

7. VOCATIONAL TRAINING INSTITUTIONS AT THE SERVICE OF THE PRODUCTIVE NETWORKS

Three examples of good practices

Considering the above conceptual framework we propose to examine three vocational training institutions in the Latin American and Caribbean region which illustrate the contributions that institutional centres and services make to regional and local development strategies.

7.1 SENAI: the example of Santa Catarina

Brazilian National Industrial Training Service (SENAI) was set up in 1942, and nowadays it is one of the most important national poles in Brazil for generating and diffusing knowledge applied to industrial development. As a member of the system of the National Confederation of Industry (CNI), SENAI gives support to 28 sectors in the economy through training their human resources and rendering services like support for production processes, laboratory services, applied research and technological information.

SENAI mission is defined as follows: *'To contribute to strengthening industry and sustainable development of the country, promoting education for work and for citizenship, providing technical and technological support, the production and design of information as well as the adaptation, generation and dissemination of technology.'* One of the main factors that allow this organisation to fulfil its mission is that it has a very flexible structure. Consequently, SENAI is the biggest vocational training complex in Latin America and the Caribbean and its services are adapted to a variety of local needs. It contributes to increase industrial production and to promote the sustainable development of the country.

The priorities in SENAI are lifelong education, technological development, information, and the dissemination of knowledge. The professionals that SENAI trains work with suitable pedagogic practices, innovative vocational training methodologies, distance learning courses, state of the art technology, courses based

on the premise of lifelong education, and modern laboratories and workshops. Graduates from SENAI are the most sought-after personnel in the market because of their ability to generate immediate results in enterprises and industries is widely recognised. In addition, SENAI also invests in projects and programmes which give priority to information and the dissemination of knowledge, and this is based on the conviction that the enterprises' success is closely connected to its capacity to transform knowledge into decisions. From SENAI's point of view, it is essential that knowledge, mainly in the area of technology, should always be kept up to date and should reach the client rapidly and in a language that is suitable to his needs.

SENAI is involved in different chains of production such as telecommunications, petrochemicals, the automobile industry, foodstuffs, civil construction, graphic arts, garment making, the electric-electronic sector, design, computers, the metal-mechanical field, furniture, textiles, etc. SENAI works all over Brazil through 293 training agencies and vocational education centres, 312 mobile units, 46 national technology centres, and 58 model centres of vocational education. All of these units are interconnected via the Infovia-CNI, a multi-media digital network that is aimed at conquering geographical distances and extending SENAI's range of action.

By 2010, SENAI aims to be the national leader among internationally recognised training bodies with innovative technology and implementing management by results.

Summary of the SENAI Strategic Plan 2000-2010

Considering the opportunities and threats in the external environment, to fulfil its mission and bring its vision to fruition SENAI's activity up to 2010 will be regulated in line with the following basic strategic guidelines:

1. *Systematic action:* Give priority to developing integrated action among SENAI units and departments and other organisations in CNI system, to attend to clients.
2. *Action in productive chains:* Widen attention to the productive sector by offering solutions for links in chains of production, in alliance with other institutions.

3. *Improve management*: Disseminate a model of business management based on valuing competencies and obtaining results.
4. *Market Oriented*: Intensify action to strengthen and widen SENAI's connections with the national and international market.
5. *Social responsibility*: Intensify action which has social impact, and focus on public responsibility and on the exercise of citizenship.
6. *Sustainability*: Intensify efforts to widen the offer of competitive and innovative products by establishing strategic alliances.

Objective 1

Increase SENAI's participation in the market of education for work, attending to the needs of traditional segments as well as those areas that are more advanced technologically.

Objective 2

Increase SENAI's participation in the information and technology market in terms of adaptation, generation and diffusion, with products that are competitive and innovative.

Objective 3

Be proactive with clients in Brazil, offering personalised services in a coordinated and homogenous way.

Objective 4

Give systematic and holistic attention to the demands of chains of production.

Objective 5

Widen SENAI's links with the international market, by co-ordinating with the National Department.

Objective 6

Expanding SENAI's action with micro and small enterprises.

Objective 7

Strengthen SENAI's position in the market.

Objective 8

Extend SENAI's contribution to the exercise of citizenship, to social responsibility and to improving the quality of life.

Objective 9

Progressively raise SENAI's sustainability rate.

Objective 10

Achieve excellence in the institution's performance in accordance with criteria and practices that are recognised by quality management.

Objective 11

Promote the valuing and recognition of internal competencies.

SENAI's strategic plan for 2000-2010 was revised and updated using methodology that was rather simpler than that one used for the 1995 plan. This simplification is the result of the institution learning in strategic management.

The main characteristic of the revision of the plan was that directors and planning technicians in all Regional Departments and the National Department contributed strategic ideas. Besides, SENAI's communications networks were used intensively and extensively to gather opinions, stimulate debate and make the conclusions viable in the different planning process stages.

The municipality of Joinville in Santa Catarina

One of SENAI's regional departments is in the State of Santa Catarina in the south of Brazil and its office is in Florianópolis, the capital of that state. SENAI-SC implements action at the basic, technical and technological levels of vocational training, and it runs courses in 33 areas. It has 37 units of which 30 are education and technology centres, 6 are technology centres (SENAITEC)⁴³ and one in the regional departmental office.

In Brazil, the State of Santa Catarina stands out for its high levels of organisation, production and quality of life. The region was originally colonised in such an efficient way that led to the creation of prosperous urban centres, and this has resulted in a diversified industrial base. The predominant industry in the north west of the state is an electro-metalworking complex that accounts for 18%

43 The SENAITEC centres in the state are the Chapecó Foodstuffs Technology Centre, the Criciúma Materials Technology Centre, the Florianópolis Automation and Computer Technology Centre, the Jaguará do Sul Electronics Technology Centre, the Joinville Electro-Metalworking Technology Centre, the São Bento do Sul Furniture Technology Centre, and the Florianópolis Enterprise Development Centre.

of the industrial production in Santa Catarina, whose 5000 enterprises employ 52,000 people. In addition, one of Santa Catarina's main exports is hermetic motor compressors for domestic refrigeration; this accounts for 10% of exports from the state. Other important industries are transport and plastics, which account for 7% of industrial work, and involve 18,000 employees in 800 factories.

Joinville is situated in a strategic point of access to the southern cone countries. The city is among the top 15 Brazilian municipalities when it comes to tax income, and it is the third industrial pole in the south of the country. Of the economic activity in this city 82% is concentrated in industry. There are 1,521 factories in the municipality employing around 85,000 people. The main ones are in metalworking, textiles, plastics, the metallurgical sector and the chemical and pharmaceutical sectors.

Joinville accounts for approximately 16% of exports from Santa Catarina. Its industry is in fifth place in the national export ranking and each year it conquers new foreign markets. Regarding the domestic market, the city is known for its manufactured products such as refrigerators, omnibuses, motor compressors, textiles, air compressors, auto parts, PVC pipes and connections, and bathroom fittings.

In addition, there has been new investment in the automobile industry in the south of Brazil. Audi, Renault, Volkswagen and Chrysler factories have been set up in the neighbouring state of Paraná, and Ford and General Motors are just to the south in Rio Grande do Sul. Since the area became competitive with important international suppliers like Italy, France, Germany and Portugal, big new opportunities for industrial production have opened up.

This is favourable for the municipality of Joinville and the cities in the north of the state because they are strategically located in the centre of the area that is receiving this new investments. At the moment, there are around 55 factories producing auto parts for BMW, Mercedes-Benz, Audi, Volvo, Peugeot, Renault, Citroen and Honda Motorbikes abroad, and, in Brazil, for GM, Volkswagen, Fiat and Ford. Parts are also supplied for trucks and agricultural machinery made in Brazil, meaning that Joinville is a supply centre of excellence. Apart from that, there are plastics, electro-electronics and textile factories in the region that also make components for vehicles.

The development of this whole industrial base is largely due to the contribution which vocational training and technological institutions have been making throughout the region. While it is true that education and training alone have a very limited impact on transforming a local productive system, they are part of the software of development and they play a strategically important role in the growth of business, and this means improvements in the area.

In local development the training of human resources becomes very important when it is seen from the perspective of business competitiveness. If the aim is to maintain or improve the competitive position of enterprises in the market, it is necessary to improve products and services, and this very often depends on the quality of human resources.

As Vázquez Barquero says, '*...the availability and quality of human resources are a key factor in the development of a place or a region since they affect the productivity of the business system and the productivity of the region, as well as the cultural model which sustains the growth process and structural change in the economy.*'⁴⁴

In Joinville careful attention is paid to training. Since 1944 the SENAI has been running a vocational training unit, administered by the State of Paraná, with industrial learning programmes in the electrical and mechanical fields. Its first headquarters was the Martins Veras Practical Commerce School and it later moved to the Joinville Workers Circle until 1946 when it acquired its own building.

In 1953, the Santa Catarina branch of SENAI severed its links with the State of Paraná and established its own administration and its own regional department in the capital of Santa Catarina, where it started coordinating the activities of the units located on its area.

The Joinville unit evolved into a vocational training centre and became a landmark in human resources training for the metalworking industry in the region.

In 1977, growing demand in the region led to a considerable increase in the number of SENAI units all over the state. The following year, another centre was inaugurated, this time in the industrial district in the north of Joinville. A vocational training centre called Joinville Norte was set up on a 20,000 square metre site with 5,400 square metres of buildings and with equipment and laboratory facilities for electro-metalworking.

These two units in Joinville came to play a crucial role in vocational training in the region, and they diversified into training and updating activities oriented to the general mechanical area, the manufacture of machines and tools, industrial maintenance, automobile mechanics and electro-electronics.

In 1984, the Joinville industrial textiles union signed an agreement with SENAI to pool the competencies of the two institutions in order to develop the textiles and garment-making sector in the region. At that time, SENAI was made a free loan of the facilities at the Joinville Textiles Training Centre (CETEJE), which

| 44 Vázquez Barquero, Antonio, '*Desarrollo de los recursos humanos*', in *Política economía local*, Pirámide, p. 276.

had been created in 1975, and which was used for training and for updating skilled workers in textile enterprises.

Since 1994 there have been post-second grade technical courses and post-graduate programmes run in cooperation with universities.

In 1996, SENAI extended its activities into new technologies by setting up the Advanced Automation and Computer Pole of CTAI (Automation and Computer Technology Centre) with modern laboratories for hydraulics, pneumatics, electronics, automation and computers in the CNC centre, to meet increasing demand from industries in the north and north west of the State.

As a result of the evolution of its activities and methods, SENAI merged its SENAI-Joinville work with that of the advanced pole of the CTAI and this union was recognised as an electro-mechanical technology centre (CTEMM). Nowadays, it serves industries not only in the municipality but throughout the region. This means responding to challenges in technological education, technical and technological support, and technological information and applied research. It has an infrastructure of facilities and specialised services for the automobile, electro-metalworking, textile, garment-making, foodstuffs, civil construction, quality management and business management branches.

