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Challenges in communicating the outcomes of a foresight study to advise decision-makers on policy and strategy

Claudio Chauke Nehme[1,2,*], Marcio de Miranda Santos[1], Lelio Fellows Filho[1] and Gilda Massari Coelho[1]

[1]*Center for Strategic Studies and Management (CGEE), SCN Q. 2, Bl. A, Corporate Financial Center, Office 1102, ZIP: 70712-900, Brasilia, DF, Brazil*
[2]*Catholic University of Brasilia, Brazil*
**Corresponding author. Email: chauke@cgee.org.br*

This paper addresses the challenges of communicating the results of a strategic foresight exercise which aimed to support decision-makers in their activities, providing for increased confidence and credibility throughout the process. Foresight recommendations are shaped and derived according to the nature and complexity of the themes being considered, the level of stakeholder participation and, quite frequently, the communication skills of those managing the process. Efforts towards better communication among participants are decisive for successful foresight exercises. This paper stresses that the intangibles are important outcomes, as well as the importance of promoting out-of-the-box thinking during the exercise. Lessons learnt are presented, as well as a case study developed by the Center for Strategic Management and Studies (CGEE), Brasília.

Keywords: foresight; decision-making; strategic intelligence; communication; mind-set transformation.

1. Introduction

Exercises to explore the future are considered to be important for strategic planning, decision-making support and for public policy formulation, as they allow for foreseeing breakthroughs, technology leaps, trends and discontinuities, new perspectives and opportunity maps present themselves to a corporation through identifying its challenges and strengths (Coates, cited by Miles et al. 2008).

Foresight seeks to provide a strategic perspective for the present, with knowledge of future possibilities, building commitment to and coordination on national or institutional priorities. Vecchiato and Roveda (2010) prefer to use the term 'strategic foresight' rather than the simpler 'foresight' in order to emphasize its close connection with the process of formulating strategy.

Strategic foresight is defined by Slaughter (1999) as the ability to create and maintain a high-quality, coherent and functional forward view and use the insights arising in organizationally useful ways, viz: detect adverse conditions, guide policy, shape strategy, and explore new markets, products and services. It represents a merger of future methods with those of strategic management. It is defined by Habegger (2010) as a deliberate attempt to broaden the 'boundaries of perception' and expand awareness of emerging issues and situations. It aims to support strategic thinking and decision-making by developing a range of possible ways in which the future could unfold.

Strategic foresight exercises can be developed by means of different approaches, dealing with aspects that might include the following: scope and purpose; knowledge and experience of the participants involved; stakeholders' decision-making culture and management styles. These are aspects in relation to which a good communication approach may help make the difference between good and bad final results. This paper discusses this decision-making environment and a relevant Brazilian

experience dealing with complex strategic foresight exercises, developed by the Center for Strategic Studies and Management (CGEE), Brazil.

The CGEE is a non-profit organization, a scientific, technological and innovation 'think tank' created in 2001. It has been qualified as a 'social organization' by the Brazilian Presidency, and is supervised by the Brazilian Ministry of Science, Technology and Innovation. Its inception was part of government efforts to promote science, technology and innovation (ST&I) development in Brazil in order to advance economic growth, competitiveness and well-being. Its scope covers three integrated themes: strategic foresight exercises (future studies); strategic evaluation of large programs and projects; information and knowledge diffusion. It is considered to be an interface organization in the ST&I environment, having responsibility for articulating the views of the government, private sector and academia, as well as other relevant ST&I players. From 2001 to the present, the CGEE has conducted nearly 400 strategic foresight exercises and strategic evaluation studies, mobilizing more than 2000 experts per annum from an average of 300 institutions.

This paper addresses the following two key points: Firstly, we consider intangibles (see Section 2). An informal or intangible outcome is an effect or result which adds value but which emerges over the course of the foresight process and cannot be formalized as a deliverable (European Commission 2011). Intangibles are deemed to be very important and foresight practitioners should pay heed to their generation as strategic foresight exercises develop. The process of sharing experiences, collective learning and understanding, creation of shared commitment to the main decisions to be made and a shared vision on future possibilities are all intangibles which need to be pursued. Their value exceeds and complements tangible outcomes, such as reports and publications, as they are usually absorbed as knowledge by those participating. From this paper's point of view, the target is always the best combination between stakeholders and decision-maker involvement and intangible generation, in addition to the ability to explain the reasoning process through clear, consistent and coherent recommendations and outcome pathways. Out-of-the-box thinking is important in a strategic foresight exercise. It is important for everyone participating in a given foresight exercise to not be afraid to attempt new ways of thinking (Kelley and Littman, 2001). Individual and group abilities must be managed to provide ways and means of overcoming difficulties and limits associated with their culture, knowledge, training and perceptions and beliefs. The methodological approach must induce out-of-the-box thinking, by the cumulative introduction of different visions on the subject, open discussions and the use of creative methods.

Secondly, in Section 3, we consider the strategic foresight methodological approach. As mentioned before, the wisdom of conducting given strategic foresight exercises, irrespective of its complexity, lies in the ability to develop tailor-made methodologies, by employing a number of tools and methods. A key factor in success is to start the exercise after a robust collective planning step. In the pre-foresight phase of this methodological approach (see Section 4), a client's needs and desires are extensively debated, the methods and tools to be applied are considered and strategies to think out-of-the-box are discussed in order to break existing mental patterns, where appropriate.

A case study of a strategic organizational foresight execise at the Brazilian Innovation Agency (FINEP), which focused on the knowledge required for a given exercise to achieve the desired outcomes is discussed in Section 5. Finally, lessons learned and conclusions are presented in Section 6.

2. Intangibles

Governance, social engagement and foresight are relatively recent subjects of study which present controversial points. As far as governance is concerned, conflicts may occur between new democratic practices, technological expertise and scientific freedom. On the other hand, as the future is unpredictable, the notion that prevails is that studies of the future are not very effective. Finally, social engagement means a change in the pattern of behavior by the citizens, much more participative and conscious of their rights. Although there are some difficulties in working with these three concepts—alone or together—it is their merger which bestows greater consistency and credibility to the individual parts. A number of remarks will be presented to illustrate situations in which these subjects are particularly complex.

