FORESIGHT: A DECISION-MAKING TOOL TO INCREASE NATIONAL COMPETITIVENESS

PROSPECTIVA: UNA HERRAMIENTA PARA LA TOMA DE DECISIONES PARA AUMENTAR LA COMPETITIVIDAD NACIONAL

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Abstract

This paper is concerned with the misunderstanding of the foresight concept and some foresight process approaches. It also deals with the application and evolution of foresight in the world particularly in Colombia.

It sets out to develop a theoretical framework about the concept of foresight to understand its complexity due to diverse perspectives and undefined extents. Then, several foresight process models are introduced to determine current frameworks of application in order to make subsequent comparisons. Later, it is presented an overview of foresight activities around the world which evidences the long tradition and impact accomplished in competitiveness to a firm, industry and national extent. Also, the Colombian case is described to give some insight on foresight work carried out in the country.

As a result, this conceptual framework was set for future research in order to reveal nuances, implications and extents of the concept itself. In addition, a foresight process model is proposed to integrate several foresight processes stated by some authors. It is also presented the milestones of foresight work undertaken in Colombia to suggest actions in order to promote future foresight activities.

Finally, it is recommended to define the scope of the discipline to assess the current body of knowledge and focus on research to hone approaches and tools so that decision-making is integral and accurate. Also, it is fundamental to consider foresight as a tool to increase firms, industry and national competitiveness and structure more Foresight Programs in Colombia which yield long-term sustainable solutions.

Keywords: foresight, concept, process, models, framework, decision-making.

Resumen

Este artículo trata la incomprensión del concepto de prospectiva y algunos enfoques del proceso prospectivo. También contempla el tema de la aplicación y la evolución de la prospectiva en el mundo y particularmente en Colombia.

Inicialmente se desarrolla un marco teórico sobre el concepto de prospectiva para entender su complejidad debido a diversas perspectivas y alcances que aún no han sido definidos. Luego se introducen varios modelos de procesos prospectivos para determinar los marcos actuales de aplicación con el fin de realizar posteriores comparaciones. Más adelante se presenta un panorama general de actividades prospectivas en el mundo para poner en evidencia la larga tradición y el impacto logrado en la competitividad al nivel empresarial, industrial y nacional. Además, el caso colombiano es descrito para ofrecer una perspectiva sobre el trabajo prospectivo llevado a cabo en el país.

Como resultado se establece un marco conceptual para efectuar investigaciones futuras con el fin de revelar los matices, las implicaciones y alcances del concepto mismo. Por otro lado, se propone un modelo de proceso prospectivo que integra a su vez varios procesos de prospectiva planteados por algunos autores. También son presentados los hitos del trabajo prospectivo realizado en Colombia con el fin de sugerir acciones que promuevan futuras actividades en el tema.

Finalmente se recomienda definir el alcance de la disciplina para evaluar el actual corpus de

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conocimientos, y centrarse en la investigación para mejorar tanto métodos como herramientas que permitan realizar procesos de toma de decisiones integrales y precisas. También es fundamental considerar a la prospectiva como una herramienta que puede aumentar la competitividad en las empresas, la industria y el país, también planteándose la necesidad de estructurar más programas de prospectiva en Colombia que produzcan soluciones sostenibles a largo plazo.

Palabras clave: Prospectiva, concepto, proceso, modelos, marco, toma de decisión.

Introduction

This article is intended to depict the current state of foresight studies. At the outset, many definitions of foresight are presented along with the history in order to give a background which will provide a perspective of its multiplicity and complexity.

Later, the foresight process is introduced by describing several authors’ proposals to show how foresight application was envisioned in the past. In addition, a model is developed attempting to integrate these previous models so as to find application patterns and relationships between different authors’ proposals. A journey around the world is undertaken to observe the development of foresight work in the countries where these studies were completed.

Then, the Colombian case is shown in depth to observe how foresight work has been managed since foresight was considered within science and technology policies. Therefore, the current situation of foresight in Colombia will present the fundamentals of the discipline and its former applications.

In terms of the process, a six-month technology surveillance exercise was carried out to collect information about foresight and cases of its application in several countries specifically in Colombia.

