define work teams 2. Identify organizational structure 3. Identify macro-processes 4. Identify resources 5. Identify and evaluate external variables 6. Identify and evaluate actors	Internal regulations	Internal Documentary Primary	Authenticity Competence Trust	4 4 4	Maximum
Strategic Diagnosis	Workshop 02 – Consolidation of the Strategic Diagnosis	1. Identify and analyze the causes and consequences of the indicators of the organization's internal processes 2. Identify and analyze causes and consequences of the organization's resource indicators 3. Evaluate (validate or invalidate) indicators. 4. Consolidate strategic diagnosis	'System Identification' Phase	Internal Documentary Primary	Authenticity Competence Trust	4 4 4	Maximum
Scenarios Construction	Workshop 03 – Delphi Method Applied to Scenarios	1. Define events 2. Set event cutoff points 3. Identify critical variables 4. Evaluate critical variables 5. Develop Delphi survey events	Vast bibliography, including official bodies, teaching and research institutions, specialized journals, etc.	External Documentary Primary and secondary	Authenticity Competence Trust	4 4 4	Maximum
			'Strategic Diagnosis' Phase	Internal Documentary Primary	Authenticity Competence Trust	4 4 4	Maximum
	Workshop 04 – Elaboration of the Current-state Vision	1. Analyze the causes and consequences of the items identified in the strategic diagnosis 2. Propose measures (actions) to correct and mitigate the causes and consequences of weaknesses 3. Propose measures to better leverage strengths	'Strategic Diagnosis' Phase	Internal Documentary Primary	Authenticity Competence Trust	4 4 4	Maximum
	Workshop 05 – Generation of Prospective Scenarios	1. Evaluate Delphi survey results 2. Analyze cross-impacts 3. Analyze consistency	'Strategic Diagnosis' Phase	Internal Documentary Primary	Authenticity Competence Trust	4 4 4	Maximum
		4. Generate prospective scenarios 5. Identify trend scenario 6. Define ideal scenario 7. Interpret prospective scenarios 8. Analyze actors and strategic partnerships 9. Propose preactive and proactive measures according to the Vision of the Future	Delphi Survey	Internal and external Personal Primary	Authenticity Competence Trust	4 3 4	Maximum
Strategy Formulation	Workshop 06 – Measurement Analysis	1. Analyze proactive, preactive, and reactive measures 2. Define general objectives 3. Build strategic initiatives	'Scenario Building' Phase	Internal Documentary Primary	Authenticity Competence Trust	4 4 4	Maximum

Source: Elaborated by the authors.

external to the organization. The structuring of data observes the precept of analysis; the logical sequence of activities observes the precept of order; attention to less evident data sources and the prescription of data traceability as a desired requirement observe the precept of enumeration; and the establishment of criteria for generating results, the detailed analysis of causes and consequences, and the identification of reference patterns for each item of knowledge generated observe the precept of evidence.

The construction of prospective scenarios is based on the analysis of variables that describe possible futures and their connections with the present. The detailed specification of the elements forming the scenarios observes the precept of analysis; the logical sequence of activities observes the precept of order; various tools — rounds of consultations with specialists, probability review, scenario simulation, and analysis of strategic interactions — observe the precept of enumeration; and the attention to clarify how and why a certain future is possible observes the precept of evidence.

The strategy is based on information generated in previous stages. The structuring of data observes the precept of analysis; the logical sequence of cause and effect observes the precept of order; the cyclical nature and explicit planning of process review activities observe the precept of enumeration; and the consistency of these foundations and the definition of objectives with measurable indicators and established goals observe the precept of evidence.

The analysis of documentation notes if it does not mention precautions regarding the statement of scenarios (an essential aspect for the scientific legitimacy of a knowledge generation method); or mentions their existence but does not clarify criteria regarding the data sources (such as the specialists' profile, for example). Consider, however, that the reviewed documentation was developed with a commercial bias; therefore, without scientific rigor. Thus, it is understood that gaps in the documentation can be (and usually are) filled in activity preparation events — this was confirmed in the case study.