The electro-metalworking technology centre (CTEMM) and the technology-based micro-industrial district (MIDIVILLE) were inaugurated in March 1999. The CTEMM, like the other SENAI technology centres, offers vocational education, technical and technological counselling, applied research, and technological information diffusion services. The building where the old Joinville Norte unit of SENAI used to work has been totally remodelled for the new centre.⁴⁵

CTEMM (Electro-Metalworking Technology Centre) and its contribution to industrial development in the region

CTEMM is a useful example of how a vocational training institution can contribute to regional development, and a concrete illustration of one of SENAI's main strategies at the national level, the National Technology Centres, better known as SENAITEC.

In general, SENAITEC are units which have been converted to attend to specific sectors or chains of production, usually on a regional basis, through integrating vocational education services with support for productive processes, labo-

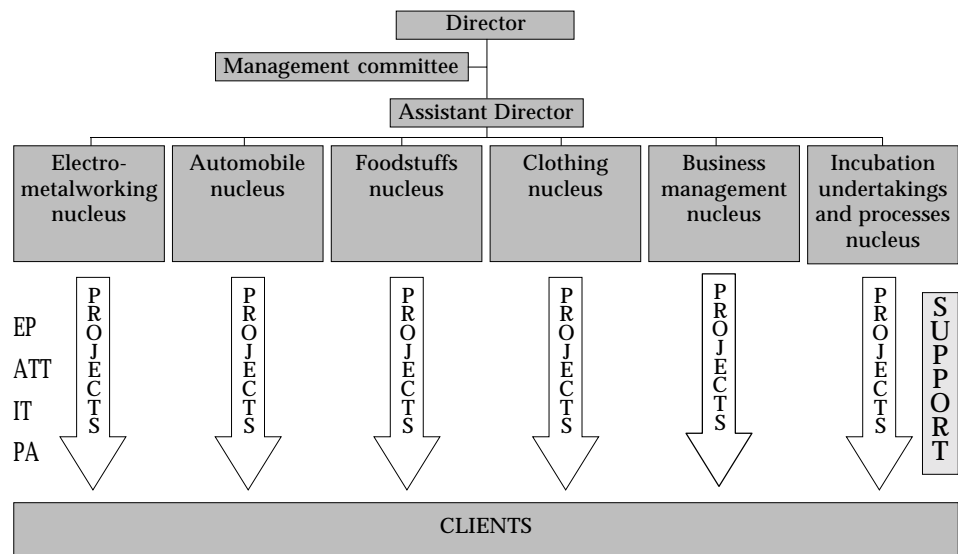
⁴⁵ Of the total area constructed (5,400 square metres), 2,250 square metres are reserved for laboratories for electrical work, computers, electronics, hydraulic and pneumatic work, computerised numerical command / flexible manufacturing system, robotics, automation, mechanical work and tool making.

ratory services, applied research and technological information. These centres have state of the art technological knowledge and infrastructure that are geared specifically to the industrial sectors that they deal with.

In practice, the aim of SENAITEC is to make available -on a national level- the knowledge derived from the most modern industrial sectors in different States.

The organigram of CTEMM is structured as a matrix in which the business nuclei manage material and human resources in their specialised fields. Each nucleus acts in four areas: vocational education, technological information, technical support and applied technology and research. The matrix organisation model involves a multiple-command system which is aimed at making interaction between different areas and different business nuclei which are flexible and agile, so that people can work on different projects that are coordinated separately. There is also a support nucleus which provides administrative technical support

**Organisational structure of the CTEMM
(Electro-Metalworking Technology Centre)**



- EP - Vocational Education
- ATT - Technical and Technological Counselling
- IT - Technological Information
- PA - Applied Research

in all the areas of activity and there is a management committee made up of the management team, the facilitators of the business nuclei and the facilitator of quality. All of them define CTEMM actions.

CTEMM infrastructure consists of three facilities in different places. In the north of Joinville, CTEMM-Norte⁴⁶ and the MIDIVILLE project –which deals with incubating technology-based enterprises–, are located in the same building. CTEMM-CETEJE⁴⁷ is in another building whereas the CTEMM-Sur⁴⁸ is in the southern part of the city.

The main innovation lines in CTEMM, as well as in the other SENAITAC centres, imply, first, focusing the centre's action on sectors and chains of production in the region or connected to it. Second, it involves diversifying and integrating these services.

The former can be clearly seen in the fields and specialised needs that CTEMM focuses on, which are closely linked to the main economic activities in the city and the surrounding area. The second aspect is reflected in the fact that while CTEMM's facilities and resources are still used intensively for training purposes, they are also being used to render new services in technological information, technical and technological support, and applied research.

This last item has at least three significant effects:

First, it **widens and diversifies the range of subjects** that are tackled in the institution. These are no longer just people – young people or adults – who want to be trained for work, but also enterprises, industrial sectors and chains of production which combine different sectors and services including industrial estates and enterprises in incubation. In short, the centres are oriented to serving the whole community and its economic and productive network. Thus, CTEMM policies are an important tool for consolidating local development since beyond training and educating human resources, they raise the quality of life in local society.

The second significant effect is that there is a **change of focus in the management of services in the centres and their relation to the world of produc-**

46 CTEMM-Norte has facilities for technical mechanical counselling, welding, general mechanics, CNC-CAD-CAM, robotics, hydraulic and pneumatic systems, industrial computers, automation, computers, electronics and electrical work, plus a metrology laboratory and a design laboratory.

47 CTEMM-CETEJE has facilities for scientific glass making, clothes making, modelling, and general maintenance of sewing machines, plus a chemistry laboratory, a CAD garment-making laboratory and a natural gas laboratory.

48 CTEMM-Sur has an automobile centre, a Ford module, a Mercedes Benz module, an MWM module, an electronics hall, a laboratory for converting vehicles to natural gas, a computer room, a hydraulics/ pneumatics room, a laboratory for electrical work, an auto machine shop, a general machine shop, and facilities for alignment and balancing, bakery and confectionery.

tion. Originally, the vocational training centres tended to be connected to the demand for training in the regions and sectors they were assigned to, but at the present time they go far beyond that. Training services are coordinated and integrated with new and diverse services, and the result is holistic. The enterprises, sectors or industrial estates do not go to the centre just to present their requirements for training or to recruit people who have completed courses there, they also go to find out about the latest technological progress in their field, to use the facilities to test equipment, tools or materials, and to make agreements with the centre – and eventually with other actors such as universities – to run applied research projects.

Last, **in virtue of the centre's specialisation and field of action, it also integrates with and complements other services, actors and resources in the region.** This happens when there is an agreement to combine the centre's infrastructure, resources and services with those of chambers of commerce, universities, and technological and other institutes. The centre's contribution, thus widened and diversified, is also oriented by an integral focus on the provision of services, and is inserted into a network which serves the whole productive network of the region.

Now let us look at one of the lines of action that was developed recently by SENAI-SC: the incubators of technology-based enterprises.

Incubators of technology-based enterprises

SENAI-SC is putting into operation three incubators of technology-based enterprises that are strategically distributed around the state. This means that new jobs will be created, and the competitiveness of undertakings in those regions will be increased. These establishments are structured in a flexible way so that they can be easily adapted to meet new needs that may appear. The incubators foster a close business connection through transferring knowledge and the results of research carried out by bodies that promote information and by producers of technology, and through training leading segments that make it possible to increase the value of business activities that are based on knowledge and technology. All this is grounded in the view that in the immediate future changes in mentality will become increasingly important, and research, development and innovation will guarantee that productive systems are modernised through local and regional strategies.

Three incubators are being set up in this scenario:

Joinville technology-based incubator – MIDIVILLE. This works in industrial automation, electro-metalworking and tool making, and as a logistical support

and operational unit of CTEMM in Joinville. This incubator was inaugurated in March 1999, and so far, even with only one of the modules initially planned, 103 new jobs have been created, 13 new products and services have been generated, and one of the latter is currently being exported to Argentina and the United States.

Criciúma technology-based incubator – MIDISUL. The areas of knowledge in this incubator are ceramics and materials. It receives logistical support from Ceramics Technology Centre (CTC), which is located in the same place, the pole of the southern part of the State. This incubator was inaugurated in May 2001 and it already has four resident enterprises.

Chapecó technology-based incubator – MIDIOESTE. The area of knowledge here is agro-industry, and there is support from the foodstuffs technology centre (CTAL) and from the city of Chapecó. This incubator has physical space for sixteen enterprises, and it will become a mechanism to generate new products and technology, seeking to add value to current production. Chapecó is the pole city in the west of the state, and there is an agro-industrial complex that works mainly in producing and processing pork and poultry.

The services that SENAI-SC incubators offer to enterprises are:

- Physical infrastructure
- Operative support services
- Strategic support services
- Enterprise development services
- Technological support services

SENAI uses the mechanism of fostering industry in the form of a physical space specially designed to house technology-based enterprises, disposed to transform ideas into products, processes and services. Besides, the project constitutes a link between the market and the technological development generated in the training and research institutions or derived from other enterprises, delivering research products to potential consumers.

The main objectives of the programme are as follows:

- To train micro, small and medium-sized enterprises to generate new technologies, specially in the electro-metalworking, foodstuffs and ceramics sectors.
- To train personnel in industrial sectors with a view to incorporating new technologies into productive processes.
- To foster the creation of new technology-based enterprises through mechanisms which enhance and stimulate entrepreneurial capacity, aimed at supporting the development of new technologies.

- To promote the development of management skills for entrepreneurs in micro and small enterprises, for researchers at universities and other research centres, and for university students who wish to create and develop new undertakings.
- To insert the environmental variable into the economic development of the state, to sensitise businessmen and mobilise them to adopt techniques to safeguard the environment, and to introduce technologies which minimise the negative effects of industrial waste.

Entrepreneurs who are interested in taking part in the incubation process have to present a business plan that demonstrates:

- that they propose to develop technology-intensive products;
- that the projects are technically viable;
- that they have commercial potential;
- that the necessary capital is available;
- that they are compatible with the objectives of MIDIVILLE-MIDISUL-MIDIOESTE.

For effective access to the incubator the enterprises must go through the following stages:

- pre-qualification of undertakings
- qualification of the candidates
- final classification

What is offered is the physical space for installing the incubated enterprises (modules) and to share the infrastructure which consists of a meeting room, an auditorium, a show-room, the SEBRAE office, copying and binding services, a classroom, training programmes, the intranet network and access to internet, access to the Infovía-CNI system, reception, security, and access to the laboratories of SENAI technological centres.

This strategy is expected to produce the following results:

- a failure reduction rate among enterprises;
- the creation of jobs;
- the transfer of technology among universities, technological research centres and enterprises;
- to accelerate the growth of the incubated enterprises;
- to influence the technological culture of the region.

SENAI-SC thus seeks to respond to the industrial society demands, making it possible for new entrepreneurs to apply research and ideas in a practical way so as to benefit society as a whole. The aim is to generate and strengthen eco-

conomic and business dynamics in the region but taking care of maintaining the local identity of the area.

Lastly, so as to present a clear panorama of the kind of activity that the incubation strategy is aimed at promoting, we will give a brief description of the enterprises incubated in MIDIVILLE. These are:

Pollux: The mission of this enterprise is to develop and install industrial surveillance systems that consist of cameras, optical elements and image-processing hardware and software used for inspecting production and assembly lines. The technology involved makes it possible to inspect 100% of the production and to detect defective products and discard them.

