SKILLS ANTICIPATION

The Transfer of the SENAI Prospective Model

50 years

International Labour Office
CINTERFOR

Modelo SENAI de Prospecção

SKILLS ANTICIPATION

The Transfer of the SENAI Prospective Model

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The Inter-American Centre for Knowledge Development in Vocational Training (ILO/Cinterfor) is an ILO technical service, set up in 1963 with the aim of encouraging and coordinating the action of the Latin American and Caribbean institutes, organizations and agencies involved in vocational training in the region.

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Presentation

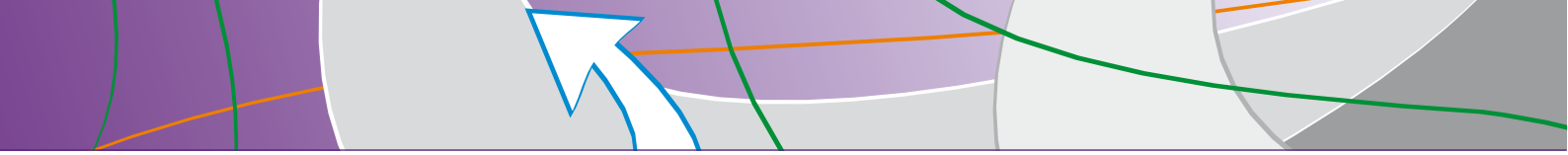
At its 97th Session (June 2008), the International Labour Conference adopted a *Resolution concerning skills for improved productivity, employment growth and development*, which refers to the significance of strengthening competencies for economic and social development and decent work. It underscores the fact that education, vocational training (VT) and continuing education fundamentally underpin employability, jobs for workers and sustainable business development.

It was stressed at the Conference that it was essential to make an early identification of qualification and skill needs – current and future – in order to incorporate this information into national and sectoral development strategies, inasmuch as an unbalanced supply and demand of qualifications has high economic and social costs, and is the consequence of structural unemployment while, at the same time, contributing to it.

Occupational and technological prospective is based on the observation of the labour market and the analysis of social, economic and technological trends in order to assess vocational training needs and ensure that they are tailored to employment. Therefore, it makes it possible to:

- Bring initial education programmes into line with present and future needs.
- Anticipate current, mid and long-term qualification needs, in order to ensure a better match between jobs and qualifications.
- Provide all interested parties, particularly displaced workers and those who seek better work opportunities, with appropriate information so that they can change over from declining sectors to those that are doing well.
- Support young people so that they can base their training choices on realistic employment perspectives.
- Enable more informed decisions regarding investment in training and continuing education on the part of employers and workers.
- Make contributions to enterprises in the field of innovation and new technology adoption, through the timely availability of appropriately qualified workers, as well as by upgrading workers' competencies and helping them to continue to be fit for employment.

The National Industrial Learning Service (Serviço Nacional de Aprendizagem Industrial – SENAI) has developed a Prospection Model that makes it possible to anticipate the demand for professional competencies and is based on different types of analyses: basically, technological, organizational, emerging occupations, impact, occupational trends, compared VT and thematic antennae. In order to perform these studies, SENAI connects with a variety of interlocutors: universities, enterprises, science and technology centres, sectoral experts and



others. The SENAI prospective makes it possible to achieve a full overview of the educational, technological and occupational context.

The SENAI Prospective Model has proved its validity, quality and relevance, both in Latin America and in other regions[1]. This acknowledgement extends to the vocational training institutions (VTIs) that make up the network coordinated by ILO/Cinterfor, which have repeatedly requested the transfer of this knowledge.

Fulfilling the ILO/Cinterfor's mission of developing a permanent community for learning and South-South cooperation is possible thanks to cooperation between the VTIs. In addition, management, sharing and collective building of knowledge constitute a salient feature of VT in Latin America and the Caribbean, which has led to very significant outcomes. In keeping with this tradition which is so well-rooted in the region, SENAI and ILO/Cinterfor have deemed it appropriate to transfer the SENAI Prospective Model to several institutions simultaneously, inasmuch as the contributions made by different agencies can facilitate the integration of a critical mass which, in turn, can have a significant multiplying effect.