4.2. Results of the investigation of epistemological legitimacy

The case study evaluated the credibility of data sources in activities carried out under the Grumbach method of strategic planning. The process was conducted in a public agency of direct administration that provides legal assistance to citizens who prove to have insufficient resources. It is not subordinate to any powers of the Republic, and is audited by the Federal Court of Accounts. Training and consultancy on the method were conducted by the same company, the author of the software that supports the activities of data recording, handling, consistency, visualization, monitoring, and interpretation — to generate statistical information, for example.

The data studied have three origins: reports on the progress of activities; documentary records of partial and final results; and participant statements. The reports preserve the memory of how the activities were carried out; the documents record the consensus at the end of each activity; the statements fill documentary gaps and improve understanding of formal records.

The institution began a strategic planning process in 2018, with a horizon set for 2040. Six workshops involved 150 public defenders and staff from across the country, representing various departments and sectors of the institution. Each workshop took 24 hours divided into three days, and the number of in-person participants was limited to 30, in a rotating system. The workshops began in October 2018. In two months, the strategic diagnosis and the reactive and prospective analyses were completed. These would later support the strategic plan, a project started in 2019.

In the first and second workshops, participants relied on official documents prepared and reviewed by work teams and endorsed by department directors. They were used to define the organizational structure of the institution, its needs, and its risks. These are documentary, internal, and primary data sources, so the attributes of authenticity, competence, and trust in each data source received a score of 4.

In the third workshop, participants relied on data from research institutions, official news agencies, federal institutions from the three branches, national and international non-governmental organizations (NGOs), scientific articles, major newspapers in the country, etc., to develop strategic questions and define the cut-off points for the events of the Delphi survey. These are documentary data sources, internal and external, primary and secondary. The attributes

of authenticity, competence, and trust of each data source received a score of 4.

In the fourth workshop, participants relied on data generated in previous stages of the process to propose corrective and mitigating measures for the institution's weaknesses in the current scenario, as well as to better leverage its strengths. These are documentary, internal, and primary data sources. The attributes of authenticity, competence, and trust of each data source received a score of 4. The current scenario was built based on the results of the Delphi survey.

In the fifth workshop, participants relied on data from the Delphi survey to evaluate its results, analyze cross impacts, generate prospective scenarios, identify the trend scenario, define the ideal scenario, and analyze the actors. These are personal, external, and primary data sources. Here, the competence attribute received a score of 3. The attributes of authenticity, competence, and trust of each of the other data sources received a score of 4.

In the sixth workshop, the Systematization Group relied on data recorded in previous stages of the process to define the long-term strategic action plan, then approved by the institution's leader. The main partners in line with the strategic action plan were identified: Presidency of the Republic, Ministry of Economy, Chamber of Deputies, and Federal Senate. The other participants relied on the proposed measures to define objectives and strategic initiatives. These are documentary, internal, and primary data sources. The attributes of authenticity, competence, and trust in each data source received a score of 4.

Evaluating the reliability attributes of the data at each stage of the process leads us to assign maximum credibility to the used data.

4.3. Consolidation and analysis of results

The documentary analysis of the Grumbach method identified each of the precepts of the Cartesian method in each of its stages, from the conception and preparation of activities to the execution of those involving strategy. Documentary records from the case study show the preparation of activities to fill gaps in scientific rigor identified in the method's documentation, which was produced with a commercial bias. The procedural rigor of the investigated method and the functional equivalences between data structures produced by it and by traditional research projects indicate its scientific legitimacy.

In the epistemological sphere, the case study identified personal and documentary data sources, internal and external, primary and secondary. The official nature of the institution in question confers legality to the documents that regulate it; defines the qualification of the actors involved; and gives visibility and scope to the agency, which is reflected in the quality of its technological resources and infrastructure. These conditions confer the highest degree to the attributes of authenticity, competence, and trust in the data sources. The experts from the Delphi survey make up the only "uncontrolled" element among the data sources used. The score of 3 given to the competence attribute reflects the diverse levels of knowledge among the specialists, which aligns with characteristics intrinsic to the future: uncertainty and unpredictability. Thus, multiple perceptions and, ultimately, future alternatives are made possible. In this way, the credibility of the data source as a whole is strengthened[4].