This work does not attempt to be an exhaustive study in technology foresight but to establish a baseline for future studies in Colombia. The emphasis will be, therefore, to present the dimensions of foresight and the effects achieved by other countries in the generation of value in social, political, economic and cultural spheres through its adoption.

A discipline with multiple definitions

Foresight is a discipline dealing with one of the most ancient desires of mankind: trying to know the future (Pereda 1995; Horton 1999; Edward Major 2001), therefore, it has undergone constant development due to several interpretations (Georghiou 2008; Sardar 2009), and meanings given throughout its history (Georghiou 2008; Reger 2001; Castellanos 2007; Sardar 2009; Hideg 2007; Ughetto 2007; Slaughter 2008; Amsteus 2007; Voros 2006).

Thus, most definitions stated so far will be considered so as to provide a wider perspective of the area and show its evolution and enrichment with time. Likewise, the perception of future and its integral construction will be discussed by means of inclusion of more tools (Stevenson 2001; Bishop 2007), specially scenarios (Robert Phaal 2003; Bishop 2007; Stevenson 2001; Lewis 1994), and other stakeholders (Cabezas. 2008).

The first notion of the term dates back to 1907 when Gilfillan suggested the term Melantology as the study of future civilizations (Cabezas. 2008). However, in 1932 H.G. Wells used it first when he called for Professors of Foresight to assert the necessity of people in charge of estimating future consequences of new inventions and devices (Georghiou 2008; Sardar 2009).

In 1957, Gaston Berger created the term prospective to denote the anticipation to lighten the present action. Later in 1966, Ossip Flechtheim introduced first the term ‘futurology’ as a branch of sociology called ‘historical sociology’ (Sardar 2009). In turn, Bertrand de Jouvenel proposed the term futuribles disagreeing with Flechtheim (Cabezas. 2008). Dator contributed to stating a Law of Futures (Sardar 2009). Then in 1967, Daniel Bell uses the voice “prognosis” supported in 1971 by Fred Polak (Cabezas. 2008).

After Slaughter proposed in 1995: “The simplest possible definition [of foresight] is: opening to the future with every means at our disposal, developing views of future options, and then choosing between them”. On the other hand, Horton defined “Foresight as the process of developing a range of views of possible ways in which the future could develop, and understanding these sufficiently well to be able to decide what decisions can be taken today to create the best possible tomorrow” (Horton 1999).
Joseph Coates in 1985 added the long-term time dimension by defining foresight as “a process by which one comes to fuller understanding of shaping the long-term future which should be taken into account in policy, planning and decision-making, and it includes qualitative and quantitative means for monitoring clues and indicators of evolving trends and developments” (Georghiou 2008). Hence, technology foresight is considered “a process rather than a set of techniques”, (Jin 2003) where technology foresight (or foresight) represents the processes focusing on the interaction between science, technology and society (Jeong 2007), taking into account other stakeholders as well.

Foresight has been described as “regard or provision for the future” by Anderson in 1997, and “an act of looking forward; a view forward”, “images of the future” by Slaughter in 1996 and Irvine and Martin in 1984. Then, Voros retakes the concept and labels it “prospection” (Voros 2003; Voros 2006).

“Technology Foresight is a process which seeks to look into the long term future of science, technology and economy and society with the aim of identifying the areas of strategic research and the emerging generic (new) technologies likely to yield the greatest economic and social benefit.” (Jin 2003). According to Anderson (1997), foresight is about shaping the future through the collective action of interested groups (Armsteus 2007). Foresight is usually seen as a participative method, gathering different kinds of actors in the process of building shared visions on long-term challenges (Ughetto 2007).

Since 1975, several names such as: future analysis, futurics field, probabilistic forward studies, future planning, futurography, antrospectrunity, projective research, short and long range planning, projections, predictive studies, futury, alternative analysis, options analysis, decision option analysis, futurist or futuristic studies, were adopted before the term foresight (Cabezas. 2008).

Historically, the term “forecasting” has sometimes been used to mean any form of “castig forward” to create views of the future, such as, for example, by Glenn or Coates in 1999. The term “prospection” has been preferred here for such “casting forward” (Voros 2006). However, the concept of forecasting changed from technology forecasting to technology foresight (Jin 2003). Since then, technology forecasting activities shifted to activities called “outlooks”, “foresight”, “issue management”, “strategic thinking” and so on (Jin 2003).