In this respect, the existence of the Vocational Training Institutions of Central America and the Caribbean Network[2] was a decisive factor in the implementation of the programme "*Skills anticipation – The Transfer of the SENAI Prospective Model*" with five agencies: INA/Costa Rica, INFOTEP/Dominican Republic, INSAFORP/El Salvador, INTECAP/Guatemala and INADEH/Panama.

The transfer and adaptation to national reality process began in May 2012; this paper provides a compilation of its specific results. Over the course of 14 months, three face-to-face meetings have taken place, sponsored by INSAFORP (May 2012 and April 2013) and by INA (November 2012). A community composed of officials from these VTIs, SENAI and ILO/Cinterfor meets online[3] to share knowledge and papers.

We extend our deepest gratitude to SENAI for its invaluable support, which is evidence, once again, of its willingness to share its substantial knowledge; as well as to the officials of the VTIs mentioned above, who have carried out significant prospection work for their countries and contributed notably with ideas for adaptation and innovation that will be of great use to other network institutions.

Martha Pacheco
Director, ILO/Cinterfor

1 OECD/ECLAC. Latin American Economic Outlook 2013. http://www.oitcinterfor.org/en/node/5132

2 Comprises INA/Costa Rica, INSAFORP/El Salvador, INFP/Haiti, INFOP/Honduras, INTECAP/Guatemala, INATEC/Nicaragua, INADEH/Panama, INFOTEP/Dominican Republic.

3 http://evc.oitcinterfor.org/course/view.php?id=22

An introduction to prospective studies[4]

1

Human beings have always looked for ways to understand and predict the future. The history of humankind is full of actions and procedures whose purpose was to satisfy the need to know what was going to take place at a later time. References are many, from the great Biblical leaders who sought to guide their followers though their visions of the future under the form of prophecies, to the famous oracles in ancient Greece where priests, sorceresses and soothsayers would foretell the future. Plato stated that a command of the "science of the future" was what distinguished gods from men and that it was through this that men sought to be gods (Vieira, 1665).

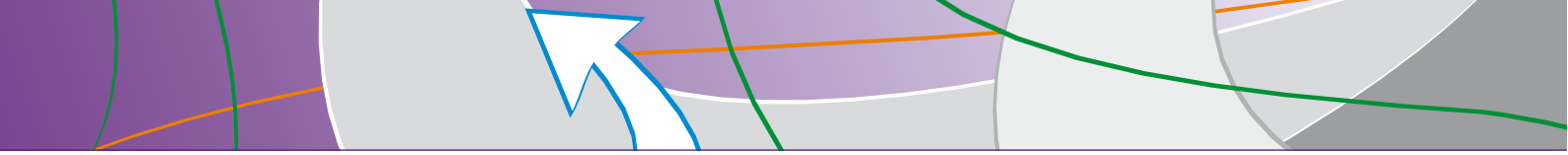
For Bowonder (et al. 1999) anticipating the future requires the joint activity of the right and left sides of the brain. Future trends can normally be induced through the following variables: accumulated experience, knowledge of the subject, the logical system used, the availability of information and time, the potential reward, the breakdown of established knowledge, the dynamics of the groups involved and possible perceptions.

A one-dimensional approach could lead to shaping the future through econometric projection models based on historical references. This form of studying the future is known as "Classical Forecast". In this case, the forecast is not brought into question by its author, since the occurrence of a certain event is considered to be genuinely probable. In a "Classical Forecast" it is not possible to alter trends and the course of events.

A second conception suggests that the future is the result of humankind's actions. This "construction" is performed stage by stage, through actions implemented in the present. On the basis of this new concept, two main forms of approaching the future have emerged: a future which is different from the past (varied and uncertain) and a future which is not determined. A diverse and uncertain future is characterized by an analysis of the complexity, meaning, speed and impact of changes occurring in society.

The approach that deems the future to be undetermined is based on the notion of a future constructed by society, through a process of compiling and systematizing information for decision-making. This is a proactive position based on the premise that human beings are the protagonists of their own destiny and are, therefore, responsible for performing appropriate actions in the present in order to achieve the anticipated future. De Jouvenel (2000) views this position as revolutionary philosophical thinking, since it does away with the idea of a self-regulated system (or a system regulated by God), in which humans are not simply objects, but constitute a fundamental part in the construction of their future.

[4] Produced by Luiz Cruz Caruso and Marcello Pío. SENAI/UNIEP. 2011.