Firstly, there is the issue of the unpredictability of the future—it is neither possible nor feasible to say how the future will be (De Geus 2002). However, attempting to understand how the future may unfold and dealing with the notion of 'possible futures' (Jouvenel 1967), is not only feasible, but is also very important nowadays and constitutes a differential for organizations and countries looking forward to shaping their own future and not merely being hostages to destiny. In this sense, shaping the future from the perception of present opportunities is, broadly speaking, known as foresight. In addition, one of the characteristics of the foresight approach involves the ample possibilities offered to investigate and understand the nature of the risks; neutralize and minimize the effects of the risks; and find ways to react rapidly in order to mitigate problems once they start to unfold.

A second issue arises when we observe the emergence of problems related to the need to coordinate new forms of research and innovation organization, as well as new management approaches and changes of focus, from short- to

medium- and long-term, in organizations, government structures and their many links and relationships. Thirdly, we observe that there has been a change in the pattern of citizens' behavior, they are willing to participate in decisions which will affect their lives and also claim their rights. For example, environmental issues are at the center of political debate, and are also being questioned by those beyond the strict sphere of science and technology (S&T). This change of behavior is logical, since the common citizen suffers directly from the effects of environmental changes. Individual participation in subjects affecting society as a whole is therefore ever more intense.

Thus, not only discussions about the need for social engagement in the decision-making process emerge, but also the concepts of governance, macro-coordination and development of vertical communication channels in the government area return to the forefront.

The main point here is: when and how are these three concepts interconnected? We can say that they are interconnected every time the need arises to identify possible futures or imagine desirable futures, incorporating the visions of those who, at the same time, will be their builders and their users, since the choices made today are decisive for shaping the future.

The participation of different stakeholders in the process of identifying possible futures creates a more democratic decision-making and incorporates different visions into the foresight process, different points of view, contributing to the success of the entire exercise and to the quality of the final results. It is very common, at the end of a foresight exercise, for stakeholders to say that 'the process was as more important than the product'. This simply means that the synergy among them, the network articulation potential, the intensity of the exchanges and the intrinsically democratic nature of the process benefit individuals and collectivity in more extensive ways than the results of the study themselves (European Commission 2011).

According to the European Commission, as cited by Irwin (2004):

> . . . in a knowledge-based society, democratic governance must ensure that citizens are able to make an informed choice from the options made available to them by responsible scientific and technological progress.

In this context, governance, social engagement and foresight can be seen from a common point of view, looking forward to visions of the future and to what must be done to transform those visions into reality, this only being justified if made for and by the citizen. Therefore, in this paper, intangibles are considered as a key element and wisdom to be acquired and applied in a better way to support this common point of view and to unite the related subjects into a whole.

From this brief introduction about the environment of governance, social engagement and foresight, it can be seen that the discussion about intangibles should be focused more on state-of-the-practices than the state-of-the-art. In other words, experiences and facts are the key points to perceiving and understanding intangibles. This paper will focus on strategic foresight, taking advantage of CGEE's background in conducting strategic foresight exercises and strategic evaluation studies during the past decade, all of which have been associated with the needs coming from and involving government at several levels, the private sector and academic organizations.

Beside the fact that the strategic foresight methodological approach adopted in this paper will be presented later, it is relevant to anticipate certain aspects more related to intangibles. The anxiety associated with acquiring new knowledge to provide for rapid solutions to problems which have been identified, is often observed among participants in the initial phase of the foresight exercise. This anxiety must be controlled by those coordinating the project, by communicating that the interpretation of information and the production of knowledge are both keys to formulating recommendations. It is then amazing to frequently see, that immediately after reaching a certain level of understanding about the complexity of the main theme considered in the exercise (high level of shared understanding), decision-makers—mainly those from the government—tend to consider themselves confident enough to start making decisions. Although a good sign that intangibles are in the process of being generated, this situation is to be avoided at all costs. The initial phase of the methodological approach has the sole purpose of improving the shared understanding about what is going on and does not generate the information and knowledge necessary to support the decision-making process, which needs further knowledge generation and interpretation of trends, perspectives and future possibilities.

Furthermore, it is important to assemble possible futures in the same way that a puzzle is assembled, step by step, and part by part, testing how best one piece fits into another. This requires time, especially in the case of complex situations. Again, this is another challenge, as different stakeholders usually have divergent perspectives for defining the best route towards the desired future. Foresight exercises help to overcome these limits and build a convergent reasoning process based on best practices in organizational learning.

In most cases, the intangibles being generated are not clear to all the participants, nor is there a particular list of them which fits all situations. This depends on the client, the specificities of the theme considered, the institutional environment created and, not least, the time available to complete the exercise. The most important intangibles are as follows:

- Collective learning.
- Better and deeper collective understanding.
- A better reasoning process to support decision-making and strategy formulation.

- The culture of looking ahead, having the past as an important reference.
- The collective commitment to take joint courses of action.

Efficiencies linked to foresight exercises are usually associated with some of the intangibles that are generated, if not with all of them.

For the sake of clarifying how distinctive a strategic foresight exercise might be, demands may be associated with innovation, competitiveness, long-term government planning, subsidies to S&T public policies, and the future of complex themes, such as climate change, demography, biodiversity, bioethanol, energy efficiency etc. In the last three years, CGEE has conducted some relevant national strategic foresight exercises, all involving ST&I policy, and having participatory approaches, namely:

- 11 strategic foresight exercises to enhance the competitiveness of the Brazilian industrial sector in the global economy: shoes, furniture, automotive, cosmetics, marine, industrial automation, civil construction, medical equipment, plastics, furniture and aeronautics.
- Strategic foresight for FINEP (the case study of this paper) and the São Paulo University Medical School System (FMUSP).
- Strategic foresight exercise for the sustainable food production process in Brazil.
- Strategic foresight for the National Council for Scientific and Technological Development (CNPq).