From another point of view, foresight -as strategic thinking- (Ratcliffe 2006) is concerned with exploration of options which is an input into strategy-making, which then directs strategic planning and action (Voros 2003). In turn, Pereda’s definition is stated as a process more oriented to achieving industrial and commercial objectives (Pereda 1995).

“Foresight is a systematic, participatory, future intelligence gathering and medium-to-long-term vision-building process aimed at present-day decisions and mobilizing joint actions.” (François Farhi 2001). Foresight involves bringing together key agents of change and sources of knowledge, in order to develop strategic visions and anticipatory intelligence. (Hideg 2007; Georghiou 2008).

According to a study done by the European Commission: "Foresight should be understood as a participatory, future intelligence gathering and medium-to-long-term vision-building process that systematically attempts to look into the future of science, the economy and society in order to support present-day decision-making and to mobilize joint forces to realize them”.

Since the 90s, because of National Program of Foresight in England (Cabezas. 2008), the term started to be used massively to rename activities such as forecasting, scanning, strategy analysis or prospective. (Georghiou 2008). Although its translation into French and Spanish is “prospection”, it is better to use the word “prospection” in Spanish inasmuch as the first term has not been yet assimilated by academics (Cabezas. 2008).

Multiple application frameworks: The Foresight process

Although nowadays there has been an apparent consensus on the term, the framework to apply foresight has been described differently in some models as well. (Miles 2002; Reger 2001; Horton 1999; Ratcliffe 2006).

Horton developed a broad three-phase framework which was retaken by other authors afterwards. The first phase consists of the collection, collation and summarization of available information and results in the production of foresight knowledge. Then, phase two comprises the translation and interpretation of this knowledge to produce an understanding of its implications for the future.
from a corporate point of view. Finally, phase three refers to the assimilation and evaluation of this understanding to produce a commitment to action (Horton 1999).

Another model is proposed by Miles who defined it as a systematic process with five interconnected and complementary phases: Pre – Foresight, Recruitment, Generation, Action and Renewal (R. Popper 2008).

In brief, the pre-foresight phase refers to determining the limits of the exercise. The recruitment phase has to do with engaging key people so that they contribute with their knowledge and expertise on an issue. The Generation phase refers to producing knowledge jointly in order to create possibilities, futures. The Action phase is concerned with implementing conceived ideas of future and linking them to strategic plans. Finally, the Renewal phase comprises the identification of opportunities and threats during the process and the results as well as creating feedback on the exercise (R. Popper 2008).

Guido Reger (Reger 2001), proposed an organizational-oriented model (Boutellier 2008) stemmed from a series of interviews to some companies. It is performed at corporate, business units and virtual structures levels.

This model (Reger 2001) divides activities more specifically than the previous models because the first step is performed in the pre-foresight phase, steps 2 and 3 encompass the recruitment phase although Reger added a foresight tool choice dimension and the sources to make research which is not considered in Miles’ model. The fourth step corresponds to the generation phase but here it is limited to data analysis while the action phase is performed through step five, six and seven though the last step shares activities performed in Miles’ renewal phase.

Additionally, Voros in 2008 presented a model based on Horton’s (1999) broad three-stage process, Mintzberg’s distinction ideas on strategy and Slaughter’s suggestions on methodologicals.

Basically, there is an input stage where defined information is gathered as done in Miles’ Preforesight phase and Reger’s steps 1, 2 and 3. Foresight stage comprises three broad steps: “Analysis” where information is refined, then “interpretation” refers to going deeper in structure and insights and finally “prospection” means the act of creating future views.

This subset of steps is contained in Miles’ Generation phase and Reger’s fourth step. The outputs stage refers to the exercise results and the thinking changes to support decision-making. It is also represented in Miles’ Action phase and Reger’s steps 5 and 6.

Finally, the strategy stage deals with leading strategic actions to accomplish changes. It also takes into account feedback activities to perform ongoing adjustments. Therefore, Miles’ Action and Renewal phases represent similar actions whilst Reger’s seventh step is included.