Prospective Studies

Prospective studies can be considered to be systematized processes with a view to understanding the future and may display social, economic, political or technological dimensions.

Events that followed World War II, such as the Cold War and the rebuilding of Europe, were fundamental for the first systematic studies on the future. In the USA, future studies were conducted in military circles, while in Europe, the problems related to economic reconstruction led to studies that focused on the economy. A military prospective study was implemented by the US Air Force shortly after World War II. One of the points initially noted in that study was that communications enabled by artificial satellites would be of great strategic importance. However, these initial observations failed to be taken seriously until the former Soviet Union launched its Sputnik.

Grumbach (1997) has shown that prospective studies became better known after the publication of "Prospective Attitude" by French philosopher and educator Gaston Berger, in 1957. In this work, Berger established a methodology for anticipating a hoped-for future for the world, and considered that prospective research should be:

- **Visionary:** unlike "Classical Forecasts", prospective studies should consider a mid to long-term temporary horizon. In the long term, it is sought to locate and establish the factors that may represent sudden changes in trends. At all events, care should be taken to avoid considerations that merely entail contextual variations over time.
- **Holistic:** prospective studies should consider all aspects of a certain situation. Information should not be fragmented, but be considered as a whole in which every point should be focused and connected.
- **In-depth:** prospective studies should be conducted at a certain depth with regard to the information necessary for the analysis. Obviously, the level of depth will depend on time and objectives.
- **Creative:** regarding this point, a prospective analysis should be able to "assess" current events. This will determine the various possibilities to be faced in the future. After Berger's work was published, several centres were established with the purpose of conducting prospective studies and several works were published that proposed future scenarios and strategic actions so that organizations and persons would be able to operate and work in such scenarios. A classic example of a successful prospective study was conducted by Shell and was able to anticipate the oil crisis of the seventies.

Bearing in mind that in a world of constant change the factors that determine a modus operandi are revised from time to time, prospective studies can be viewed as an interesting tool, which enables organizations to react strategically (acquire flexibility) to sudden changes in direction.

SENAI's Prospective Model

Introduction

For VTIs, the use of prospective methods allows them to gain a considerable competitive advantage, inasmuch as they enable decision-makers to anticipate the demand for qualified labour. This gives institutions the opportunity to offer the best training for that type of workers, reducing the negative effects that would arise from its absence, particularly during a time of economic growth, when intensity is greatest. In addition, anticipating possible changes in the sectors analysed can lead to a variety of technological services to be offered by the institution.

In order to address these issues in relation to possible changes in occupational and educational profiles, SENAI[5], together with some of the country's principal academic centres, developed SENAI's Prospective Model[6], whose general objective is to forecast future qualified labour needs in industry. This paper will review all of the stages in this model.

The Model's outcomes make it possible for SENAI to be better prepared with regard to training labour, thus reducing the negative effects arising from a lack of such labour. In addition, anticipating possible changes in the industrial sectors examined may lead to a number of technological services to be offered by SENAI, which would contribute to increasing the competitiveness of Brazilian enterprises. In this Model, the need for qualified human resources is considered from the perspective of the following dimensions:

- Estimated number of qualified workers.
- Identification of probable occupation profile changes.
- Identification of probable changes in the supply of vocational education (regular and further training courses)
- Development of technological dissemination actions.

The Model is composed of an interrelated set of prospective methodological activities based on known tools. Among the activities anticipated, of particular note is the Thematic Antenna (TA), which summarizes the outcomes of the various activities related to technology, organization, labour and education. The TA is a stage in the discussion process at which the level of knowledge acquired so far is recorded. Subsequently, technological dissemination monitoring activities are activated and new knowledge is produced, to be debated and disseminated in forums specifically created for this purpose.