3. The value of out-of-the-box thinking in a foresight exercise

The concept of out-of-the-box thinking adopted in this paper is related to learning organization theory (Tosey 2005). It is directly associated with the mind-set concept. Brummer's thoughts about mind-sets in management are interesting and capture the essence of this concept:

> ... knowledge about the human behavior which drives a competitive force, and in particular that of its management creed, as well as the group dynamics of such a management team, may have prominent influence on determining how such competitive force will approach the possible opportunities, uncertainties and threats of the future business environment. Brummer (2005: 156)

The idea is a thought-oriented process aiming to make decisions or share perceptions, free from prejudice, cultural influence, and reasoning processes. This concept requires that experts and other stakeholders think about the new, to collectively foresee related issues, to imagine influence and impacts regarding a specific issue in the foresight study. In this context, planning for out-of-the-box thinking is absolutely necessary if one is to break the mental barriers and common sense perspectives ingrained in the past (Hames 2010; Johnston 2010).

In foresight exercises developed by CGEE, mind-set revision involves the participation of experts and stakeholders, applying a variety set of methods and tools, and a suitable combination of quantitative and qualitative approaches. On account of its being strategically positioned very close to decision-making at the highest level, it displays a high capacity to mobilize experts, within and outside Brazil. It has the necessary funding, human resources and infrastructure to handle complex thematic debates in several areas of interest, planning for small and very large events—such as the last three national S&T conferences organized by the CGEE—and for applying a variety of methods and tools to bring the main issues impacting a given foresight exercise to the table. In addition, its in-house-developed web-based platform[1] to carry out surveys can be employed whenever there is a need to gather primary data from experts and other stakeholders.

4. Strategic foresight methodological approach

This section will explore the main aspects of the strategic foresight methodological approach. Its role is to guide staff in charge of planning and conducting foresight exercises according to the CGEE's values and institutional mission (Santos et al. 2004). It takes into account the methodological structures proposed by Horton (1999) and Conway and Voros (2002), as well as practical orientations contained in the *Handbook of Knowledge Society Foresight* (Miles et al. 2002) and in Godet (2001).

This approach considers that many forms of analysing the future of ST&I coexist and can be mobilized, individually or in combination with others, so as to fulfill the needs of a given situation. Porter et al. (2004) have coined the term technology futures analysis (TFA), which comprises technology intelligence, forecasting, roadmapping, technology assessment, and foresight.

In addition, this methodological approach was based on the perception that decision-making emerges from a negotiation between multiple actors. This perception is the key point of the forsight methodology, which can be defined as a:

> ... process which leads to a more complete understanding of the forces shaping the future and which must be considered in the formulation of policies, planning and decision-making. (Martin, cited by Cuhls and Grupp 2001)

This approach aims to link the present decisions and actions to a strategic perspective, coping with the possibilities of the future for the construction of commitments around national priorities for ST&I.

Based on concepts developed by the EU (Santos and Santos 2003), foresight is considered to be an activity connecting three different dimensions of the same process: thinking, debating and shaping the future.

The diversity of communication channels and the need for effective coordination between these three different levels emphasizes the importance of setting up a well-structured governance body for the whole exercise. Moreover, it is crucial to heed the validation and implementation phases, both integral parts of this methodological approach, in informing the decision-making processes on ST&I (Santos et al. 2004).

There are a number of key elements embedded in this methodological approach. Firstly, and most important, stakeholders must be involved in the exercise from the very beginning (Eriksson and Weber 2008). As discussed in Section 2, stakeholders have to feel comfortable and confident about participating in all phases, irrespective of the complexities involved. It is absolutely fundamental that complex ST&I issues are translated into the language of government officers, private sector representatives and ordinary people for this end to be achieved (see Fig. 1, 'Definition of main objectives'). Usually, at this point, the purpose of the methodological approach is to listen, interpret and understand the client's needs, desires and preoccupations. In this context, the task is to help to articulate and translate to all participants, in a common and understandable way, the main objectives and strategic goals, taking into consideration the possibilities, opportunities and different perspectives brought by the clients themselves.

Secondly, systematically introducing collective intelligence throughout all the phases of the process is the key for achieving success (Glenn 2010). In other words, collaboration, interaction and communication are all important. Additionally, attempts to design and plan the foresight exercise with a sense of anticipation, pointing out where participants find the most difficult points and where revisions of mind-sets are expected, might create positive attitudes and engagement along the route ahead. This also helps to create the environment for an innovative dialogue to be established, perhaps one of the most important outcomes of any collective intelligence-based process. In the second block (see Fig. 1 'Topic selection'), the correct identification of the subject and its interaction with other studies and government activities, the priority issues and critical questions comprise the key points.

This starts with the correct identification of factors associated with the subject under analysis, including its nature and scope, time horizon, intended applications of the results by clients etc. Due to the uncertainties and complexities involved, it is also important to have sufficient flexibility to allow alternative approaches, methods and tools that may fit the needs of the exercise better, to be mobilized. Participatory management structures are highly recommended to allow for 'on the fly' decisions to be made once the exercise starts.