The French approach was described by Godet as a model oriented to future construction (Mojica 2005; Ratcliffe 2006) using a structured method based on scenario-software as follows (Saritas 2009): At the outset, MICMAC determines key variables, then MACTOR identifies trends and stakeholders’ strategies, after morphological analysis and Delphi filter out unlikely scenarios and finally SMIC and MULTIPOD yield and assess future options.

This model performs continuously Miles’ model except for the renewal stage because every step in Godet’s is finished and that output becomes the input to the next step. For instance, after performing MICMAC MACTOR is usually performed. The situation is similar in Voros’ proposal since Godet’s model develops the sequence Inputs-Foresight-Outputs in every step.

The cycle loops until scenarios are assessed to make decisions at the strategic level. In Reger’s model, the the first 5 steps are executed but steps 6 and 7 are performed until the last process in Godet’s model is finished. However, some steps of the process might be performed independently since not all steps are mandatory.

These models have been widely used depending on the context, despite; their individual limitations which may produce limited results. Thus, a five-phase integrated model is presented to meet stakeholders’ needs integrally. The phases are: Scope exercise, Execute exercise, Assess outputs, Implementation and Feedback.

The scope stage consists of determining the scope of the study. It is concerned with limiting the extents of the problem managing variables such as time horizon, domain, territorial scale, stakeholders, foresight tools, data features, information sources and data collection. The execute exercise stage comprises performing the foresight exercise with the tools, stakeholders and features previously
defined. Here, future views are built by executing any foresight tool.

Then, the assess outputs stage is concerned with interpreting and filtering the results of the exercise. Besides, some recommendations, guidelines and decisions are prepared in order to be communicated to the stakeholders. This stage was kept aside because it is better to appraise the exercise results before implementation so as to avoid misconceptions and inappropriate execution of suggestions.

Later, the implementation stage deals with transferring the knowledge and results to the strategy of the firm, sector, industry or country. It implies to incorporate the filtered and useful outputs in order to make decisions which add value to their current activities, processes, goods or services. Finally, the feedback stage has to do with identifying actions to improve during future exercises. It is important to keep track of the performance to make suggestions on guidelines to follow in order to avoid inaccuracies and little impact in decision-making recommendations. This stage is also performed throughout the stages to make corrections so that the whole process is consistent and value-adding.

**Foresight work in the world**

Foresight activities have been performed to a great or lesser extent in different countries and regions around the world. This usual practice has meant a development of experience by applying and honing concepts, processes and tools of foresight (Bishop 2007). Therefore, the main countries and their foresight practices will be identified so as to determine the best practices.

The first notions of foresight date back to the ending of the First World War where Europe and America shifted their attention to domestic economic development (Jin 2003). Much of the pioneering work in technology foresight in the industry and at national level was done in the USA (especially in the defense sector) in the 1950s and 1960s (Reger 2001; Boutellier 2008). Then, Japan at the end of 1960s started to apply forecasting methods and since then they conducted Delphis once every five years for over 30 years (Jin 2003).

However, foresight boomed in the 1990s because of many national foresight programs specially United Kingdom’s (Jin 2003). Since then, foresight became part of strategic management and decision making at all levels (Boutellier 2008) being aware of the results obtained in other countries (May 2009).

United States is foresight pioneer due to its long tradition in paying attention to the competitiveness of markets. Foresight has always been linked to science and technology as an engine to enhance industrial productivity. The most important endeavors in performing foresight work are associated with research for determining defense technologies (1989) to maintain the country’s superiority in the area. In addition, studies on critical emerging technologies (1990), informatics technologies, aerospace industry critical technologies (1987) and specific technologies for nine industrial sectors with a time horizon of ten years have been carried out (Rodríguez 2000). As it is noticed, their main goal is not to establish a Science and Technology System but to review critical technologies so as to maintain the country’s place as a top economy (Rodríguez 2000; Pereda 1995).

In Japan foresight work has been carried out in long-term time horizons and lead by government institutions. The first exercise was performed in 1971 with a 30-year time horizon wherein 13 former areas were determined. Then, subsequent exercises widened the list of important critical technologies to include topics such as materials, science of life, environment, transportation and communications, among others. Japanese studies have considered many experts’ experience from industry, academy and government (Pereda 1995; Rodríguez 2000) and are carried out not only in the economical side but social to try to shed lights on problems such as population aging (Rodríguez 2000; Mojica 2005).