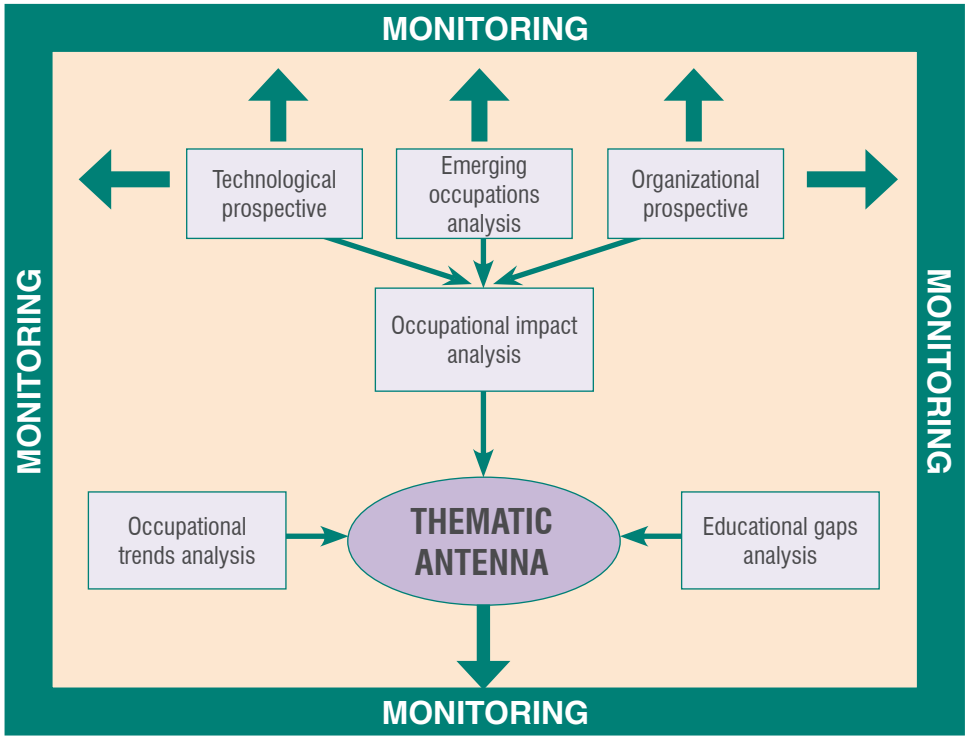
5 http://www.portaldaindustria.com.br/senai/

6 http://prospectase.senai.br

The TA's resulting recommendations serve as guides in the development of future activities in the area of vocational education, technological services and the human resource updating. Thus, SENAI's Prospective Model facilitates the comprehensive analysis of the dynamics of the production sectors and the different ways to achieve a better performance for VTIs.

Figure 1 provides a graphic representation of the flow of activities in the Model process. Its main characteristics and the objectives of the activities are described in detail below. The explanation provided makes it possible to achieve a linear and logical understanding of the ensuing topics, which are organized according to the established methodology. In addition, the techniques employed will be visualized as applied to the sector in question.

Figure 1 – General layout of the SENAI Prospective Model



Source: UNIEPRO/SENAI-DN

Human resources structure for the application of SENAI's Prospective Model

The application of the Model requires the participation of three work teams:

Executive Group (EG): composed of sectoral experts, whose purpose is to provide technical guidance for the studies in the relevant sector. Some of its duties are:

- to select, describe and approve the technologies and occupations to be included in the Delphi questionnaires;
- to choose and approve the lists of experts to make up the Delphi panels;
- to check the outcomes of the technological and organizational prospections;
- to make recommendations.

The EG may be constituted as follows:

- two external experts from the business or academic world;
- two external sectoral consultants, who are also responsible for the sectoral study in its technological and occupational dimensions;
- four VTI experts from the units specializing in training planning or in the sector being analysed.

Delphi and Expert Panels: groups formed by sectoral experts who attempt to identify technological dissemination trends over a period of 5 to 10 years.

Sectoral Experts: groups that contribute their knowledge to the investigation of occupational impact.

Stages in SENAI's Prospective Model

Technological dissemination trends (technological and organizational prospection)

The purpose of technological prospection is to identify Specific Emerging Technologies (SETs) – characterized as developing innovations – that are pre-commercial or have been recently launched into the market, or those with a low dissemination level, independently of how long they have been on the market, of up to 70% of the user market in a time horizon of 5 to 10 years.