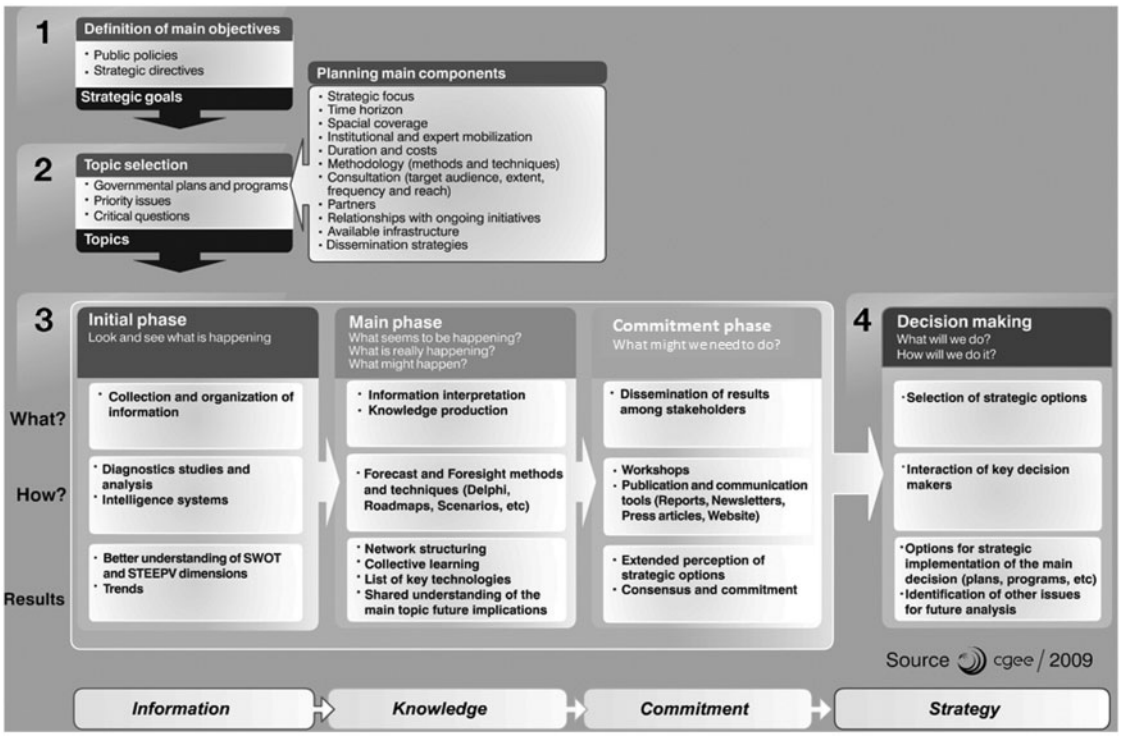

Figure 1. Strategic foresight methodological approach.

The foresight exercise itself comprises three distinct phases: initial, main and commitment, (see Fig. 1, block 3). In the initial phase, the baseline of the exercise, usually mapping what is occurring in relation to the main issue. In this phase, tasks related to gathering and structuring data, and environment scanning are frequently established. This phase also produces the key information components, which will support further analysis in the future.

The main phase is where most information interpretation will take place and where creativity will be required to the best of the participants' capacity. Studies, scenario planning, workshops, and electronic tools, among other tools, are applied in order to revise and transform mind-sets, and understand possible futures associated with the main issues under analysis. In this phase, it is vital to apply collective intelligence procedures, to achieve high levels of common understanding about future possibilities and impacts associated with the theme of the main exercise. The basis for a good decision-making process is laid out in this phase, providing for clarity and making it as comprehensive as possible.

The commitment phase is the one in which the main recommendations are fine-tuned with decision-makers in all their aspects, an implementation strategy is first designed, with dissemination occurring then.

A commitment and dissemination process is established in the commitment phase, and the question is: What can be done? In this phase, participants (mainly decision-makers) are asked to think how to implement the alternatives identified in the previous phases, building upon and consolidating consensus where possible and mapping controversial points, which will require a more elaborate implementation strategy. It is also an opportunity to convey non-classified results to a broader audience, through the dissemination of information via the Internet or by means of publications, seminars, conferences etc.

The expected result is the transformation of the accumulated knowledge in strategies and proposals, resulting from discussion and commitment among key stakeholders, expanding the perception of strategic options among the decision-makers.

Block 4 in Fig.1, lies outside of foresight activity governance. The client and stakeholders are in charge of implementing the recommendations and corresponding strategies. It is important to note that the CGEE is independently evaluated with regard to the effectiveness of its recommendations. However, it is not involved in the implementation process. This means that its credibility depends on the relevance and applicability of the final recommendations.

A number of examples from studies developed by CGEE are presented in Table 1 to show the application of the methodological approach.

A special remark is needed regarding this methodological approach to engage clients and stakeholders. To attain the desired outcomes, the challenge of engaging clients and stakeholders in the main and commitment phases depends on the ability of the coordination team to link the participating stakeholders to the technical and scientific communities and vice versa. A critical factor for success is that scientists understand the behavior of government officers and representatives of the private sector, if shared commitments are to be produced. Thus the coordination team must be aware of these problems and provide for solutions to them. The communication styles are, therefore, considered to be crucial. The understanding of the chosen tools, workshop objectives, and the scope of the exercise depends on how best these are communicated to participants, thereby facilitating the acceptability of the whole process to all the participants. Thus, different groups of stakeholders demand different communication skills and style.

5. The FINEP case study

In order to illustrate what was discussed earlier in this paper, we now present an organizational foresight exercise developed for FINEP, the main federal S&T funding agency in Brazil, which is also known as the Brazilian Innovation Agency (Coelho et al. 2011).

The following items are presented:

- A brief description of FINEP's context.
- The strategies and attitudes adopted to promote out-of-the-box thinking during the course of the exercise.
- The changes and adaptations required in the methodological approach to increase the chances of success.
- The strategies developed to generate intangibles.

FINEP is one the main agencies under the Ministry of Science, Technology, and Innovation (MCTI). It currently occupies a central position in the funding of the Brazilian ST&I institutions and organizations. The scale of funding (see Fig. 2) and the pressure from the stakeholders for more efficiency have led the former president of the agency to carry out a foresight study with a clear message of urgency: 'Our future is now'. This message must be interpreted as a call to explore possible futures and to adapt the agency to face potential future developments, and, at the same time, increase and improve its current performance indicators.