The premises and assumptions of this study could also be confirmed by documentary analysis of a traditional research: a retrospective of genetic improvement conducted by the National Research Center for Rubber Tree and Oil Palm, a unit of the Brazilian Agricultural Research Corporation (Embrapa). The publication has no relation to scenario planning, but it allows the identification of both typical scenario data and the stages described in the Grumbach method (section 1.2).

CONCLUSIONS

This research produced a set of arguments supporting the scientific and epistemological legitimacy of the Grumbach method of strategic planning and, by extension, the scenario planning methodology. The theoretical foundation of scientific legitimacy was developed based on the traditional Cartesian method. Meanwhile, epistemological legitimacy

4 This is the caveat cited in the abstract of the article: the possibility of different, non-unanimous points of view qualifies the method (Grumbach) and the methodology (planning by scenarios) for prospective studies.

was mainly developed based on the perspective of Karl Popper.

The investigation generated: a list of key concepts about scenario planning; a list of skeptical challenges; an essential glossary; a set of premises to assess the scientific validity of the investigated method; a set of assumptions that would support the representativeness of the method in relation to the methodology; a table of variables linking the precepts of the Cartesian method to each stage of the investigated method; a list of questions to track each stage of the investigated method, to assess control over the used and generated data, as well as the techniques for formulating hypotheses and evidence; and a table of variables on the credibility criteria for the data generated at each stage of the investigated method.

The study identified gaps in the documentation of the Grumbach method. They are explained by its commercial (non-scientific) bias and are remedied in the preparation phase of activities, as provided in the documentation — without affecting the activities, therefore.

Partial results of the study indicate that: in each stage of the investigated method, all precepts of the Cartesian method were evidenced; data structures were identified that point to prospective scenarios and scientific hypotheses as the same class of ideas; the case study confirmed the use of credible data sources, the generation of consistent and sufficient data throughout the process, and the construction of statements that adhere to the three laws of thought.

Partial conclusions of the study indicate that: prospective scenarios are hypotheses that become mutually exclusive over time; the past is rich in hypotheses that make up an inexhaustible source of data to inform prospective studies; and the scientific and epistemological legitimacy of scenario planning can be sustained by the quality of the evidence that supports the hypotheses, since even the smallest probabilities can be legitimate: Black Swans (Taleb, 2020) exist, after all.

The study was developed within the context of a master's course, whose time and resource constraints are significant, such as the selection of a single method as representative of the methodology, and the development of a single case study. Despite these, all premises and assumptions were covered by the investigation, and all objectives were met. Future approaches to address such restrictions include: replicating the methodology of this research with other scenario planning methods; comparing the results of these studies; and improving the criteria for the legitimacy of scenario planning. We hope that this study will be useful to inform the academic position on the discipline, and that the concepts and arguments presented here will help provide confidence in the use of scenario planning, for the benefit of societies and organizations.

REFERÊNCIAS

Bishop, P. C. (2017). Baseline analysis: The epistemology of scenario support. *World Futures Review*, *9*(2), 83-92. https://doi.org/10.1177/1946756717705962

Bradfield, R., Wright, G., Burt, G., Cairns, G., & Van Der Heijden, K. (2005). The origins and evolution of scenario techniques in long-range business planning. *Futures*, *37*(8), 795-812. https://doi.org/10.1016/j.futures.2005.01.003

Byerly, T. R. (2013). Explanationism and justified beliefs about the future. *Erkenntnis*, *78*, 229-243. https://doi.org/10.1007/s10670-012-9374-7

Castro, I. E. (2005). Apresentação. In E. Morin, *Ciência com consciência* (M. D. Alexandre & M. A. Sampaio Dória, Trads.; 8ª ed.). Bertrand Brasil.