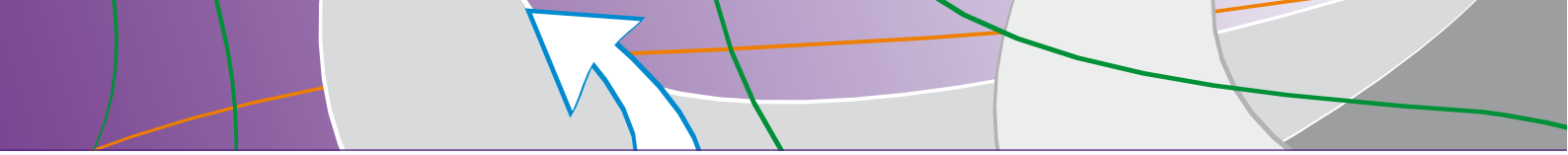
It can therefore be considered that the study is not a prospection into technological innovation specifically as regards the evolution of the state of technology. This is justified by the fact that VTIs have had a strong impact – in relation to labour training – owing to their dissemination of technologies among the stakeholders of an industrial sector.

The goal of organizational prospection is to identify possible changes in the organizational structure of the sector or segment under analysis, in the same time horizon used for technological prospection; that is, between 5 and 10 years. Every sector/segment or productive structure should be capable of recognizing future changes in the most influential vectors of macro-managerial structures, in order to deal better with the uncertainties generated and prepare from the organizational point of view.

The prospective tools used in the identification of technological and organizational dissemination trends are the Delphi research method[7] and Expert Panels[8]. Both tools use as a basis for analysis the SETs identified by the EG.

[7] The Delphi method was developed by Olaf Helmes in the sixties. It consists of asking a group of experts – individually and by means of pre-designed questionnaires – about the future trends of a certain critical factor, system or part of one. The Delphi technique has four basic features: anonymity, interaction, information-sharing and statistical control of answers. Questions are made in several rounds and after each they are analysed and re-framed so that the experts can re-evaluate their initial positions and attempt to reach a consensus.

[8] Expert panels are structured meetings that seek interaction between experts in order to reach a certain degree of consensus.



Analysis of emerging occupations

The purpose of the study is to identify sectoral occupational changes in certain countries, classifying them as emerging or evolving occupations, according to the definition of the Bureau of Labor Statistics (BLS) of the United States. The methodology used is based on mapping and analysing secondary data gathered in Brazil and other countries.

Emerging occupations constitute a set of activities, knowledge, capabilities and skills that are entirely new. Because of this, they may not be categorized in occupational structures. If they have been included within such structures, they are depicted with new titles.

Evolving occupations are those whose work content triggers changes. The activities, knowledge, capabilities and skills needed to perform them are significantly different from those categorized originally in current occupational structures. These occupations are represented by old titles with new work content.

Analysis of occupational impact

The analysis of occupational impact is a step that follows technological prospection and its purpose is to identify and evaluate, with representatives of businesses, universities and other participating organizations, the probable professional profile changes arising from the introduction of SETs and the organizational changes identified. Arriving at this understanding will make it possible to identify a number of possible new activities and competencies related to specific labour groups.

Changes in vocational education are identified by establishing new knowledge, skill and attitude standards, which can jointly generate new vocational competencies. This identification enables VTIs to adjust their vocational training.

This study embraces the concepts established by SENAI[9] and by Tejada (Lazzarotto, 2001), according to which, "*competency refers to a professional's functions, tasks and actions in carrying out his or her work operations appropriately and expertly, as the outcome and objective of a training and qualification process*". The attributes considered were: knowledge[10], skills[11] and attitudes[12].

A study for the identification of occupational impact is carried out with two different groups: the members of the EG and the sector's entrepreneurs. According to the methodology established, research is conducted first with the members of the EG.

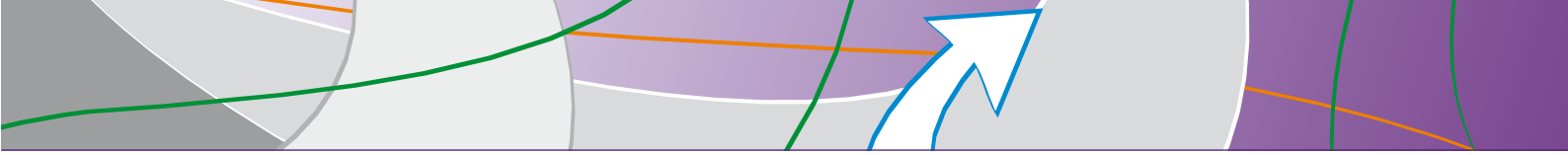
Two questionnaires constitute the research tools – the first is structured and the second is semi-structured. Structured questionnaires are displayed in the form of a template and

[9] SENAI/DN. Glossário das metodologias para desenvolvimento e avaliação de competências: formação e certificação profissional. Brasilia: SENAI/DN, 2004.