FINEP's mission entails promoting economic and social development in Brazil through public funding for the development of ST&I. It is broad enough to support a large spectrum of ST&I activities in the country. All phases of the innovation value chain are being mapped by FINEP in order to define strategies and instruments for funding and supporting the national ST&I system. FINEP's portfolio includes: funding oriented to

Table 1.

Theme	Objectives	Focus	Initial phase	Main phase	Commitment phase
Energy	Establishment of R&D priority agenda, considering existing challenges to Brazilian energy matrix in next 20 years	Technologies for generation of electric energy, fuel supply and energy transmission and distribution, distributed generation and storage, planning, conservation and final use	Interviews with experts	Delphi: 63 technological topics were examined by experts, using Delphi technique and considering four dimensions of analysis: techno-economic, strategic, environmental and social Multi-criteria analysis: identified technological topics were evaluated using hierarchical criteria and analysis of robustness	Identification of an initial list of 63 technological topics Identification of seven priority technological topics, considered 'robust' Final report and dissemination of results
Water resources	Establishment of ST&I priority agenda aimed at guiding future investments made by governmental agencies in six pre-defined themes	Quality of superficial water; rationalization of use of water in rural areas; quality of underground water; products and equipment; climate and water resources; sanitation	Diagnosis of six themes related to water resources	Experts panels to debate and validate reference papers elaborated for each one of six themes Analyses of recommendations of each panel compared to previous Brazilian foresight studies and international information	Workshop for presentation, discussion and prioritization of results in an integrated format Final report and dissemination of results
Biotechnology	Mapping challenges and opportunities for biotechnology in Brazil, with particular focus on research and commercialization of genetically modified organisms (GMOs). This should include social and cultural aspects associated with GMO commercial use and consumption in agricultural and health sectors	Future economic and social impacts of GMO technologies; trends in regulatory and legal national and international framework; applied metrology for biological products and processes; trends in public perception and flows of information; technological and commercial strategies (long term perspective); financing mechanisms; future of plant breeding and plant breeder profile; and trends in intellectual property rights (IPR)	Mapping S&T national capacity according to data available in CNPq/Lattes databases and Innovation Portal	Expert panels to debate the following themes: economic impacts of GMOs; national and international legal and regulatory biosafety framework; access to genetic resources and traditional knowledge; future of plant breeding and future breeder profile; and IPR as applied to biotechnology development	Validation of results in workshops, final report and dissemination of results
Nanotechnology	Mapping current situation and future trends in S&T in Brazil and in a number of selected nations, in order to guide national investments in nanosciences and nanotechnologies	Trends in S&T development in a selected group of countries; trends in private sector investments worldwide; state-of-the-art in nanoscience and nanotechnology in Brazil (main research groups, lab infrastructure, funding, training activities and international cooperation)	S&T monitoring using text mining techniques applied to relevant international databases Benchmarking, aiming at comparing development of nanosciences and nanotechnologies in selected countries	Delphi, involving around 1,800 participants	Final report and dissemination of results of Delphi

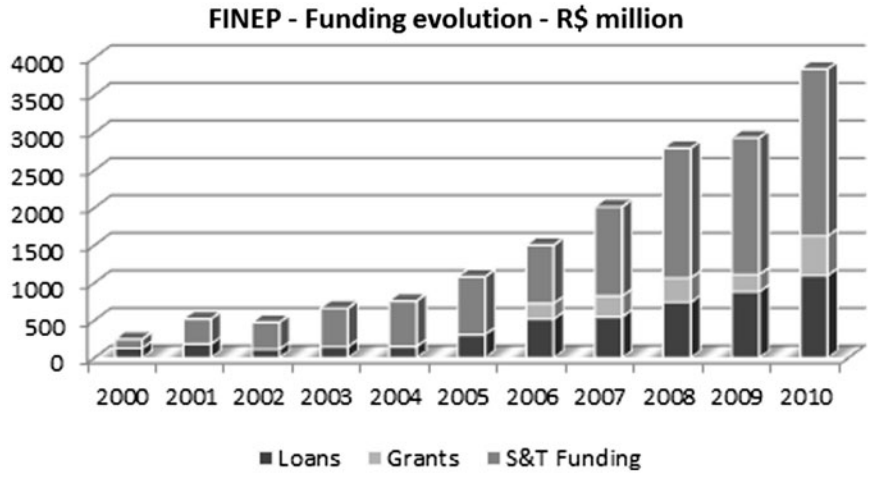

Figure 2. Evolution of funding to FINEP, 2000–10.

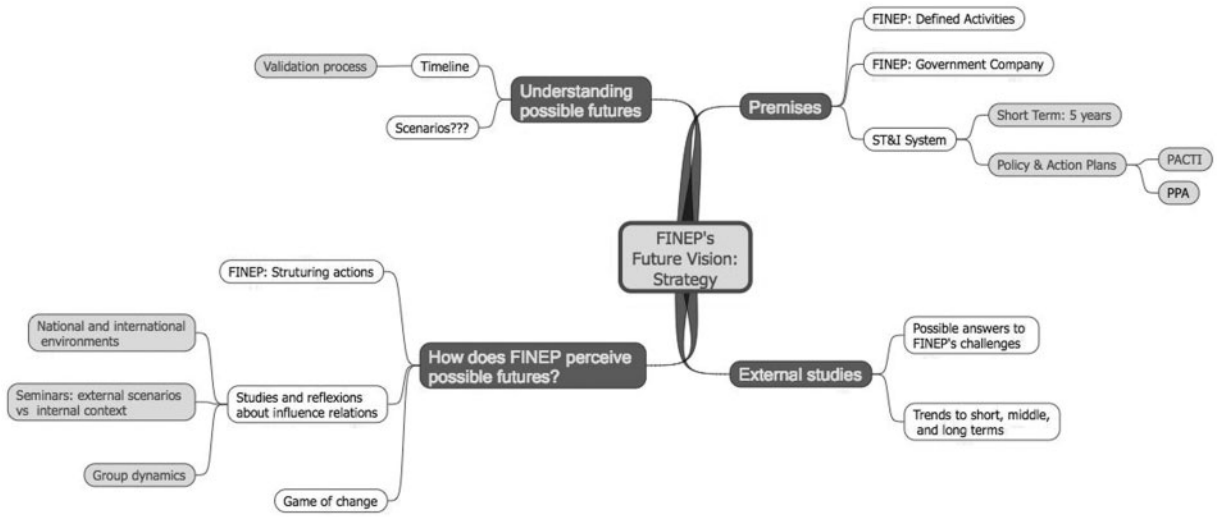

Figure 3. Strategies aiming to promote out-of-the-box thinking.