The main advantages of the surveillance systems are that they ensure quality, improve productivity, eliminate waste in production processes, and maintain the company's image in the market by preventing products with visible defects from reaching the final consumer.

By applying world technologies, Pollux caters to the visual inspection needs of big enterprises in industries such as pharmaceuticals, cosmetics, drinks, automobiles, the electro-electronic field, and graphics. The company's headquarters is in Joinville and there are branches in Florianópolis, Sao Paulo and Mexico. Apart from the partners who founded and manage the company, Pollux has two large funds for technology-based enterprises that are managed by Banco Fator and by GP Tecnología. In 2001, Pollux won the FINEP prize for technological innovation, which was awarded by the Ministry of Science and Technology.

South – Quality industrial solutions: This company is a leader in the dimensional metrology, reverse engineering and instrument calibration areas and applies advanced technologies in the services it provides in these fields. Dimensional metrology is used for evaluating pieces, tools, moulds and devices, using apparatus for measuring by coordinates and comparing surfaces in three dimensions. In reverse engineering the process consists of using equipment and software which captures the form of surfaces and reproduces them with fidelity and precision in a three dimensional mathematical model. In the instruments calibration area, South is a specialist in calibrating conventional and complex control devices, and it also handles the implantation of metrology and calibration. The enterprise has won important clients in the automobile, electro-electronic, metal-working, metallurgical and plastics sectors.

Fastparts – prototypes: The design of prototypes is an essential step in the development of a product since it allows enterprises to test their products safely before making investments in definitive tools. Fastparts produces prototypes, models and mock-ups using a tri-dimensional modelling process machined in CNC, thermoforming and silicon moulds. CAD and CAM software are used to generate

models of pieces of varying degrees of geometrical complexity. A vacuum-forming machine is used to make pieces with constant thickness. In vacuum casting, silicon moulds are made to help the reproduction of geometrically complex pieces. With an injection of resin it is possible to simulate the final material and make a pre-series of the product. Fastparts maintains absolute confidentiality with its clients and it has a team of qualified professionals who have an average of 15 years experience. It works with enterprises in the automobile, electro-electronic, household appliances, packaging, and design workshop sectors. Its main clients are Volvo, Multibrás, Busscar, O Boticário, Docol, Motorola, Tigre and Weg.

ISA of Brazil: This is an industrial automation company that was founded in 1997 whose headquarters is in Joinville. It works in harness with a partner, ISO Automatisierungs Technik, which was founded in 1991 and is based in Herrenberg, Germany. The two units, the Brazilian and the German, are efficaciously interconnected and they support each other. They make up a highly specialised team that uses state of the art technology to meet specific needs in the electro-mechanical sector. The company plans, constructs and implants systems adapted to the client's requirements.

Its main services are to develop electrical projects (using Eplan *software*), to develop software applicable to PLC (Programmable Logic Controller) and to the AGV (Automatically Guided Vehicle) supervision system, to set up electrical panels and infrastructure, to start up the system, and to provide training in automation and maintenance. ISA of Brazil's clients include Embraco, Renault, Tupy and Multibrás.

Hbtec: This company provides services in information technology. Since 1989, it has been working in Blumenau, and for the past three years in Joinville as well. It is a specialist in CRM (Customer Relationship Management) systems. It deals with the whole cycle of sales and relationships with clients, and provides support for enterprises in areas like scenario/market analysis (Hbtec-DEX, data extractor, the OLAP tool), automating the sales force (Hbtec-AFV, multi-platform solution – Palmtop, Notebook and Web), telemarketing and telesales processes (Hbtec-TMK), and service of the SAC/technical support kind (Hbtec-SAC). The services of Hbtec-CRM can be used in isolation or as a package, depending on the needs of each client. Technical support from this company allows a manager to focus on his sales operation, relate to his clients and give excellent service. Hbtec stands out in the market for its agility in rendering services, for the reliability of its products and services, and for the way it works, focusing on adapting the client company's products and processes to the final customer.

Kronos-Engineering: This company applies the concept of simultaneous engineering in developing injection moulds. It uses CAE/CAD/CAM/CAV technologies as a support instrument in the making of tools, and in modelling, design and

modification. It has a very experienced and specialised team and it is important in the household appliances, packaging, toy and automobile markets. With the CAD system a 3D ambient is developed: products, reverse engineering, mould projection and movement simulation in mechanisms in moulds and complex products.

Computer simulation (CAE) allows evaluation of the variables involved in thermo-plastic injection and generates alternative possibilities for the product, the mould and the regulation parameters for the injection machine, and this makes the process more efficient. The manufacturing system (CAM) allows exact reproduction of the design of the product, generating the trajectory of the tool for the CNC machine. All the programmes are verified (CAV) so as to optimise the process and avoid collisions. Kronos Engenharia is a specialist in machining graphite and copper electrodes, cavities and replacements, for which it has high speed milling machines.

Sysfocus -Software Solution: This company works to support manufacturing in the areas of engineering, stock, planning (MPS, programming, MRP and CRP), and the control of production and industrial costs. The software allows each stage of the production process to be visualised, and monitors the processing, cost and storage of intermediate products. It makes it possible to control products, co-products and sub-products at the same stage of production which involves defining control items for the productive process and associating them with the technical index of the process. It also makes it possible to make fine adjustments in production and subsequently to compile productivity rates.

It also makes it possible to control materials and products, and operate with different measurement scales. The costs system allows the enterprise to define the variables which contribute to the composition of the cost of each product (raw materials, packaging, labour, depreciation, etc.) and draw up detailed accounts. Sysfocus has specialists who have experience in developing and implanting business management systems in various Brazilian and international enterprises.

DesignInverso: This enterprise develops design projects in a planned and strategic way to connect the areas of product design and graphic design, so as to continuously produce alternatives from the conception of the product until it goes on the market. It has trained professionals and it employs a methodology that is geared to functional, aesthetic, ergonomic and innovative solutions for products and brands, so as to increase sales, market position, overall quality and innovation. It runs production projects in areas such as household appliances, furniture, and medical and orthodontic equipment.

Developing graphic design projects involves planning the packaging, trademarks, institutional profiles, catalogues, publications, merchandising and sign posting. The quality of the project is guaranteed by alliances with enterprises

that work with prototypes, engineering, and photographic and graphic producers. Some of Design Inverso's clients are Wetzel S.A., Kavo do Brasil S.A., FGM Productos Odontológicos, Grupo Meta and Cargolink Almacenes de Cargas.

NitreAço. This company works in the area of nitrogenation with plasma. This process creates a very hard and resistant layer on pieces, moulds and tools made of steel. Nitrogen is incorporated into the surface of the material, which results in a combination with the iron and the alloy elements. Besides plasma, this also comes in liquid and in gaseous form, but these take longer and are noxious for the surrounding area. The utilisation of plasma for the process means there is less chance of geometrical distortion since the temperature is lower and the treatment is quicker. The equipment was developed in Brazil, and this is the only service of its kind in the south of the country. The process is used in the metalworking and automobile industrial sectors. Results as regards resistance to wear are optimal: a 2mm diameter high speed conical steel drill that perforates stainless steel has a 1000% increase in its useful life, with a increase from 20 to 200 holes before it needs to be discarded. NitreAço offers solutions to the problems of wear.

7.2. SENA in Colombia: a knowledge organisation

The National Training Service (SENA) was created in 1957 through a joint initiative involving the Colombian government, workers' organisations, employers, the Catholic Church and the International Labour Organisation. It is a national public institution, with legal status and its own independent assets and has administrative autonomy under the auspices of the Ministry of Social Protection of the Republic of Colombia.

SENA discharges the State function of investing in the social and technical development of Colombian workers. It offers and implements integral vocational training so as to insert people in productive activities which will contribute to the social, economic and technological growth of the country.

Apart from vocational training, SENA provides continuing training for personnel connected to companies, information, orientation and training for work, support for business development, technological services for the productive sector, and support for innovative products, technological development and competitiveness.

SENA recently formulated its 2002-2006 strategic plan,⁴⁹ which is aimed at converting the institution into a 'knowledge organisation' that has a global man-

⁴⁹ National Training Service - SENA / General Management, Strategic Plan 2002-2006: 'SENA: una Organización de Conocimiento', Bogotá, 6 March 2003. Available at: www.sena.edu.co

date and serves the country. It plans to act in three main areas: integral vocational training for workers, promoting and facilitating technological and innovative development, and the development of an entrepreneurship culture.

In these four years, SENA plans to double the number of people it will train, and to take steps to improve the quality and pertinence of its courses. This widening and improvement in the training offer is based on incorporating new technologies into the system and putting the emphasis on the intensive use of information and communication technologies. It also involves incorporating a teaching component which will prepare its trainees to be able to generate their own jobs, and in this way it will become a leader in training for work for the unemployed population. It bases its activities on the labour competency focus but it also plans to encourage other training bodies to join so as to construct a national system of training for work. In this framework, SENA is the responsible body for the standardisation and certification of labour competencies.

Due to several outstanding qualities, SENA is regarded as an important actor not only on national basis but also at regional and local ones. Some of these strengths are shown in the diagram below.

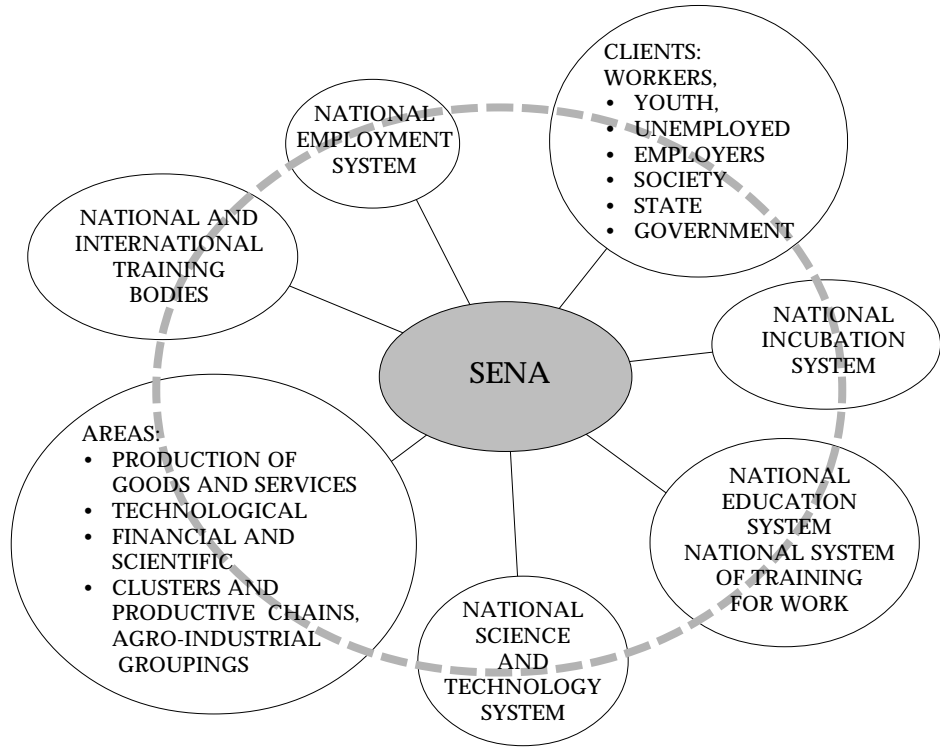
Over and above each of the strengths considered individually, SENA also has a kind of 'meta-advantage' as an institution. This is a consequence of the nature of the organisation as a space for participation, concerted action and social dialogue among different departments in the State apparatus and with the public sector, the private sector and civil society. This scheme, which can be clearly seen in the composition of its Managing Boards at a national level, has also a regional and local expression involving individuality and originality.

