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## Production Chains 2016 - The Brazilian Technology Foresight Programme Foresight Brief No. 15

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**Sponsors:** The Brazilian Ministry of Development, Industry and Trade (MDIC)  
The United Nations Industrial Development Organisation (UNIDO)  
**Type:** A national technology foresight programme focused on the future of production chains in four key industry sectors: Construction, Textiles & Garments, Plastics, Wood and Furniture.  
**Organizer:** The MDIC of Brazil - Ministry of Development, Industry and Trade. Contact Carlos Manuel Pedroso Neves Cristo at [Carlos.Cristo@desenvolvimento.gov.br](mailto:Carlos.Cristo@desenvolvimento.gov.br)  
UNIDO – The United Nations Industrial Development Organisation. Contact Ricardo Seidl da Fonseca at [R.Seidl-da-Fonseca@unido.org](mailto:R.Seidl-da-Fonseca@unido.org)  
**Duration:** **Phase 1:** 1999-2003 **Budget:** €245,000 **Time Horizon:** 2016  
**Phase 2:** 2004 +

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### Context

The main objectives of the Brazilian Technology Foresight Programme or BTFP are to increase the competitiveness of economic stakeholders in specific industry sectors and to provide relevant information to public sector actors involved in the formulation of technology policy. The first phase of the BTFP focused on production chains in four key industry sectors – construction, textiles and garments, plastics, wood and furniture. This work is now finished and dissemination has begun. The initiative is notable for its use of methods to understand the structure of production chains, critical performance factors for the future and emerging key technologies.

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### A Mezzo-Economic Perspective

In 1999 the Brazilian government launched two initiatives to support national long-term STI<sup>1</sup> planning. The first initiative - PROSPECTAR, was established by the Ministry of Science and Technology. It examined macro-level STI issues in order to detect important technological trends and inform government and industry of their possible impact. The second initiative and the subject of this brief, is the Brazilian Technology Foresight Programme or BTFP. It is located in the MDIC - Ministry of Development, Industry and Trade. It is a more pragmatic programme, focused on productive chains in key industrial sectors of the country. The first phase of the BTFP

focused on four main sectors of importance for the Brazilian economy - construction, textiles & garment manufacture, plastics, wood and furniture. These sectors were selected on the basis of input from the Brazilian Forum for Competitiveness – Avança Brasil – on the basis of their potential contribution to employment, wealth creation, export growth as well as technological & regional development. Work on the wood and furniture sector is not yet completed and so this brief deals mainly with the first 3 sectors. The application of foresight to production chains in a sector involves:

- Describing the production chain,
- Analyzing its institutional and organizational environment,
- Identifying the needs and aspirations of the production chain partners,

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<sup>1</sup> Science, Technology and Innovation



- Analyzing their performance and identifying critical factors,
- Forecasting the behavior of critical factors and visualizing the future performance.

This method comprises two main elements:

- **Diagnostic** tools that consist of desk research and interviews with key stakeholders such as industrialists, researchers, government officials, and individuals involved in the various segments of the production chain,
- **Prognostic** tools that consist of a flexible combination of various foresight techniques.

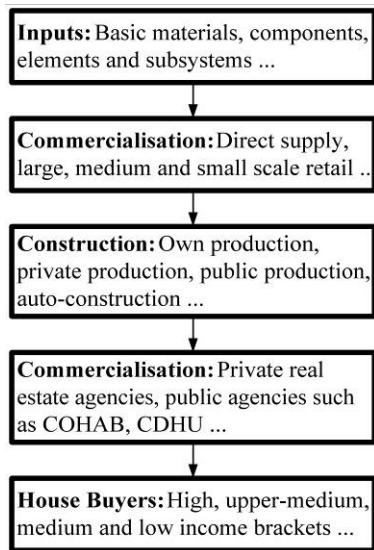
Although each sectoral exercise employed the Delphi method each adopted its own mixture of support methods.

Sector	Support Methods
Construction	Critical Factor Analysis Scenario Analysis
Textiles and Garments	Brainstorming Critical Factor Analysis Cross-impact analysis Key Technology Analysis Scenario Analysis
Plastics	Brainstorming Critical Factor Analysis
Wood and Furniture	Critical Factor Analysis Scenario Analysis

## Foresight on Production Chains

### Construction

The construction exercise focused on the development and commercialization of urban housing. The production chain was considered as being comprised of five main segments:



### Critical Factors

A total of 61 critical factors were identified across the 5 segments of this production chain. These were analysed using 4 basic performance criteria - competitiveness, efficiency, quality and equity. The results fall naturally into three main clusters:

**Factors related to accessibility:** Availability of financial resources, availability of land, informal development, support for self-construction, regulation & coordination and the housing deficit. The critical factors related to housing accessibility are mainly linked to the criteria of equity. However some such

as informal development and support for self-construction are associated to quality and sustainability. Actions to improve accessibility mainly belong to the politico-institutional environment of the production chain, for example in the field of housing policy, funding, regulation and the coordination of urban policies.