supporting basic and applied research; the development of innovative services, products and processes; the incubation of firms and the implementation of a technological infrastructure in private and public organizations. Implicit in its mission is the requirement for management and operational structures and staff to be prepared to implement a variety of financing possibilities, adapted to client needs, but basically available in three forms: S&T funding, non-reimbursable grants and loans for firms.

FINEP's strategic management plan was developed in 17 months, in an intense and challenging process of looking into the future of the agency and its role in the national ST&I system. The main objective of the exercise was to design a new management model for the agency, which would maintain and expand its current position as the main public innovation agency in Brazil, over the next 15 years.

In the case of FINEP, the challenge of promoting out-of-the-box thinking was very complex. It required a broad exercise of exploring future perspectives and a systematic process of questioning 'what is going on' and 'what we should do differently', with the participation of staff and a range of potential beneficiaries and stakeholders. This activity was part of the methodology preparation of the strategic foresight exercise. The main ideas and designed strategy on how to implement out-of-the-box thinking at FINEP are shown in Fig. 3.

A vision of a possible, successful future for FINEP, in its quite challenging context, required a strategy which, on one hand, balanced the knowledge related to the present and a number of relevant future possibilities, and, on the other hand, compared the internal and external views about the agency, which are often quite conflicting. The reasoning behind the central idea is described in Fig. 3.

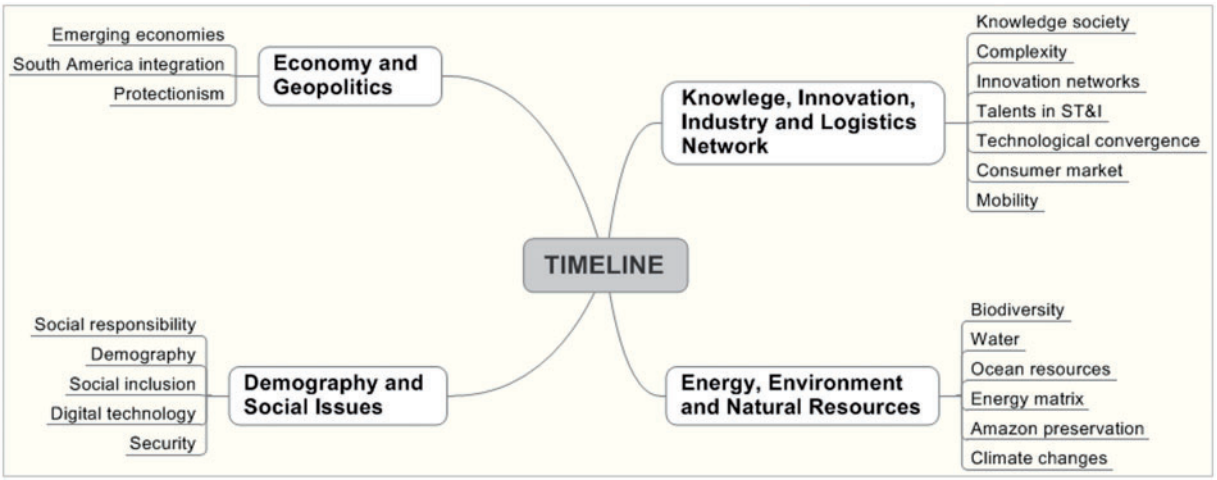

Figure 4. FINEP SMP timeline: observation dimensions and facts related to future.

5.1 Premises

There were two basic assumptions:

- FINEP's nature, role and strategic main line of activities were to be preserved.
- FINEP was an important stakeholder in the Brazilian ST&I system, but did not have full governance to deal with all those variables which could impact its present and future.

There were three relevant elements over which FINEP had partial or no control at all: the Brazilian ST&I Plan of Action (2007–10); the government's multi-year budget plan; the political changes that could affect it as a government-owned company.

5.2 Future perspectives

A tool—the future timeline—was developed in order to help stakeholders' thinking oriented by the main ST&I drivers. The timeline tool was chosen as an alternative to the method of scenarios, because the uncertainty and complexity of the environment demanded an approach which offered stakeholders a tool for collective reasoning without the need to definine strategies or elaborate decisions, as the method of scenarios normally requires. A 'timeline', as conceived in this case, is the representation of a temporal sequence of possible future events, delimiting the scope of the observation dimensions and of the identification of drivers for future events promoting environmental changes, and alterations in the trajectories of relevant phenomena, defined by national and international studies, in order to support decision-making and the drawing up of policies and strategic plans.

The focus provided by the differential use of the timeline in prospective studies arises from the fact that these elements are likely to occur in the medium- and long-term, as opposed to the original concept, commonly adopted, by drawing a line based on known facts which have actually happened.

As an alternative to conventional scenario methods, the timeline was an interesting option. The idea was to explore existing knowledge and the different possibilities, which emerged regarding the future, and create a fuzzier vision than scenario building permits. If we look at the past, it is clear that a great change is often anticipated by a series of micro-events, often not perceived. When change is consolidated, those who were able to perceive the signs certainly have a comparative advantage over others (Loveridge 2009).