One of the consequences of having the above institutional nature is that there is a high degree of coordination between SENA and different State policies. An example of this is its participation, along with *Colciencias* and other State bodies, in the National System of Science and Technology (SNCT) where it mainly offers its know-how in development and the capacity to generate and transmit knowledge.

The fact that SENA has widened its coverage and improved the quality of technical education shows that, as an institution, it has made a great effort. One of SENA's objectives is that all its training centres should run programmes coordinated with the structure of secondary technical education in their respective regions.⁵⁰

50 Other examples of this are the National Strategic Plan for Green Markets, its contribution to constructing the National Labour Registration System, the 'Youth in Action' programme, the National Productivity and Competitiveness Programme, and the Competitiveness and Productive Technological Development Programme. More detailed information about these and other programmes is available at the SENA web site: www.sena.edu.co

The diagram below gives a simplified picture of the connections that SENA has at the national and regional levels.



SENA strengths

- Well structured and responsible financial administration
- Solid assets
- Insignificant indebtedness
- Assured financing for pensions
- Accumulated know-how from the 45 years that SENA has been in existence
- National cover geographically, of the population and by economic sectors
- Redistributive allocation of resources among sectors and regions
- Diversification of action to give integral attention to the needs of the productive and social sectors: training of human resources, counselling for business development, technological services, information and orientation about the labour market, and support for innovative projects and technological development
- Installed capacity for providing services, such as classrooms, laboratories, workshops, practice areas, technical and administrative support areas with the necessary equipment
- SENA trainees adapt well in the labour market, according to impact evaluation studies
- Combination of training modalities in centre, out of centre, and non-formal training, plus diversification in the offer of vocational training for a first job, continual vocational training for connected personnel, and occupational vocational training for the unemployed
- The sectoral round tables have become a strategy to actively connect with the productive sector in identifying workers' vocational training needs
- Experience in strategic alliances with national, regional, local and foreign organisations for running projects jointly, transferring technology or special training for specific population sectors
- Capacity to call together entrepreneurs, workers, the educational sector, research and development bodies, and other public and private organisations to orient vocational training and technological development
- Employers and SENA participation in formulating technological innovation and development projects
- Infrastructure and an open mindness when it comes to enterprise initiating programmes to promote undertakings and set up enterprises.

Source: SENA, 2002-2006 Strategic Plan "SENA: Una Organización de Conocimiento", Bogotá, 6 March 2003.

The National System for the Incubation and Creation of Knowledge Enterprises

We have selected one of all the examples of SENA's most recent initiatives, the Strategic Plan, to describe in detail. This plan is aimed at facilitating the development of business initiatives through the national system for incubating and creating knowledge enterprises.

According to law No. 344, which was promulgated in 1996, SENA was given a mandate to spend 20% of the income from the contributions on gross salaries on programmes to develop competitiveness and productive technology. Apart from other action and programmes geared to complying with this law, since 1999 SENA has participated as a founding partner in 13 enterprise incubators. These incubators are non-profit organisations, and through them 96 new businesses have been set up. They have a high content of innovation and technological development which guarantees that new knowledge and technologies will be transferred to the integral vocational training which SENA gives in its training centres.

Over five years SENA has invested more than 9,829 million pesos in these business projects. Through the thirteen incubators, 464 enterprises have been set up, generating 4,802 jobs and sales of more than 43,500 million pesos. The areas of production include software, electronic systems and equipment, health, the agro-industry, services, telecommunications, tourism, the graphics industry, leisure and sport, bio-technology, oils and oleaginous products, transport, education, precious minerals, and chemistry and pharmaceuticals.

In 2003, SENA set itself the target of creating 22 enterprise incubators and promoting 116 enterprises, with an investment of approximately 6,200 million pesos.

The thirteen incubators which SENA helped to found and is now represented on the board of directors are Corporación Innovar e Incubar Colombia (Bogotá), Incubadora de Empresas de Base Tecnológica de Antioquia (Medellín), Génesis (Rionegro), Incubar Urabá (Apartadó), Corporación Bucaramanga Emprendedora (Bucaramanga), Incubar Caribe (Barranquilla), Incubar Futuro and Software Technological Estate (Cali); Incubadora del Eje Cafetero (Pereira), Incubar Manizales (Manizales), Incubar Bolívar (Cartagena), and Incubar Huila (Neiva).

The **National System for the Creation and Incubation of Enterprises** is defined as a concerted national effort which will lead to a new chain of value to create new state of the art enterprises. This chain of value consists of five broad components or stages:

- **Sensitisation:** The transformation of a life project into an undertaking.
- **Identification:** Identifying the degree of maturity of the initiative and its position in the ambit.
- **Pre-incubation:** Raising the degree of maturity of the initiative through preparing the business model.
- **Incubation:** Constructing the company's business projection (work team, products/services and clients) and going into operation in the natural market.
- **Acceleration:** Maximising the added value of the company through internationalisation and continual innovation to constantly re-think the business.

The System is a combination of different efforts and the SENA has a role to play in each of them although its main emphasis will be on training. The six main national efforts are training, support industries, finance, the legal framework, incubation and internationalisation.

Enterprise incubators

Enterprise incubators are institutions which accelerate the creation, growth and consolidation of innovative enterprises through the enterprise capacity of citizens. These institutions are like state of the art enterprise laboratories whose inputs are ideas and knowledge teams, and whose products are profitable enterprises. The main task is to get the entrepreneurs into a way of thinking: entrepreneurial thinking.

The incubators are non-profit organisations with a **tripartite structure** which comes from an alliance between the **public, private and educational sectors**. The partners or promoters of these institutions are training bodies (technical, technological and university), public and private enterprises, local governments, councils, unions, chambers of commerce, and in some cases union federations. Moreover, the participation of different actors leads to acknowledge the social, economic and cultural reality that they work in.

SENA's part in this incubation system is not new, it has been sponsoring enterprise initiatives from citizens and promoting incubation in the country since 1999. However, it is clear that in the current strategic plan this area has expanded and become an important line of action for the institution. Between 2002 and 2006 SENA expects to promote 40 incubators across the country, of which 22 were expected to be working in 2003, supporting the setting up of enterprises that have a high level of innovation and technological development.

The National Projects Committee is the top evaluation body, it is made up of representatives from SENA, Colciencias, DNP, and the unions and workers, and it is presided over by the Ministry of Social Protection. So far in the current administration, it has approved the formation of 7 incubators for enterprises and has supported 29 enterprise initiatives to the tune of 3,533 million pesos. However, the administration has not authorised the payments. Before the payments are authorised the auditing process has to be strengthened. This auditing process guarantees the hand-over of resources which is contingent on meeting targets, on the correct execution of the resources on a national level, and on the transfer of the technology developed in each SENA enterprise initiative. The National University of Colombia is cooperating in this auditing process.

On the other hand, the fact that fees for education are now payable in cash, and that the correct percentage would go to the Enterprise Fund, is an attempt to support and stimulate associations of students or trainees who have recently completed courses at SENA or other educational institutions that are recognized by the State. Therefore, they may undertake their own business initiatives by making the knowledge acquired in the generation of new sources of income and employment available to them. The Enterprise Fund will cede non-repayable resources directly to those young people's projects that have a direct relation with their training area and are supported by training institutions.

Since 1999 the work of the enterprise incubators that SENA is connected to has resulted in 464 new enterprises being set up, and these have generated 4,802 jobs and more than 43,500 million pesos in sales. For example, in the first quarter of 2003 the Bucaramanga Enterprise Corporation helped to found 55 new enterprises with 350 new jobs, and the incubated enterprises achieved sales amounting to 1,200 million pesos. Similarly, on the Cali software technological estate 12 new enterprises, 36 new jobs, and the incubated enterprises are generating sales of 500 million pesos. At the same time, the Antioquia technology-based incubator helped to set up 33 new enterprises with 597 new jobs, and the enterprises incubated there have made sales amounting to 1,750 million pesos. These are just three examples of the important work that the thirteen SENA-connected incubators have been doing. It amounts to a real and considerable contribution to re-activating the country's productive apparatus and generating new opportunities for young Colombians.

In order to develop the National System for the Creation and Incubation of Enterprises, the SENA has made the following national strategic alliances:

- Colciencias
- United Nations Development Programme
- DNP. National Planning Department

- FONADE. Development Project Financial Fund
- SECAB. Executive Secretary of the Andrés Bello Convention
- National University of Colombia. Auditing Office
- EmpreAndes: A student group that fosters the spirit of enterprise and the creation of enterprises at the University of the Andes
- ANEIAP. National Association of Industrial Engineering, Administration and Production Students
- MINCI. Interactive Knowledge Worlds

Besides, thanks to the management schemes of the different associated incubators, SENA has a wide range of other alliances at local and regional levels. For example, INCUBAR Quindío in Armenia, an incubator which has already been set up and is in process of establishing an association with the SENA. Its partners include the local government of Quindío, the mayor of La Tebaida, the Armenia Chamber of Commerce, the University of Great Colombia in Armenia, the University of Quindío, the Administration and Marketing School, Actuar QUINDÍO, Café Quindío, the National Coffee Estate, and the Quindío Departmental Committee of Coffee Producers.

SENA's role in the construction of the National System for the Incubation and Creation of Knowledge Enterprises

To take the lead in this task, which has nation-wide scope and regional, local and sectoral impact, SENA has implemented the National Programme of Technology-Based Enterprise Incubators (IEBT). This Programme comes under the Employment Board of the institution and works as a support group for programmes that are aimed at developing the strategy to enhance innovation, competitiveness and technological development.

A consultative committee has been set up as an advisory body made up of representatives from the different institutions connected to the program. The function of this committee is to accompany the structuring, promotion, diffusion, operation and consolidation of the programme to ensure it includes the operative models which contribute to widening the cover of the services offered. In addition, it gives the encouragement the different users might need to create and consolidate their new production units in the framework of innovation and the introduction of technology to their processes.

The broad objective of the programme is to create enterprises through promoting and supporting pre-incubation and incubation projects classified as having high levels of technology, innovation or competitiveness. This support is un-

derstood as assistance, accompaniment, and financing the applied research that is required for formulating, putting into operation and consolidating each project, disaggregated according to characteristics in each case.

The specific objectives of the programme include:

- To establish orientation policies to promote the creation of high technology enterprises which will facilitate the diversification of national production, incorporating advanced processes and products in the international ambit.
- To define and formulate strategies which will help to facilitate interconnections between private and institutional entrepreneurs and the incubators and the support bodies of the programme, so as to maximise the results that it generates.
- To have a work model with highly trained and specialised personnel to develop and accompany the processes to be implemented, so as to bring to fruition the ideas and initiatives that are successful in the creation of enterprises.
- To promote productive sectors that are vital for GDP growth and the socio-economic development of the country.
- To promote the creation of employment in the different phases of the project; in the pre-incubation phase with research groups and the making of plans, and in the productive stage through setting up the new productive unit and starting it off.
- To bring support institutions into the process of creating enterprises, and to bring in private domestic and foreign investors as external support for the programme.
- To establish a chain of support and service for the entrepreneurs in the international ambit so as to facilitate production and commercialisation.