The United Kingdom performed these exercises to give solutions to situations such as market competitiveness, high laborer costs, innovation based on knowledge and pressures on the health and security systems due to the population aging (Rodríguez 2000). In 1993, UK performed their first national foresight exercise with a market orientation where key technologies to make future research were considered in a planned time horizon of 15 years. Some of the technologies identified in this first exercise were: environment, communications, energy, information technology, education, defense and chemical products, among others (Pereda 1995). A second exercise was undertaken in 1999 primarily consulting documentation on internet and regional workshops rather than the Delphi technique.
France has a long tradition in foresight which dates back to post war. However, the practices were taken up again in the 90s thanks to the international boom and previous works made by authors such as Berger with the foundation of “Prospective Studies” in the 1950s; through the work of Jouvenel and Godet (Hideg 2007; May 2009; Ratcliffe 2006).

Foresight efforts have been aimed at identifying critical technologies which provide competitive advantages in addition to knowing the current position of the country with the key technologies identified.

Europe has developed and encouraged foresight at a national, regional and local extent through the development of joint projects and different monitoring and research institutions such as the European Foresight Monitoring Network. This network has monitored ongoing and emerging foresight activities. For instance, the EFMN website listed 1,916 foresight initiatives, 160 briefs and 124 other documents in April 2009 (May 2009).

Foresight has become so important for the European Union (EU) that it is already established in its institutional structure. The Institute for Prospective Technological Studies based in Seville, among the eight joint research institutes, leads foresight issues in EU focusing on energy through fusion, transportation (high speed trains) and environment (May 2009; Pereda 1995). Additionally, European countries such as Germany, Austria, Spain, Holland, Hungary, Ireland, Italy and other countries such as Australia, New Zealand and Korea have done important foresight work as well.

In Latin America some foresight exercises have been carried out especially during the 1980s and 1990s with the support of international institutions (Rodríguez 2000). Nonetheless, these efforts have been characterized as isolated, bureaucratized and disregarding of the decision-making of policies in science, technology and innovation. After 1990, the endeavors have been aimed at generating integral national plans oriented to establishing innovation systems in the Latin American countries (Rodríguez 2000). Some foresight work has been performed in Brasil, Venezuela, Chile, Peru and Argentina, among others (M.K.a.R. Popper 2008).

Foresight in Colombia

Colombia has had a significant development of foresight work in Latin America. According to a study carried out by Raffael Popper in 2008 (M.K.a.R. Popper 2008), Colombia has performed 35 foresight exercises which place us in second place in the region (Rodríguez 2000). Nevertheless, in the last year the foresight work rate has increased up to 80 exercises in the areas of territory, education, conflict and economic development (Vásquez 2008).

The former studies were performed in the eighties and the beginning of nineties. Most of these studies were not science and technology oriented but they were useful to develop further studies.

At a national extent, Colciencias launched the National Programme of Prospective in 1986 and the “Misión de sabios” in 1993-1994 jointly with the Presidency of the Republic to define some guidelines in terms of science, technology and education. Then in 2005 the ICFES and ICETEX conducted a study to determine needs for education in human resources (Rodríguez 2000; Vásquez 1997).

There have been departmental efforts such as Proantioquia (1986), La Cali que queremos (1988), Colombia siglo XXI, Risaralda siglo XXI, Caldas siglo XXI, Agroindustrial Project Tolima Future 2010 and Project of prospective of West Colombia which attempted to create future views about potential activities which provide them with departmental competitiveness (Rodríguez 2000; Vásquez 1997).

Later, in 1996-1997 a study was performed with Colciencias to determine eleven science and technology programs and four strategies to develop them. In 1997, the CICS program was launched by Colciencias to identify trends and future scenarios in every science area and application. Then in 1998, a project called “Grupo Destino Colombia-Hacia el Nuevo Milenio”, was carried out to design scenarios about peace in the country. Other studies on foresight thinking are: ¿Para dónde va Colombia: un coloquio abierto?, developed since 1997 (Rodriguez 2000; Vásquez 1997).