**Factors related to Quality of Housing:** Quality of housing materials, technical standards, organizational and institutional support for quality, knowledge of consumers' needs and conformance of components and materials to standards. Critical factors linked to quality mainly depend on the institutional and organisational environment of the production chain - technical standards, compliance, knowledge of consumer needs and the dissemination of quality programmes.

**Technology and Management Factors:** Project Management, barriers to technology adoption, productivity, loss and waste, construction costs and research. These critical factors are mainly linked to criteria for efficiency and competitiveness.

### Prospects for the future

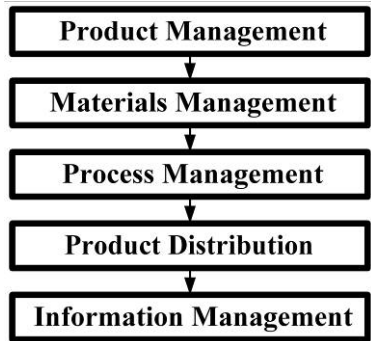
**Techno-economic Prospects:** An increase in the market for components and prefabricated products is anticipated however little progress can be seen for the moment. There is a need for cultural change. The uneven distribution of income makes progress difficult. Contractors make so little profit that they have no resources for training and capacity building.

**Socio-political Prospects:** The housing deficit and the growth of the informal construction sector have a strong influence on housing quality standards. Governmental regulation and new institutional support such as the creation of a National Certification System are needed to create more competitive, efficient, and equitable environment in the housing sector.

**Sectoral Prospects:** By 2013 the Brazilian housing sector will still be dominated by the use of traditional processes such as asphalt membranes (sistemas moldados in loco) and conventional materials. It is expected that the use of light prefabricated materials and metal structures will increase moderately.

## Textile and Garment Manufacturing

The production chain for this sector is described as follows:



### Critical Factors

Many internal, external and technological factors were identified. These cluster into as follows:

**Product Management:** Research on fashion, new materials, new markets, and product development.

**Materials Management:** The acquisition of materials, selection and development of suppliers, and quality control.

**Process Management:** The qualification of human resources, plant acquisition and utilization, profits management, planning and control, prototyping, modeling and risk management.

**Product Distribution:** Sales.

**Information Management:** Information systems controlling productive processes and product development.

### Future Prospects

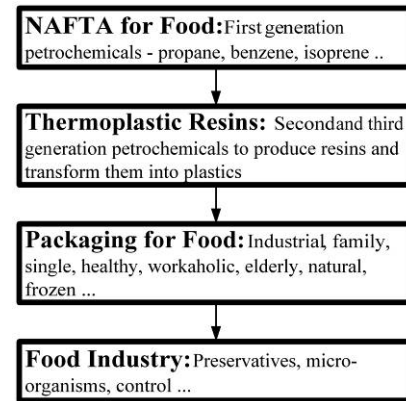
**Techno-Economic Prospects:** Increasing diversity of the global market will force suppliers to update traditional production skills. The promotion of free-trade areas will also reinforce competitiveness in the sector. Key future technologies include technologies compatible with CPTV, virtual clothing and 3D modelling systems, virtual reality, microelectronics, Microsystems, robotics, electro-optical components, Internet based integrated services, nanotechnology, fast prototyping, and marketing based on information technologies.

**Socio-political Prospects:** By 2013 there will be a polarisation of interests between countries dedicated to managing processes and those dedicated to executing processes (conception vs. implementation), an intensification of environment related trade barriers and further concentration of production in developing countries.

**Sectoral Prospects:** Increased internal demand will generate adaptations and new services customised to both individuals and cultural groups. Increased use of fibers based on PTT for differentiated, technologically sophisticated products as well as micro-fibers. Synthetic fibers will dominate the market.