The aim is to promote and spread the spirit of enterprise, to help to identify and consolidate ideas with the potential to foster the growth of new enterprises, to support research, to help in preparing business plans, and to accompany the new productive units as they go into operation. The agents of this are SENA's different enterprise training centres and their partners in the programme, which in this case are the technology-based enterprise incubators.

The process whereby technology-based enterprise incubators become associated to SENA

In the framework of Science and Technology Law 29 in Decree 393, enterprise incubators can apply for association to SENA. This means they receive accompaniment for implementation, orientation from regional science and technology policies, participation on their boards of directors and therefore support in the form of money or payment in kind, and also the co-financing of projects that have a considerable information and technology component, are oriented to strategic sectors, and are in the technological development phase.

The incubators will have to take account of the following orientation criteria:

- To foster an enterprise culture to generate new knowledge enterprises
- To create knowledge enterprises oriented to open markets
- To promote the inter-relation of regional work between enterprise/university/ government
- To coordinate action with financial service providers for possible accompaniment in the process of obtaining starting capital and other resources for the new enterprises
- To establish agreements with national and international incubators, technological development centres, productivity centres and universities
- To belong to national and international networks which would make support for enterprise initiatives possible
- To link up regional efforts which would have an impact in the centres of greatest competitiveness in the region, defining target clusters or productive chains to implement enterprise initiatives
- To accompany the development of each initiative as set out in the work time plan
- To give priority to coordinating the work of the incubator with the business prospects of the region or with the vision of the region's future
- To maintain the standard defined by the national system to incubate and create knowledge enterprises
- To receive projects pre-incubated by SENA training centres, which could be incubated within the standards defined by the incubator

Mechanisms for financing initiatives

In Colombia, debt has become the mechanism which entrepreneurs traditionally have recourse to when it comes to financing their business initiatives. However, this mechanism is usually out of the reach of new entrepreneurs mainly because they are not eligible for credit.

Therefore, it has become necessary to formally develop new creative mechanisms for financing which will give the new entrepreneurs access to the financial resources necessary to put their enterprises into operation.

These mechanisms should be understood as actors who make it possible to start up chains of value in the financing of new enterprises, guaranteeing that the resources reach the company at the right time. Some of these mechanisms are as follows:

- **Investment Angels:** The so-called investment angels are people who finance business initiatives on their own account. The investment angel usually appears when the entrepreneur decides to move out of his original ambit to seek the resources he needs to implement his business plan. From here on, the investment angel will accompany him and provide him with money, contacts, work, experience and all the resources needed to gradually go through the stages required to be able to gain access to new and greater resources.
- **Venture Capital Funds:** Venture capital funds are enterprises that serve as financial intermediaries between potential investors who are seeking a satisfactory return from investment that is long term as well as for fixed periods. It also benefits new, innovative, state of the art enterprises that are looking for backing. The venture capital comes into the process of financing enterprises in a transaction against assets.
- **Corporative Funds:** Corporative venture capital funds are enterprises that invest in a new enterprise whose product or service is connected with their main activity. This source of finance has big advantages for new entrepreneurs because of the strategic importance of receiving investment from an enterprise in a cluster or sector in their field. For the investor it is perhaps the best option for developing and maintaining its innovation and competitiveness strategies.
- **Private Equity or Mutual Funds:** Private equity bodies build up a portfolio of shares in companies that are not quoted on the official markets, and bring added value to their management. Their aim is to have a fixed but long term presence in the enterprises. Mutual funds are an intermediate step between financing with venture capital and launching the stock of the enterprise on

public markets. In general terms, the way private equity operates is similar to a venture capital fund, the difference is in the tolerance of risk. The mutual funds do not assume high risks and only intervene in enterprises that have a high level of consolidation.

- **The Stock Market:** This is the best option for corporate venture capital funds and mutual or private equity funds to disinvest. Their role ends and the investors obtain a return on their investment from the resources they have put in the enterprise, in other words, they sell all or part of their participation in the company.
- **Debt:** We are not talking here about a creative source of financing in Colombia but rather about a formidable and rare opportunity that consolidated enterprises have to move forward with resources that are nearly always costly. However, it is increasingly evident that the two spheres - debt and venture capital- have become mixed together and even that the former may change into the latter and vice versa.

The two value chains, that relative to the creation of enterprises and that of financing them are connected through the phases set out below.

- **Seed Phase:** The capital requirements are relatively small, and the investment is given directly to the inventor or entrepreneur so that he or she may develop the initial concepts of the company. These resources are used to develop prototypes and to carry out market research. It is very important to start building up the work team that will guarantee that the steps set out in the business plan are followed successfully.
- **Start up Phase:** The capital is given to companies that have completed the market research and prototype development phase. Enterprises in this situation have usually been in operation for a year at most but they may have reached this point without commercial sales. The work teams should already be formed and be solid, market studies should have been completed, and the business plan should be in operation.
- **First Round of Financing:** The capital is handed over to companies that already have validated their prototypes on the market (real sales) and now need to expand the installed capacity of the enterprise and move on to the industrial production phase. An advanced level of management and organisational structure is required, and the business plan must be adjusted according to the company progress.
- **Second Round of Financing:** The capital is given to companies which are already producing and distributing. The resources are for providing working capital in the company to strengthen its inventories and response times.

Although the company may be generating a good level of sales, it is usually not showing high profit levels.

- **Third Round of Financing, or Mezzanine Financing:** The capital is given to companies which have passed the point of equilibrium and are growing strongly. The resources are used to strengthen the expansion of plant, marketing, working capital, and the innovation and development of new products.
- **Financial Bridge:** These are the resources needed to take the company to the point where it can put its shares on sale to the public. These are usually financial loans that are payable with the income from the public transaction. Often these resources are used to re-structure the assets of the company before the sale of shares.
- **Public Sale of Shares:** This is the mechanism whereby the property of the company is made public, usually on the stock exchange. This is the normal strategy that investors in the previous phases use to recover their investments with high levels of profitability.

A concrete example:

The Antioquia Incubator of Technology-Based Enterprises

The Antioquia incubator of technology-based enterprises (IEBTA), which was set up in November 1996, is a non-profit corporation in private law. The incubator forms part of the national science and technology system created by Colciencias.

The main objective of IEBTA is defined as an indicator, to maximise the business value of the initiatives it supports in the shortest possible time.

Its main function is to set up state of the art enterprises, and its scheme of work involves continuing training, unlimited cover using a flexible virtual incubation model, to develop a portfolio of services based on applied knowledge accumulated by the incubator and its business laboratory, and to make strategic alliances.

The virtual incubation model is different to SENAI-SC incubation, which was based on the assumption that physical facilities would be available and that different services would be concentrated in that space. In IEBTA, on the other hand, the strategy is based on information services, knowledge management, technical assistance and consultancy services.

Besides the incubation process, which will be described below, IEBTA offers new entrepreneurs, incubated enterprises and external enterprises, the following services:

- Intermediation or seeking new business
- The presentation of projects for co-financing and financing
- The management of projects for tax exemptions
- The valuation of enterprises
- Presentation of enterprises to venture capital funds and strategic investors
- Consultancy and management of enterprises for venture capital funds
- University social groups
- Talks and presentations about projects and undertakings
- Lectures and seminars

The virtual incubator is an information and knowledge management system for identifying, creating and developing innovative enterprises. Its management strategies are based on information technology, the internet and interaction with resources in the support industry, or on consultancy, counselling and other facilitators.

The Virtual Incubator model adopted by IEBTA allows entrepreneurs to be in contact, in an organised way and in real time, with the different actors who have to be involved if the enterprise is to be successful. Access is controlled in accordance with the level of the enterprise, and each person or body responsible for contributing to the process of managing the enterprise registers his action and receives tasks which the system co-ordinates with all the others or which necessarily have to be carried out. As an intelligent system, advisers, consultants, financiers, entrepreneurs, managers and agents who are external (from the investor's market or from clients) participate in developing the enterprise initiative to which they have been invited or accepted. The administrator of the system, which in this version is IEBTA, guarantees follow up, control, and the quality of the processes.

The Virtual Incubator allows entrepreneurs to apply their idea, project or enterprise on a maximised internet platform. In the first phase, the essential resources, the human talent team, the business model and the proposed target market are identified. In the second phase, the resources that have been identified and the business model are systematically matched against possible allies, supporters and competitors in different scenarios in the global market. In the next stage, if there are clear indicators of viability, all the actors draw up an enterprise plan and a business plan, and work is done on research and formalisation.

In the subsequent phases control is taken in a sequential way of all the day to day concepts of management training. This covers different subjects such as the estimated value of the enterprise as well as the training and learning of employees and clients.

The Virtual Incubator is an IEBTA project added to a concept of operations and logistics based on new technologies and interaction with the best there is in the support industry.

Organisations which support the Antioquia Incubator of Technology-Based Enterprises	
Universities	
National University of Colombia	Catholic University de Oriente
University of Antioquia	JIC Colombian Polytechnic
Bolivariana Pontifical University	Metropolitan Institute of Technology
University of Medellín	Antioquia School of Engineering
EAFIT University	María Cano University
Lasallista University	
Bodies	
Medellín Public Enterprises	FESTO
Medellín Chamber of Commerce	OIM – German Government
ANDI	SENA
PROANTIOQUIA	METRO of Medellín
Corfinsura	Noel
Leonisa	Suramericana Foundation
Cemento Argos	Oracle
Corona Foundation	World Group - ANDERCOL
National Federation of Coffee Producers	(supports its financing strategy)
The following make significant contributions:	
Government of the Department of Antioquia Municipality of Medellín Colciencias German Government Quebec Engineering School Government of Toscana and Iris and Cesvit Metz National Engineering School	

At the present time, IEBTA has seven enterprises in pre-incubation, thirteen in their incubation phase and fifteen in post-incubation.

Enterprises in **pre-incubation** benefit from services of selection and generation of value of the idea, project or enterprise; analysis and conenterpriseation of the workability or viability of the idea, project or enterprise; accompaniment in formulating the business plan; and assistance in evaluating experimental prototypes (if this is necessary).

Enterprises in **incubation** are assisted through services of counselling about the legal constitution of the enterprise; accompaniment in managing technological and financial resources; help in accessing starting capital, venture capital funds or other models of financing; and counselling services in any area such as finance, accountancy, production and/or marketing.

Enterprises in the **post-incubation** phase, and also institutions and enterprises in general, enjoy services of technical support and counselling in different fields such as outsourcing, spin-off products, sensitisation talks, lectures and technical visits, identifying new ideas based on the structuring of strategic clusters, advice and accompaniment in presenting projects for co-financing and financing, guidelines, seminars and training about organisation in enterprises, strategic thinking and the management of human talent, the management of innovation and technological development, business models and the valuation of enterprises.