Between 1994 and 1998 National Policies in Science and Technology were integrated in sectors of national life in order to improve quality life of Colombian inhabitants and increase competitiveness in the industrial sector. In addition, a program to develop technological capabilities was developed between 1996 and 1998 where several national and international institutions got involved. In 1999, the Observatory in Science and Technology was created to support the dynamics of science, technology and innovation through rates
which orient and evaluate national policies (Rodríguez 2000).

Foresight work has continued in 2002 by performing the first cycle of National Foresight Program (Vásquez 2008; Vásquez 2006) mainly with Delphi and the second cycle in 2005 (Georghiou 2008; Vásquez 2008). In the first foresight cycle, efforts were oriented to developing national skills on foresight and strengthening research capabilities by training experts, making exercises and promoting the results around the country. In addition, in the second cycle strategic sectors were identified to foster decision processes at national, regional and industry levels (Vásquez 2008; Vásquez 2006; Vásquez 1997).

**Final Remarks**

This article presented an overview of the concept of foresight attempting to gather the core of the discipline through the articulation of previous definitions. It was shown how foresight evolved from a general discipline to a more interactive and decision-oriented process. However, some additional effort is still required to determine the extents of the discipline for further and focused research which will increase tools, process efficiency and accuracy in results.

After 40 years of foresight activity around the world (Slaughter 2008), some widely acknowledged features of foresight have emerged to establish guidelines for researchers and practitioners of the field. First of all, foresight is acknowledged as a participative process linked to technology aimed at building future views. Then, it is fundamental to consider foresight as a process related to experts’ knowledge, although other stakeholders have been progressively involved as well (Vásquez 2008; Cabezas. 2008). Furthermore, it allows making decisions in a medium and long term time horizon to a local, national and regional extent (S. S. Li 2009). However, recently it has been used in organizational and industrial settings in order to determine key success factors which increase effectiveness in the organization’s activities (Reger 2001).

It is observed that foresight offers the possibility to step forward into the future by anticipating to potential situations that might have an impact on organizations, countries or regions. Therefore, it has taken an important role in business analysis (Ratcliffe 2006) and countries’ policy definition because it sheds lights on situations where uncertainty reigns and deterministic decisions are no longer assuring sustainability or success. It also allows all the variables affecting a system to be considered so that stated solutions are integral and benefit all the stakeholders.

Consequently, common mistakes when dealing with problems are avoided, for instance: problem misinterpretation, limited extent of the solution, inability to consider other alternatives and randomness in decision-making because of uncertainty and lack of foundations. Likewise, it is expected that the proposed foresight process model provides a common framework in foresight work which is evidently subjected to the context and changing environments.

On the other hand, the history of foresight in several countries has given an overview of the potential that Colombia can develop if additional efforts are made to support based decisions in firms, industries and national settings.

Although, the 2003 and 2005 cycles (Vásquez 2006) were a stepping stone to define founded and appraised solutions they were not thoroughly aimed at identifying key technologies to make the country competitive to an industrial and national extent.

Therefore, it is recommended to undertake foresight programs intended to identify key technologies so that the country might orient efforts to turn potential opportunities into competitive advantages.

This approach has been observed in foresight-experienced countries such as Japan, which has developed foresight work every five years for a span of thirty years (Rodríguez 2000; Mojica 2005), enabling them to adjust their science and technology policies according to the needs and changes of the environment. It has also allowed them to fund specialized research programs and keep track of current developments aligned with recent and future technologies, processes or products. Moreover, Chile has focused its foresight work on the identification of key activities and technologies to increase its future development (Mojica 2005).

It is also required that the role of Colciencias in conducting future foresight work in Colombia be strengthened and redefined. It might be better to create an independent office within Colciencias in charge of managing foresight work permanently so as to keep track of current technological developments and provide feedback for later
adjustments to science and technology policies. Some examples are found in Japan, for instance the National Institute of Science and Technology Policy, and in England.

In fact, it is important to integrate stakeholders from industry, government and academy (Ughetto 2007) in order to achieve high-impact and sustainable solutions through joint actions that benefit all stakeholders involved. Indeed, it would promote long-lasting relationships committed to the development and care of the country’s interests.

Although foresight does not provide exact answers to predict the future it will definitely enable firms, industries and countries to select a desired future and to pursue it.

In Colombia, it might be a powerful tool to head into the future with our current problems and weaknesses but without ruling out our strengths and opportunities for the future.

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