The major challenge in the development of prospective studies is to identify which events or change drivers are actually relevant and to imagine a timeframe in which they may possibly occur. A number of structuring elements were defined for the development of the prospective timeline. These are presented schematically in Fig. 4 (only the observation dimensions and the keywords indicative of the future-bearing facts are shown, although the complete timeline included other variables).

5.3 Perception

Perception is an intentional process for gathering internal and external perceptions and, afterwards, promoting reflections on a more strategic and realistic positioning of FINEP in the national ST&I system. In this case, several ways of gathering stakeholders' perceptions were employed.

In order to hear the opinion of government authorities and representative leaders from industry and the national system of ST&I, about the system itself, FINEP, its performance and future expectations, interviews were conducted with different stakeholders at national level, including 30 government, industry and academy

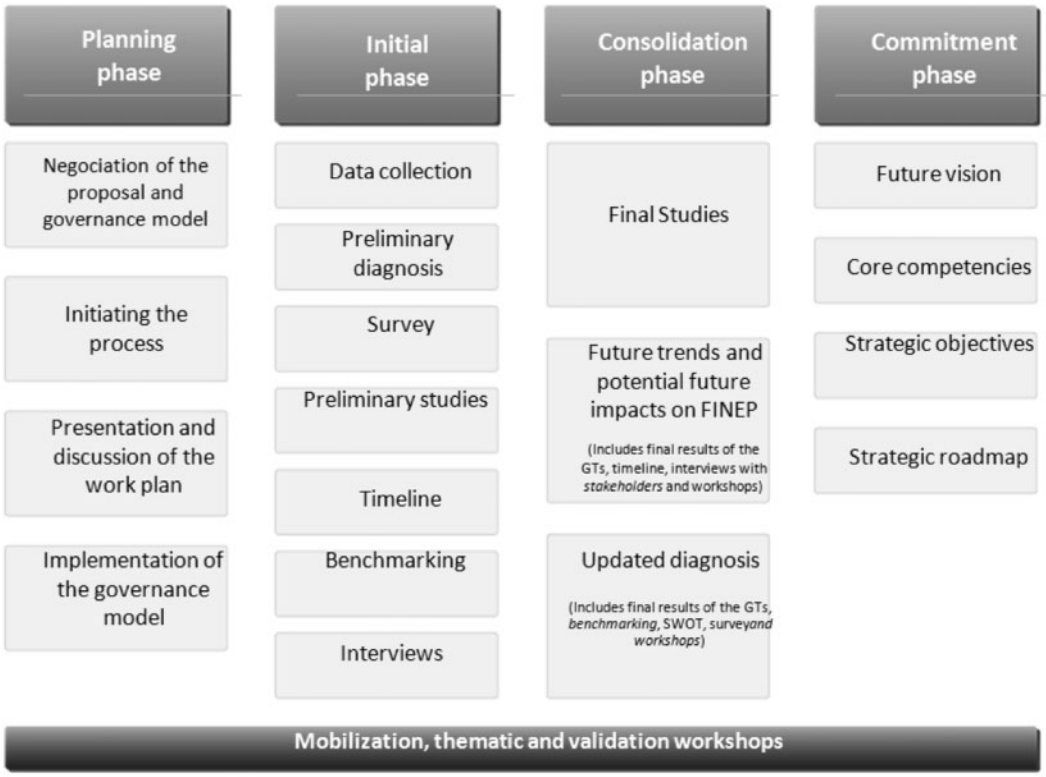

Figure 5. Methodological process for development of FINEP's SMP.

representatives. The interviews were semi-structured and applied in person. The views of these players were important elements in broadening the vision for the future of FINEP.

Among the international contributions, Moorcroft's study (Moorcroft 2009) stands out. It presents an overview of trends and changes affecting ST&I and the types of policies required to foster innovation in the future. Other than this study, foreign experts gave lectures which provided a clearer vision of the international context of ST&I development and the role of funding agencies.

Analyses and synthesis of the information obtained were made and the results were discussed with FINEP's senior management, employees and other stakeholders. The methods used were interactive, to ensure mobilization, participation and commitment at all levels of the agency and with key external players who would be fundamental in ensuring that the defined strategic guidelines would be implemented.

Workshops were held to discuss and validate the inputs generated in previous stages of the process. The results of these workshops (held with the participation of representatives from government (MCTI and other ministries), the FINEP Advisory Board and the workforce), allowed advancement into the final phase—commitment—which is meant to consolidate all the elements necessary to create the strategic management plan (SMP).

The final workshop, 'FINEP of the future', provided a forum for further discussions between employees and stakeholders, resulting in the construction of the key elements of the proposed plan:

- The statement of the future vision.
- The definition of core competencies.
- The proposal of strategic objectives to formulate an action plan.

Corporate values identified in interviews with the agency's employees were also validated and its mission revised.

From the reasoning presented in Fig. 3, FINEP's SMP was developed as the main outcome of the organizational foresight exercise, which considered future trends in ST&I and their possible long-term impacts on the agency. This was created due to FINEP's need to promote changes in its organizational and management processes, overcome structural problems and develop a new institutional culture.

Thus, the use of the conceptual and methodological approach of strategic foresight to set strategic priorities and action plans, allowed for shared commitments between the relevant players to facilitate the construction of a future vision and roles for FINEP in the national ST&I system. Some important changes and adaptations to the methodological approach were required, and are briefly described below.

The four phases proposed for the development of the SMP (see Fig. 5) were defined to meet the needs of the process, taking into consideration FINEP's culture and experience in planning and management over the years.

The use of distinct methods, techniques and tools is one of the characteristics of future studies, as has been highlighted by Porter et al. (2007) and Popper (2008). These authors have proposed a classification of methods and techniques by the type of approach (exploratory or normative), method (qualitative, semi-quantitative or quantitative) or source of knowledge (creativity, expertise, interaction or evidence).

Of the 33 methods and techniques identified by Popper, the FINEP SMP has employed the following: wild cards, SWOT analysis, roadmapping, web survey and interviews, expert panel, conference and workshops, multi-criteria and stakeholder analysis, indicator development, benchmarking, scanning and a literature review. The timeline tool was also used as an alternative for scenario planning.