Some examples of **pre-incubated** enterprises are CREA (bio-technology), CONEXIÓN (connections), COLOMBIA T.V. (television), MADERA PLÁSTICA (furniture and materials for industry), TÚ Y TU BEBE (orientation and sale of products for the care and education of children), VISIÓN VERDE (treatment of solid waste and its transformation into raw materials or new products).

IEBTA: enterprises in the incubation, post-incubation and pre-incubation phases

Enterprises currently in **incubation**:

AFUERA LINK: This enterprise deals with commercialising information on a world scale, specially information to help set up commercial links between purchasers and sellers. It takes advantage of commercial opportunities that appear in the market and acts as an agent between the person who wishes to buy and the supplier that has the capacity to meet that need, between the person who wishes to sell and clients that are disposed to buy, and between economic sectors which share the need to buy or sell similar products.

CONSULNET: This enterprise works in tele-information and information systems for the hotel sector, such as cabling to connect computers, internet communications, creating and running web sites on the internet, remote administration, the analysis, support and auditing of projects and the hotel information system.

CRP: This enterprise works in the area of client service and helps in the management of service. Through the internet or a private virtual network it becomes the communication and operational channel between the enterprise and its clients. This gives both sides real-time permanent monitoring of their relationship. It allows companies to collect, store, analyse and manage information from clients, and it allows clients to monitor the requests they make to the company.

FROG: This enterprise researches and adapts new technologies in public and private communications based on information networks.

GESCOMER: This enterprise provides integral solutions for the commercial management of in-home public service enterprises (E.S.P.), making these organisations more efficient through the suitable, correct and opportune management of information. For this, new computer tools are developed whereby the product support and maintenance service becomes the most important component in the commercial relationship.

HOMINI: This company specialises in developing and implanting systems to check and authenticate the identity of persons who engage in operational and commercial transactions. This is done by physical or electronic means or using the internet, and the company employs biometric technology. Its portfolio includes unique identification services –

digital signatures – for citizens dealing with the State, and the particulars of all digital operations conducted on the internet including conenterpriseation of people's identity in the integral health information system, the national labour information system and other State information services. On the web, there is a conenterpriseation system for electronic transactions involving the State such as the paying of taxes, pensions and indemnities, and the adjudication of contracts and of virtual and physical government and private elections.

INTERACTUAR: This company provides computer solutions of its own or from third parties, and it is specialised by sectors. It is not sold to the client as a product but as a service that is leased via the internet (Application Service Provider, ASP).

MPC: This company issues and digitally distributes multi-media content to educate, motivate, entertain and inform employees and captive audiences, and promotes services and products with the same benefits as traditional analogue television, at a cost that medium-sized enterprises can afford. The great difference is that the content and frequency are controlled by the client, and there is a mix of information from different media like internet, data bases and real time tele-conferencing, which allows commercial and administrative corporate objectives (marketing, sales, service, management, human resources, etc.) to be efficiently met.

NETMO: This enterprise works in the area of the planning, operation, fault management, performance and configuration in telecommunications networks.

PLC: This is a service and development enterprise in electrical and electronic engineering which is based on good knowledge of the technology involved and a high degree of creativity. It offers solutions in automation in industrial processes, manufacturing and innovative technological development

S-SQUARE: This is a consultancy and advisory enterprise specialised in simulating business processes, and it provides organisations with decision-making tools.

VISIÓN TECNOLÓGICA: This enterprise is oriented to the design and export of components for developers who use the Delphi and C++ Builder languages, supported by all the infrastructure and technology available on the internet. It is also oriented to creating software tools which cover

a wide range of the commercial applications offered by the media using a massive distribution strategy via the internet, electronic payment and strategic alliances.

The enterprises in **post-incubation** include:

ACCIM: The initials stand for massive intelligent access. This company provides integral solutions which are based on the intelligent management of access, and it offers a management system that is intelligent and highly dependable. The system is used for managing valuations, offices, access control and the management of precautions, it is a powerful administrative tool for planning, execution and control, and is the most efficient means for the direct market.

A-MAQ: This is a high technology research enterprise in vibration analysis applied to machines, systems and mechanical structures to detect faults, prevent disasters, meet standards, and check and improve quality.

CAD: This company creates products for other companies and helps them to create value for their clients through designing, developing and commercialising new concepts and identifying new innovation opportunities, by engineering and producing a prototype rapidly. At the present time it is working on vending machines and three-wheeled vehicles.

CICENET: This is an internet business information and knowledge centre. Its main aim is to support electronic commerce for exporters that are seeking to set up electronic channels on internet protocols for commercialising their products or services in international markets. A second aim of the company is to explore the possibilities of commercialising information and/or knowledge in the same scheme.

COLOMBIANET: This is a multi-purpose enterprise in communication services. Its aim is to render services based on state of the art technology, and wherever the user is there will always be an agent available at any time or in any space to attend to his needs.

CONVISIÓN: This enterprise aims at applying state of the art technology in our environment so as to optimise the use of energy and the natural resources that produce it. It also works to automate productive processes so as to make industry more efficient and competitive in domestic and international markets.

CYBERIA: This service enterprise is a corporative network security consultant. It provides improved security in company networks so as to

give them better possibilities for electronic commerce to be able to survive in an increasingly technologised market. Cyberia provides advisory and consultancy services, implements software and hardware security tools, and trains personnel.

DDI: An engineering company geared to the need for automation, control, updating and the appropriation of technology. It adds a high knowledge content and applies specialised software. At present it has 36 staff who are engineers, technology experts, technicians, and project and maintenance operators.

FACTORING MARKET: This enterprise develops, launches and administers virtual markets which generate high added value. Artificial intelligence technologies are used to handle business to business or business to consumer transactions.

ENDO VASCULAR DEVICES: This enterprise develops its own designs for coronary stents (intravascular prostheses) and specialised devices for use in heart operations. It is registered and approved by the Colombian official medicaments office – INVIMA – and it is authorised by the United States Food and Drug Administration, the FDA. The company has applied for a patent in the USA, and is preparing to apply for the CE-Mark in the European Union.

IDEAS APLICADAS: A computer service provider for the business area which aims at improving its clients' competitiveness and growth by providing opportune and reliable business answers. Its services and products are backed by competent personnel who stimulate innovation and creativity with technology and methodologies whose quality and efficiency standards are certified at a level that is recognised internationally.

LIDERAGRO: A company that develops and applies specific solutions for the agricultural sector through innovations in the management of agro-industrial enterprises. These involve implementing information systems that coordinate the work of teams that are specialised in areas like the production of improved seeds, and using bio-technology processes and the genetic selection of cattle in milk production.

INTERSAT: This enterprise develops applications for interactive audio response platforms to provide services that add value in telecommunications. Its portfolio of products and services includes pre-paid communications from fixed telephones to cellular phones inside the country and internationally, external control over the telephone services of compa-

nies so that calls can be managed by restricting times, origin numbers, numbers called, and duration. This optimises telephone services inside large, medium-sized and small enterprises. There is a single service which allows investment in the concept of payment on a cellular telephone (the person who receives the call pays); advertising during a call, whereby advertising information can be presented to both parties during a call; DIAL (automatic call directioning) which is a virtual number that allows connection to any domestic, cellular or international number; and the development of different products in audio-response systems such as competitions, and the capture and delivery of information.

V-FACTORY: This enterprise aims to be the Latin American leader in the creation, development, promotion and management of virtual business for domestic and international markets, making use of the high technology available in the international ambit and the competitive advantages of the country. Its basic tool is the internet, where the high level of diffusion and the exchange of knowledge, products and services take place in real time and without geographical barriers.

WINET: This is a new enterprise in the computer services sector that focuses on providing outsourcing services for optimising business processes. It is based on internet technology and has the optional support of digitalised documents. Its portfolio of services includes constructing, setting up and administering the process of preparing, scanning, indexing, and the storage and consultation of digitalised documents; the intelligent recognition of characters and data-construction of applications in internet/intranet for transnational processes and for process control (workflow); and the construction of e-business systems.

IEBT in Antioquia is also developing a series of special projects. These are:

Agricultural Groupings Incubator: This agricultural incubator aims to identify economically viable social and environmental projects so as to provide them with ongoing accompaniment through management, preparing business plans, formulating projects and giving advice in the different business areas.

The groupings or clusters become the structure of the incubator, those being understood as enterprise conglomerates which create synergy through effective relations, seeking to consolidate business and agreements with each of the main actors such as suppliers of raw materials,

enterprise transformers, academic institutions, and financial and commercialising bodies.

The first agro-industrial incubator is based in the city of Apartadó and gives coverage in the sub-region of Urabá in the department of Antioquia. It has support and continuous accompaniment from the Antioquia incubator for technology-based enterprises.

Regional Innovation Centres (CIR): This is a joint programme involving IEBTA and the Medellín Chamber of Commerce for Antioquia. The aim is to identify enterprise initiatives in the regions. For that purpose, there is a programme of sensitisation and positioning in which the activities of CIR are publicised among producers, institutions and people from the region. At the same time, ideas, projects and enterprises are received so as to give them accompaniment in getting established or in consolidating.

CIR are directly or indirectly linked to developing scientific, academic, technological or entrepreneurial activities in the region, with the aim of building up a work network.

The first CIR went into operation on 1 August 2001 in Ciudad Bolívar. It covers the south west of the Antioquia region, and it seeks projects of an agro-industrial nature.

University Innovation Centres (CIU): This is a joint IEBTA-university programme which has a physical space in the university. Its objective is to generate an environment that is favourable for the development of enterprise initiatives that are born as proposals from undergraduates, postgraduates, ex-students, university teachers, members of research centres or any agent from the university who is directly or indirectly connected to science, technology or business.

From this starting point the incubator works to put the initiative into practice in a business sense, searching for financing, accompaniment and transference of management models, until the enterprise is successful.

The incubator is currently accompanying the setting up and strengthening of innovation centres at the University of Antioquia and the Antioquia Engineering School.

Technological Maps: These are a technological service for which the incubator has developed an interesting methodology. The service allows new business and strategic technological plans to be visualised, and the incubator focuses on developing these for enterprises.

7.3. The INA's contribution to a local-based sustainable tourist industry in Costa Rica

The history of development in Costa Rica is unusual when compared to that of the region. In the last fifty years the country has enjoyed a rate of economic growth that is among the highest in Latin America. Meanwhile, there has been a high degree of stability in the political system and considerable progress in the social sphere thanks to sustained investment in developing the capacities of the population. Consequently, there has been a contribution to improving the quality of life of the inhabitants.

However, the domestic and world situation in which this pattern of development evolved has been gradually changing in recent decades. Initially, the consequences of these changes were absorbed by the system and it became consolidated, but towards the end of the 1970s and in the 1980s the rhythm of change accelerated. The crisis at the start of the 1980s laid bare a series of problems, and gave rise to an in-depth and wide-ranging national debate about which development paradigm the country should adopt. This debate has not finished yet.

Apart from these different opinions, it seems clear that any perspective on development will have to preserve the fundamental characteristics of Costa Rican society which give it its identity, and any initiative will only be successful to the extent that these can be conserved. Three main characteristics stand out, first, the emphasis on social equity, which is understood as an egalitarian distribution of income, access to basic services, and opportunities for personal, economic and cultural development. The second is the investment in developing people's capacities, and the third is the perspective of sustainable development which preserves the country's natural resources as a strategic asset.