## The Transformation of Plastics

This exercise focused on production chains for plastic packing used in food. These were modeled as follows:



### Critical Factors

An analysis of the sector discussed critical factors relating to competitiveness, productivity, infrastructure, employment, important dependency, export capacity, employment and the environment. These included access to raw materials, efficiency, quality and security, the availability of equipment, selling channels, size of enterprise, available capacity, potential capacity, business concentration, work-place supply as well as recycling and clean technologies. Future behavior of these critical factors was analyzed on the basis of an understanding of forces that would influence the future of food related plastic packing.

F01	Price of raw materials
F02	US Dollar parity
F03	International trade rules
F04	Scale of Production
F05	Production Chain Integration
F06	Company mergers and acquisitions
F07	Product substitution
F08	Product availability
F09	Adequacy of funding
F10	New consumer markets
F11	Type of packaging
F12	Fiscal incentives
F13	Diversity of consumer profile
F14	Number of producers
F15	Innovation
F16	Packaging in the food industry
F17	The tagging of packages
F18	The creation of clusters and cooperatives
F19	Informal sector
F20	Type of food
F21	Model separating centrals & refineries

The results are summarized in the following diagram:

Critical Factors	Enabling Forces	Hampering Forces
Access to raw materials	F02, F05, F06, F10, F11, F12, F14, F16, F18	F01, F03, F04, F09, F17, F19
Efficiency, quality and security	F08, F16, F18	F04, F17, F19
Equipment availability	F10, F11, F15, F18	F09
Selling channels and size of enterprise	F02, F04, F10, F11, F12, F15	F09
Available and potential capacity (import dependency)	F10	F02, F03, F18
Export capacity	F02, F10, F12, F15	F01, F03
Business concentration	F05, F06, F14	F19
Work-place supply	F14, F16	F12, F19
Recycling & clean technologies	F15	F19

## Prospects for the Future

**Techno-economic Prospects:** By 2013 there will be more development and acquisition of technology oriented towards the substitution of imports. Substitution of NAFTA depends on the government's natural gas initiatives. There will be further concentration in the sector due to mergers and acquisitions. The main challenge is competitiveness.

**Socio-political Prospects:** The consensus is that the 'Zero Hunger' programme of the current government will have a positive impact on the sector. This could lead to support and strategic alliances that will reduce the effects of hampering forces in some segments.

**Sectoral Prospects:** Plastics will not be substituted by 2013. Plastic packaging for carbonated beverages and mineral water will dominate the market - where PET is the most used resin and blowing is the most applied process. Although there is a general agreement that supermarkets will maintain their role as main distributors, both private and public sector believe that small retailers will continue to play a role in the sector. Only the public sector has the optimistic view that NAFTA prices will remain the same in 2013.

## Building Strategic Alliances

Foresight applied to production chains offers a fascinating framework for understanding the real complexity of long-term planning on issues concerning a large variety of interdependent stakeholders. The identification of critical factors for each segment of the production chain provides information that is extremely useful for those involved in policy development both from the industrial and public sectors. The development of visions shared by civil society as well as the public, private and academic sectors can result in the creation of unre-

alistic pictures or images of the future with little scope for coordinating joint actions and policies.

Foresight on production chains by no means guarantee that the outcomes of exercises will be easier to implement – this is a challenge faced in equal conditions by any activity aimed at the improvement or modification of the status quo. However it does help to establish a basis for building strategic alliances, strengthening institutional and organisational links and developing visions that take account of a broad set of stakeholder needs and aspirations.

## Sources and References

The Brazilian Technology Foresight Programme Website: <http://www.desenvolvimento.gov.br/sitio/sti/proAcao/proTecnologica/>

The Brazilian Science and Technology Foresight Programme (Prospectar) Website: <http://www.mct.gov.br/cct/prospectar/98-1015>.

GOMES DE CASTRO, Antonio Maria, VALLE LIMA, Suzana Maria and PEDROSO NEVES CRISTO, Carlos Manoel. Production chain: A conceptual frame for supporting technological prospection. Espacios, 2002, vol.23, no.2, p.31-56. ISSN 07

**About the EFMN:** Policy Professionals dealing with RTD, Innovation and Economic Development increasingly recognize a need to base decisions on broadly based participative processes of deliberation and consultation with stakeholders. One of the most important tools they apply is FORESIGHT. The EFMN or European Foresight Monitoring Network supports policy professionals by monitoring and analyzing Foresight activities in the European Union, its neighbours and the world. The EFMN helps those involved in policy development to stay up to date on current practice in Foresight. It helps them to tap into a network of know-how and experience on issues related to the day to day design, management and execution of Foresight and Foresight related processes.