The guidelines used in the process include:

- Participatory process: involvement of managers, employees, experts and stakeholders in all stages of the process'
- Senior management commitment: regarding the whole process, from methodology development to the analysis and validation of the results obtained.
- Strategic thinking: focused on prospective vision and on the definition of strategic guidelines covering time horizons of 5, 10 and 15 years.
- Out-of-the-box thinking: with stimulus provided to do different things differently.
- Activities under the scrutiny of a governance model: built to contribute to the development and validation of the main results of the SMP, with clear attribution of responsibilities.

The governance model was designed to explore the advantages of top down and bottom up flows. Four management groups were formed, each one with specific characteristics and attributions:

- Advisors group (AG): set up to provide strategic directions, according to institutional policies and framework.
- Management group (MG): assigned to manage process and ensure interaction between advisory (AG) and operational levels (thematic groups (TGs)).
- Coordination nucleus (CN): assigned to discuss and define strategies for the application of methods, tools and techniques according to the methodological approach utilized and to support the mobilization of all of the stakeholders involved and expertise, as well as conduct validation activities.
- TGs: assigned to develop, studies and analyses related to specific issues directly or through consultants.

The process was, indeed, very participatory and involved internal and external stakeholders in a continuous process of adding value to the information obtained, searching for as much consensus among the participants as was possible. Overall, around 3,000 people participated in the process in its various stages.

Participation was actually one of the main drivers used to generate durable intangibles. The preoccupations of FINEP's staff and their suggestions about the future of the agency needed to be heard and seriously taken into account. In addition, it was imperative for the main stakeholders in the national ST&I system to be involved in order to be committed in the implementation phase. These two main aspects were decisive in inducing FINEP to absorb the main outcomes, visualize possible futures and take strategic actions.

The development of the FINEP SMP also represented an excellent opportunity for those participating to reflect on the main characteristics of the national ST&I system, whether good or bad, and on FINEP's role in this context.

Among several other possibilities, there were a few aspects of the process which contributed to its success:

- In the organization's prior planning experiences, no other process had managed to gather a similar amount of information, stemming from internal and external sources, and had attempted to make it possible for voices to be heard at all levels of decision-making.
- The quality of the contributions, at all levels, by far surpassed initial expectations.
- The process had a very beneficial effect on FINEP, irrespective of the results and objectives achieved.
- The methodological approach assured, through the participatory process, commitment of an expressive contingent of internal and external stakeholders, not only with the process, but also—and mainly—with its continuity. This represents an important intangible gain, where the process was as important as the outcomes.
- Strategic foresight proved to be a powerful instrument for long-term planning, combining the concepts of strategy and foresight, relying on a diversity of methods and techniques and, above all, having flexibility and resilience in its application, which enabled it to be adapted to the specific needs of each study.
- The principle of participation generating commitment and the use of methods that rely simultaneously on evidence, creativity, expertise and interaction, bestowed methodological robustness on the process and provided quality to the results.
- Changing mind-sets have helped to create a daring but not unrealistic vision—transforming Brazil through innovation—to motivate people and align efforts.

6. Lessons learned and main conclusions

The items briefly discussed here summarize the main lesson learned, taking into consideration the three types of decision-makers normally involved in these activities: government, private sector, and academia. It is important to comment in this paper that the lessons learned and conclusions are strictly related to the Brazilian environment and reality. The present authors hope to expand this experience to other cultures, societies and realities.

These three types differ in the following aspects:

- Preparation and delivery timing:
  - Government: the sense of timing is related to political opportunities which arise to create initiatives and projects in the course of a given government mandate. The main challenge is to introduce long-term perception and analysis to foster strategic foresight of interest to the state more than a given government structure.
  - Private sector: the sense of timing is driven by increased competition in the internal and external markets, requiring immediate solutions to the problems identified, a long-term vision not being the norm. Competitive intelligence approaches produce better engagement than strategic foresight. Private sector stakeholders tend to become very active when precompetitive technological programs reach government decision-making at high levels.
  - Academia: representatives from universities and research institutions tend to impose barriers to accepting strategic foresight activities. Time is usually not a problem and all governance levels are to be considered and respected. Methodological approaches are to be consistent with scientific standards to attract participation and provide for stable engagement with academic stakeholders.
- Foresight exercises are usually exposed to some dangerous pitfalls throughout their development. It is important to note, in order to avoid such situations, that:
  - Government representatives frequently start making decisions before interpreting the material which was obtained in the first phase of the exercise (information and data gathering), as discussed before.
  - Private sector executives may have trouble thinking beyond their business. Foresight exercises and innovation strategies are interconnected and it is important to stress the possible influence and impacts from other business segments.
  - Academics often find it difficult to think beyond their disciplinary structures. Due to a long disciplinary tradition of research and learning in the academic world, huge efforts of mind-set revision and transformation are needed, when foresight exercises and innovation strategies are applied to new future possibilities in academia.

Some of the intangible gains must be highlighted, regarding what is envisaged in the literature (European Commission 2011):

- The creation, expansion, mobilization and maintenance of networks, are often considered as important as the tangible results, such as reports or recommendations.
- More important than consensus on future challenges—not always possible—is the shared sense of commitment to a desirable future established by different stakeholders.
- Changes in attitudes and mind-sets helps people think about long-term issues and be better prepared to face the challenges ahead.
- The establishment of a foresight culture within organizations or industries, which could result in a better decision-making process.

Note

1. CGEE's website Delphi and survey tool allows for gathering experts' opinion using questionnaires tailored to the investigation of both broad and narrow topic domains. It allows for quickly building surveys with an easy-to-use interface, customizable themes, and flexible options. Moreover, it collects responses with a web link and an email invitation. It is possible to see results in real-time, filter by question or respondent, and export the data. Available at <www.cgee.org.br>.

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