This is the context in which Costa Rica is meeting all the familiar challenges that the current regional and world situation poses, particularly the challenge of raising its levels of productivity and competitiveness through sustainable economic development strategies. For this, the country has a series of assets or advantages which have the potential to be a solid network on which to base prosperity and satisfactory living standards for Costa Ricans in the future. These assets are as follows:

- Income distribution that is more equitable than most countries in the region.
- Adequate access to basic services like education, health, housing and social security.
- A strong culture of democracy, a stable political system, and institutionalised mechanisms to resolve social conflicts.
- High average levels of training in the population.

- A path towards sustainable development based on preserving natural resources. There is wide social and political consensus about its importance and it can be considered State policy.
- It is a small country as regards size, population and the economy, and this means it has a minimal impact in other markets, especially in those of the more developed countries, which is important in the context of trade agreements. However, while any expansion of Costa Rica's role in the world economy is bound to be relatively small, it would have a big impact inside the country.

In the context of a crisis in the traditional agricultural sectors (coffee, sugar), the best way to take advantage of the country's assets can be found in a deep-rooted trend in the national economy, namely the transition from an agricultural and agro-industrial economy to one in which tertiary activities, particularly commerce, tourism and services, are coming to the fore.

The development of the tourist industry

For the purposes of this study we will focus on the development of the tourist sector in Costa Rica in recent years. An analysis of the number of foreign tourists who visited the country between 1992 and 2000 shows there was an increase of 85% (Table 1). The relative weight of tourism in generating foreign currency

Table 1
Number of international tourists visiting Costa Rica
Absolute figures and percentage of growth year by year 1992-2001

Year	Number of Tourists	% growth
1992	610,591	0
1993	684,005	12.02
1994	761,448	11.32
1995	784,610	3.04
1996	781,127	-0.44
1997	811,490	3.89
1998	942,853	16.19
1999	1,031,585	9.41
2000	1,088,075	5.48
2001	1,131,406	3.98

Source: Author's preparation, based on data from Costa Rica Tourist Institute (Statistics Annual 2001)

increased considerably, and in 2001 tourism accounted for 25.5% of all income from exports (Table 2). Lastly, the contribution of tourism to the GDP went up from 4.6% in 1991 to 7.8% in 2000 (Table 3).

Table 2
Share of different sectors in generating foreign currency 1996-2001

Year	Exports thousands USD	Electrical micro- structures %	Tourism (%)	Coffee (%)	Bananas (%)	Meat (%)	Sugar (%)
1996	3758.4	0.0	18.3	10.3	16.8	1.1	1.2
1997	4205.5	0.0	17.1	9.6	13.7	0.7	1.0
1998	5526.6	17.9	16.0	7.4	12.1	0.4	0.8
1999	6640.8	38.5	15.6	4.3	9.5	0.4	0.5
2000	5847.7	28.3	21.0	4.7	9.3	0.5	0.5
2001	5005.9	16.2	25.5	3.2	10.3	0.5	0.7

Source: Author's preparation, based on data from Costa Rica Tourist Institute (Statistics Annual 2001).

Table 3
Share of tourism in GDP

Year	TOURISM USD millions	Tourism / GDP
1991	330.6	4.6%
1992	431.1	5.0%
1993	577.4	6.0%
1994	625.7	5.9%
1995	659.6	5.6%
1996	688.6	5.8%
1997	719.3	5.6%
1998	883.5	6.3%
1999	1,036.1	6.6%
2000	1,229.2	7.8%

Source: Statistics Annual, ICT and BCCR

According to estimates for the year 2000 the tourist business employed about 140,000 people, which amounts to 10.6% of the working population of the country. The only sectors that employed more people were community social services (25.5%), agriculture, forestry, hunting and fishing (20.4%), and the manufacturing industry (14.4%). Tourism generated more jobs than the wholesale and retail

trade (9.6%), construction (6.8%), transport, warehousing and communications (5.9%) or financial establishments (4.8%).

Costa Rica's good performance in the tourist sector has to do with the assets mentioned above, but there are other factors that work in favour of competitiveness. First, Costa Rica has a lot of diversity (in climate, flora and fauna, culture, and possible activities) that is geographically concentrated in a small area, and this means the tourist offer includes a wide range of products that are all interconnected. Second, the infrastructure of the country is sufficiently dense for tourist attractions to be accessible. Third, a number of companies that are specialised in different consumer niches or sectors have developed the local market. Fourth, 45% of the tourists who visited Costa Rica in 2001 were from North America. Fifth, the strategy of sustainable development that was mentioned above has resulted in a well-structured system of conservation. Lastly, the country has consolidated its image as one of the main destinations in the world for naturalists.

However, future possibilities for the development of tourism are not predetermined. Hence, in the framework of the national tourist development plan,⁵¹ three alternative scenarios have been put forward for the future of tourism in Costa Rica. Each has its own characteristics and restrictions for facing the future as well as different consequences for local development prospects and for the demand for training.

Scenario 1: The Current Trend

In this scenario the current trend would continue. This trend is for tourism based on traditional tourist activities, and these would continue to develop in a very spontaneous way with very little structural or spatial organisation. Investment and the growth of the offer and of services would come from initiatives by the agents themselves, investors/builders, wholesalers and travel agents. Public investment would continue to be reactive, and the margin for promoting private investment would continue to be small.

Unplanned development would continue, and because of the characteristics of the market it would tend to be concentrated in places that are already highly developed. Therefore, the country would still not have a national strategy for effectively developing infrastructure to support this private investment in tourist facilities.

In this scenario, big changes in the design or innovation of products are unlikely. The tourist locations which already enjoy a considerable degree of devel-

| 51 Costa Rican Tourist Institute (ICT): *Plan Nacional de Desarrollo Turístico 2002-2010*.

opment, and the products that are commercialised there, would be strengthened. However, the industry would still be dispersed. The image of Costa Rica as a tourist destination would remain the same, and the marketing strategy would only be to renew the campaigns from time to time.

Scenario 2: Sustainable Tourist Centres

Development would be based on a much more integral effort. Spatial planning would determine the areas where development was to be concentrated and it would be multi-polar, that is to say tourism would be structured and concentrated in different locations and different kinds of attractions. This would allow sustainability to be implemented as a fundamental principle for development, and thus ensure a balance between the environmental, social and economic variables.

Infrastructure would be built up by the public sector in a pro-active way and in association with the tourist centres to be developed. Private investment, mainly in medium-sized installations, would be encouraged, and a new generation of incentives for tourists would be established to promote this investment.

Tourist products would be developed in other parts of the country where tourism would be fostered, and this would make for greater diversification in the offer.

Costa Rica as a tourist destination would acquire the image of ecological sustainability, and the marketing would be adjusted to this new situation. The idea of the country as a tourist destination would gain strength, which would allow some regions that currently have little tourist development to become more competitive.

Scenario 3: Concentration in Development Poles

This scenario involves selecting one to three tourist centres that have the potential to develop quickly, and concentrating all public and private effort in those places. The rest of the country would continue to operate in accordance with scenario 1.

Public investment would be concentrated in these few centres, and a new generation of incentives focused on mega-projects would be implemented to attract private investment to big projects. Sustainability would not be a determinant factor in these centres because the cost-profit relation would be focused on

generating an offer that would cause demand to increase rapidly. In addition, the development of these centres over the next ten years would generate sufficient demand to be able to indirectly promote development in other parts of the country.

The image of the country would have to be split. On the one hand there would be direct promotion of domestic destinations regardless of the image of the country, and this would be done with a contribution from the State but mainly through private investment and using private or mixed promotion mechanisms. On the other hand, the focus on nature in this tourist destination would remain for the rest of the country and there would be no big changes in the communication strategy.

The characteristics and restrictions of each of these scenarios are shown in the table below.

Characteristic	Current trend	Sustainable centres	Development poles
Planning instruments	Local development plans and regulatory plans both aimed at orienting but with little impact on development	Planning unit prepares sustainable plans for land use. Regulatory development plans, and strategic plans for centres linked to land use plan and with a determinant effect on the control of development	Master plan for development centres. The rest of the country continues as in scenario one
Infrastructure development	Public investment reactive and dispersed, depending on the possibilities	Moderate public investment oriented to sustainable centres and at the level required for medium-sized enterprises	Very high public investment concentrated in the centres in accordance with the needs of the big development projects
Return on investment	Moderate to fast	Slow to moderate	Very high, but concentrated in the centres
Generation of employment	Moderate over a large part of the country	High and distributed across the country	Very high, but concentrated in the centres
Tourist installations	Variable, without a determinate focus. Lodges, cabins and medium sized hotels	Focus on medium-sized enterprises	Focus on large enterprises, possibly mega-projects
Quality of tourist services	Relatively low	High due to competition between centres	Very high in the centres, and radiating to the rest of the country in the middle term

Characteristic	Current trend	Sustainable centres	Development poles
Type of tourist	Intermediate-low market with general interest in the destination	Intermediate-high market with interest in a combination of nature, adventure, sun and beach	Intermediate market with focus on sun, beach and having fun
Local development	Possibilities of moderate to high	Good possibilities depending on planning in the use of the land	Low
Negative social impact	Moderate	Low in the centres	Moderate to high in the centres and support communities
State effort in marketing	Moderate to high about the destination's image	Moderate to high with image of destination and multi-product	Low Private enterprises assume the main role
Capacity for protecting the environment	Very low because of dispersal and weak capacity for control	Moderate, depending on investment and control in the centre but manageable because of planning	Very high in function of the concentration of impact in very specific areas
Training needs	Moderate and constant.	High in the short term and moderate in the middle term	Low in the centres, with a positive impact in other areas of the country
Multiplier effect in the economy	Moderate and constant	High in the middle term	Low and constant in the centres, but having an indirect effect in other places
Cost of implementation	Low	Moderate	Very high, basically because of public and private investment
Guarantee of expected results	Low	Moderate	High

The strategic planning group which put forward the three scenarios recommended that the most suitable for developing tourism in the country would be scenario 2. Even considering that it would be more costly to implement than the current alternative, it is clear that there are greater possibilities for development. The vision of the future that it embodies is as follows: *The tourist industry will become one of the main driving forces in the economy of the country, generating direct benefits for human development. It will be of high quality and will be distributed all over the country, allowing efficient use to be made of the natural and cultural resources in the different planning units. Enterprises as a whole will be very professional, and while large,*

middle-sized and small enterprises will co-exist in the different branches of the tourist industry, the main emphasis will be on the small ones. Tourism will be an excellent vehicle for developing the country.

This kind of scenario would seem to be the most promising choice among the various possibilities for stimulating local development. First, it implies that the different regions would have more balanced access to the opportunities opened up by the tourist industry. Consequently, there would be more chance for them to participate, and the negative social impact would be less. The growth which is largely spontaneous that has taken place in parts of the country's tourist offer tends to perpetuate the differences that already exist, with certain areas already positioned as tourist destinations and other areas not being taken advantage of or missing out on this development. In addition, in some cases this may translate into a negative social impact because the competition to attract visitors could bring about a displacement of traditional activities in the economy and in local culture and societies, and this could cause an effect which is contrary to what was initially sought. Lastly, there is the risk of ruinous duplication between the different initiatives, especially those on a smaller scale.