Chermack, T. J., & Coons, L. M. (2015). Scenario planning: Pierre Wack's hidden messages. *Futures*, *73*, 187-193. http://dx.doi.org/10.1016/j.futures.2015.08.012

Chermack, T. J., & Lynham, S. (2002). Definitions and outcome variables of scenario planning. *Human Resource Development Review*, *1*(3), 366-383. Recovered from https://chermackscenarios.com/wp-content/uploads/2020/09/Definitions-and-Outcome-Variables-of-Scenario-Planning.pdf

Descartes, R. (2001). *Discurso do método* (2ª ed.). Livraria Martins Fontes.

Godet, M., & Durance, P. (2011). *Prospectiva estratégica para as empresas e o território*. Dunod. https://doi.org/10.3917/dunod.godet.2011.01

Grayling, A. C. (2003). Epistemology. In B. P. Company (Ed.), *The blackwell companion to philosophy* (2ª ed., pp. 965). https://doi.org/10.1002/9780470996362

Grumbach, R. J. S., Franco, F. L., Silva, J. W., & Grumbach, R. P. (2020). *Construindo o futuro: o método Grumback de gestão estratégica*. Cia do eBook.

Iden, J., Methlie, L. B., & Christensen, G. E. (2017). The nature of strategic foresight research: A systematic literature review. *Technological Forecasting and Social Change*, *116*, 87-97. https://doi.org/10.1016/j.techfore.2016.11.002

Kuhn, T. S. (2020). *A estrutura das revoluções científicas* (13ª ed.). Perspectiva.

Mackay, B., & Tambeau, P. (2013). A structuration approach to scenario praxis. *Technological Forecasting and Social Change*, *80*(4), 673-686. https://doi.org/10.1016/j.techfore.2012.06.003

Marcial, E. (2011). *Análise estratégica: Estudos de futuro no contexto da inteligência competitiva* (Vol. 2). Thesaurus.

Marcial, E. C., & Suaiden, E. J. (2016). A estrutura científica da inteligência competitiva. *Transinformação*, *28*(1), 97-106. https://doi.org/10.1590/2318-08892016002800008

Martelli, A. (2001). Construção de cenários e planejamento de cenários: estado da arte e perspectivas de evolução. *Futures*, *33*(1).

Miller, D. (2010). *Karl Popper: Textos escolhidos* (V. Ribeiro, Trad.). PUC-Rio.

Morin, E. (2005). *Ciência com consciência* (M. D. Alexandre & M. A. Sampaio Dória, Trads.; 8ª ed.). Bertrand Brasil.

Pares, A. (2011). Prefácio. In E. Marcial, *Análise estratégica. Estudos de futuro no contexto da inteligência competitiva* (Vol. 2, pp. 13-14). Thesaurus.

Rohrbeck, R., Battistella, C., & Huizingh, E. (2015). Corporate foresight: An emerging field with a rich tradition. *Technological Forecasting and Social Change*, *101*, 1–9. https://doi.org/10.1016/j.techfore.2015.11.002

Snowden, D. J., & Boone, M. E. (2007). A leader's framework for decision making. *Harvard Business Review*, *85*(11), 69-76. Recuperado de https://hbr.org/2007/11/a-leaders-framework-for-decision-making

Soares, S. A., Florêncio, J. G., Assis, J. A., Digolin, K., Gontijo, R., & Canesin, R. M. (2019). *Alcances, limites e antinomias de métodos e técnicas em cenários prospectivos*. Ipea. Recuperado de https://repositorio.ipea.gov.br/bitstream/11058/8964/1/td_2443.pdf

Sonk, M. (2015). How to justify beliefs about the future - some epistemological remarks. *European Journal of Futures Research*, *3*, 17. https://doi.org/10.1007/s40309-015-0076-7

Taleb, N. N. (2020). *Anti-frágil: Coisas que se beneficiam com o caos*. Objetiva.

Varum, C. A., & Melo, C. (2010). Directions in scenario planning literature – A review of the past decades. *Futures*, *42*(4), 355-369. https://doi.org/10.1016/j.futures.2009.11.021

Walton, J. S. (2008). Scanning beyond the horizon: Exploring the ontological and epistemological basis for scenario planning. *Advances in Developing Human Resources*, *10*(2), 147-165. https://doi.org/10.1177/1523422307304101

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