The problem of disparate development in different regions is also a risk in a strategy which exclusively favours mega-projects. Although these projects could achieve positive results or even be massively successful, the jobs such initiatives generate are usually restricted to a few small areas and even at the local level this option implies the risk of negative social impact. Besides, this kind of development does not generally involve local actors to any significant extent.

On the other hand, the scenario of sustainable development centres is based on social participation and strengthening of local management capacities. It is geared to balanced development in different regions, to planning exercises, and to an increasing power of tourism which not only does not threaten natural resources or the social, economic and cultural characteristics of each area, but in fact takes advantage of them as prime asset.

From the point of view of training strategies there are big differences between this second option and the other two scenarios. Spontaneous development tends to produce a weaker demand for training and segmented in accordance with the scale of the undertakings and the previous level of development in different regions. Demand for training would also tend to be more fragmented, erratic, and of a kind that has to be dealt with urgently because this type of development tends to behave reactively to problems as and when they come up.

The mega-project focus, on the other hand, produces demand from the most concrete investment poles, and this is concentrated in the initial phases of development. The effect on demand for training in other regions that are not involved

is much less. Most of this demand would be oriented to specialised and technical contents and not so much towards developing management and business capacities.

The strategy of sustainable development centres would require continuous training systems that are flexible and diversified so as to be able to cater to different kinds of labour insertion, and demands for a diversity of competencies. While this involves a higher degree of complexity, it would be supported by the intensive use of planning tools, and public and private institutions would necessarily cooperate. Lastly, it would involve a wider and integral vision of the demand for training. Therefore, the whole country and local society would be involved in a kind of tourism which would take advantage of rather than threaten local characteristics and competitive advantages so that the trainees would not only be people directly employed in the tourist industry as such. As well as staff and entrepreneurs in the hotel, catering and tourist agency sectors, there would also be a need to train public employees, the police, transport workers and all those who would have a direct or indirect connection to tourism.

The INA: A strategic asset for a policy of training for the development of tourism in Costa Rica

The Costa Rican National Training Institute (INA), which was founded in 1965, is a public body with a tripartite management system. It is financed through a specific tax on the gross salary payroll. As a rector institution for vocational training in the country, it gives national coverage and its training offer reaches all sectors of the economy.

INA is organised into five regional and two sub-regional centres.⁵² Among other functions, these units identify local needs, programme their training, obtain the packages or courses, contract instructors, discharge the services and issue certificates to the students. The regional units offer the different learning modalities that the institution has.

To carry out their training work the regional units have to coordinate with sectoral bodies which are called nuclei of training and technological services. There are twelve nuclei (see below) which are technically un-concentrated units which facilitate different actors in vocational training working jointly in a specialised area so as to improve quality, productivity and competitiveness in enterprises through training, vocational training and adapting and transferring technology.

⁵² The INA regional centres are Huetar Atlántica, Pacífico Central, Huetar Norte, Chorotega and Brunca. The sub-regional offices are Central Occidental and Central Oriental.

As well as assisting the regional units, the nuclei are authorised to create Specialised Centres which are set up in spaces for research and development, technical assistance and consultancy for enterprises, and interaction between training, work, technology and production.

The twelve INA Technological Service and Training Nuclei are:

- **Vehicle Mechanic Nucleus.** Sub-sectors: light vehicle mechanic, heavy vehicle mechanic, agricultural mechanic.
- **Metalworking Nucleus.** Sub-sectors: precision mechanic, industrial maintenance, metallic construction, automobile panel beating and painting, moulding and metal casting and founding.
- **Textile Production Nucleus.** Sub-sectors: textile and industrial garment-making machine mechanic, textile production, industrial garment-making.
- **Hotel and Tourism Nucleus.** Sub-sectors: catering, hotel management, travel agencies.
- **Agricultural Nucleus.** Sub-sectors: zootechny, plant production, irrigation, drainage and soil conservation, agricultural mechanisation, agricultural management.
- **Sea Fishing Nucleus.** Sub-sectors: naval mechanic, fishing, navigation, aquaculture, fishing for sport.
- **Electrical Sector Nucleus.** Sub-sectors: electricity, electro-technical, refrigeration.
- **Foodstuffs Industry Nucleus.** Sub-sectors: baking, conservation of fruit and vegetables, meat processing, processing dairy products, chocolate making.
- **Materials Technology Nucleus.** Sub-sectors: construction industry, design, plastics industry, furniture industry, packing, wrapping and storage of materials.
- **Administration, Commerce and Services Nucleus.** Sub-sectors: marketing and sales, administration, production, advertising, accountancy and finance, computers, image, secretarial management, occupational health, business management, training trainers.
- **Handicrafts Nucleus.** Sub-sectors: shoe-making, cabinet making, leather, made to measure tailoring, handicrafts, hairdressing and beauty.
- **Graphics Industry Nucleus.** Sub-sectors: flexographic printing, pre-printing, offset printing, screen printing.

The need to coordinate the regional bodies and the sectoral nuclei stems from their mutual dependence on training resources. Despite the fact that the centres (except specialised ones) usually depend on the regional offices, the instructors, curricular design and resources for rendering technological services are in the orbit of the nuclei.

This organizational scheme facilitates horizontal coordination in at least two senses. First, it makes possible a national vision in national strategies (nuclei which co-ordinate with different regional offices), and second, regional demands may involve more than one sector (different nuclei co-ordinate among themselves to meet a regional demand).

A far-reaching transformation of institutions was begun in 1994 and the tourism nucleus was set up in 1996 to cater to the expanding tourist sector. Its objective is to seek new vocational training schemes which will provide a suitable response to the growing need for competent staff able to contribute to the productivity and competitiveness of the national tourist sector.

Its objectives involve:

- To establish and to keep constantly up to date a system of standardization, training, and certification of labour competencies for the tourist sector.
- To provide technological services for enterprises in tourist sub-sectors, to improve their productivity and competitiveness.
- To implement a system of guaranteeing quality in the internal and external management of the nucleus.

The tourism nucleus deals with the sub-sectors of hotel management, catering and tourist services. It works in the modalities of initial training (learning and skills), complementary training, dual training and distance training, and it also offers services of certification, the accreditation of training, and technical and technological assistance to enterprises. The main training programmes in the tourism nucleus are given below.

INA Tourism Nucleus offer of vocational training

CATERING SUB-SECTOR

- Hotel assistant chef
- Hotel chef
- Costa Rican Caribbean cooking
- Spanish cooking
- Typical Costa Rican cooking
- Italian cooking
- Grill chef
- Desserts and confectionary
- Cooking for tourist micro-enterprises
- Bar and restaurant service and special events
- Bartender
- Saloon staff
- Tropical fruit-based cocktail service
- Flaming and serving delicacies at the table
- Banquet and buffet organization and set up
- Preparing and serving food and drink on tourist boats
- Serving wines
- Preparation and service of coffee-based beverages
- Table service and client attention
- Bar and restaurant for tourist micro-enterprises
- Bar and restaurant staff

HOSTELRY SUB-SECTOR

- Tourist group leader
- Room service
- Management of security department
- Plans and procedures in hotel security
- Laundry services
- Cleaning rooms
- Bellboy
- Hotel receptionist
- Housekeeper
- Table service for tourist micro-enterprises
- Security in tourist enterprises
- Reception for tourist micro-enterprises

TOURIST SERVICES SUB-SECTOR

- Tourist guide and driver
- Tourist information
- General tourist guide
- Travel and airline agency
- Regional tourist guide
- Tourist marketing
- Ornithology
- Handling snakes
- Rescuing tourists with ropes
- Tourist guide specialised in plants and mushrooms
- Design and sale of tourist packages
- Dealer techniques
- Jungle survival
- Environment legislation
- Impact of hotels on the environment
- Norms of tourist sustainability
- Ethics for tourist enterprises
- Providing tourist services for the disabled
- Tourist guide for fast water, class I to III

It can be seen that the offer covers a wide range of specialised functions and occupations which, as was mentioned above, in some cases are offered directly by the nucleus and in others as a response to demand from the different regional offices.

However, there is another form of action which is taken when the frame of reference is a specific place or a local initiative. It is here that we can see not only the co-ordination between nuclei and regional offices, but also with other nuclei and other institutions, bodies and organizations that do not belong to the INA.

For example, INA is involved in coordinated action with the Small Donations Programme (PPD) of the United Nations Development Programme. This programme was launched in 1992 and it has financing from the World Environment Fund. It aims at providing financial and technical support for community-based groups and non-governmental organizations to respond to environmental problems. The targets are groups that are taking environmental action that will also improve their conditions of life. Since it was set up, the PPD has financed around 160 projects throughout the country, specially in the conservation field of bio-diversity which includes about forty community eco-tourism initiatives.

The INA has become a great ally of the programme, both through the tourism nucleus and through other nuclei that provide technical support to groups that are undertaking all kinds of initiatives. Thanks to INA, personnel in some of these initiatives are receiving training in areas like Local guides, Client service, Natural History in Costa Rica, tourist geography, conversational English to cater to tourists, tourist information, tourist marketing and catering.

One of those initiatives involves working with the divers of Paquera. These are local fishermen who are worried about the fall in stocks in their fishing grounds, mainly of species that are being over-exploited like lobster. Therefore, the programme has helped them to build artificial reefs to block off areas within which the marine fauna can reproduce, leading to a great increase in productivity per square metre. In addition, in order to complement fishing, they have been trained by INA's sea fishing nucleus as master divers, they have acquired the necessary diving equipment and they are taking tourists down to see the reefs and other parts of the sea bed in the area.

Another example of support is the co-ordination between the tourism nucleus and the Agricultural Nucleus involving the training offer of the former and assistance and training from the latter so as to work on community tourism or eco-tourism initiatives, for example, to conserve native flora and fauna.

When it comes to training and technical assistance, the responses that are 'made to measure' for particular regions or places are rarely in the exclusive prov-

ince of one single nucleus but are a combination of resources and effort from different units.

INA does not merely respond to requests that are made and there are many examples of the organisation taking the lead in its dealings with the private sector or communities, initiating action and calling attention to the need to innovate. This has happened in the management and certification of the quality of tourist services, and in ensuring adherence to safety norms (for instance, in adventure tourism).

Moreover, INA's leadership has spread the concept of accessible tourism, which is geared to attracting tourists with disabilities. The private sector had always seen incorporating innovations and modifying tourist infrastructure as an extra expense and, in view of new legal dispositions, as an imposition. The tourism nucleus has succeeded in demonstrating the economic potential of catering to this niche in the market, therefore Costa Rica has not only consolidated its image as a nature-oriented holiday destination but also as one where tourism is accessible.

However, in attempting to insert its action and resources into the framework of the local development process, one of the problems that INA (like other public bodies) is up against is that municipal administrations were recently created. Taking into account that mayors and councils are usually important allies when it comes to local development, there is likely to be a progressive strengthening of the role of these actors to make them legitimate public organs of local government. The high degree of institutionalisation in the country at all levels is marred by a weak tradition of participation and local management. However, recent studies by the tourism nucleus and the ICT show that this is now changing, and there are many local-based economic initiatives.