[10] Explicit knowledge was considered in this study, as defined by Nonaka & Takeuchi (1997), to be "knowledge transmitted by formal and systematic means, easily codified through formulas, symbols, standards and specifications. It is easily disseminated by current communication systems".

[11] The concept of skills is related to the way tasks are executed, to the application of knowledge and to a form of acting and thinking (Lazzarotto, 2001).

[12] The concept of attitudes is related to the previous and established positioning of an individual, in his or her behavioural form of reacting and acting in the face of a product, organization, person, event or situation. Normally not reiterated over time.



are related to the selected SETs and the Specific Organizational Actions (SOA)[13] driving predetermined labour groups. This template seeks to identify the level of impact (incremental or high) of each action or technology on each of the occupational groups being considered.

After the structured questionnaire is applied, researchers are requested to select the two occupations that will experience the greatest impact from the SETs and driving SOAs. Once they have made their choice, members of the EG fill in the semi-structured questionnaire, in which items involving activities and knowledge are identified for each occupation, which will be more significant if the dissemination of SETs and SOAs occurs. It is underscored that these attributes may be considered novel aspects in the profile of the occupation or occupational group being examined.

These analyses may be performed with regard to a single technology, an SOA, or a group. In addition, research also seeks to identify possible new professionals that may emerge if the selected SETs are disseminated and the importance of the SOAs grows.

The procedure for conducting research among business representatives is similar; the only difference resides in the list of occupations to be analysed. At this stage of the investigation, the four occupations that undergo the highest SET-related impact are selected, according to the answers given by the EG. However, this second group of respondents is allowed to indicate one other occupation which, during the first stage of the investigation, was not included among those that would experience an impact. It should be noted that this fifth occupation must be chosen from among the list of occupations in the questionnaire presented to the EG.

Analysis of occupational trends

SENAI's Prospective Model uses occupational trends analysis in order to estimate changes in the number of jobs in different sectors of the economy.

This methodology is based on the Brazilian economy's input-output model, using two macroeconomic and sectoral scenarios as the foundation for its design: one of them basic and the other optimistic, in an attempt to assess final variation in demand by sector for the years included in the projection. Using two scenarios reduces the level of uncertainty of this type of projection, caused mainly by the economic dynamics of highly globalized markets. Projections can be used by VTIs as a reference in order to adjust and design training programmes.

Analysis of educational gaps

These gaps are identified by means of a comparative analysis of students' skill levels and the profiles demanded in different scenarios. That is, what individuals know or should know is established according to their level of schooling and skills required to take a technical or technological course. With this information, it is possible to determine the need to adjust levels in order to enable students to take advantage of technical training.

[13] Actions to be borne in mind by the Delphi Panel and the EG; highly significant for most or all the links in the chain being considered.

Recommendations

The TA is the final step in the Model, at which all the results obtained in the previous stages are discussed. This leads to recommendations for future VT actions and the updating of human resources. These actions will also enable VTIs to act as "induction" agents in the dissemination of new technologies, by means of activities to reduce uncertainty among production flow representatives at the SET acquisition stage.

As support agents for the production sectors, VTIs should seek to develop products with the purpose of contributing to increasing sector competitiveness. This goal is inextricably linked to the technological update of centres and units, as well as of enterprises.

Decision-making in technological upgrade processes generally entails a considerable amount of uncertainty for the stakeholders involved, which can gradually be eased by providing consistent information regarding the technological trends of the sector in question.

Future scenario studies always include some degree of uncertainty, which prospection diminishes. Recommendations constitute inferences regarding the extent of technological dissemination, organizational trends and possible occupational impact in an established time horizon.

Recommendations produced at this stage entail less financial risk for decision makers. As an example we can refer to recommendations related to updating curriculum designs for students and to updating courses and lifelong education for teachers. In all of them, a fundamentally theoretical dimension is borne in mind, and certain advisory and informative Technical and Technological Services (TTS)[14] are also included.

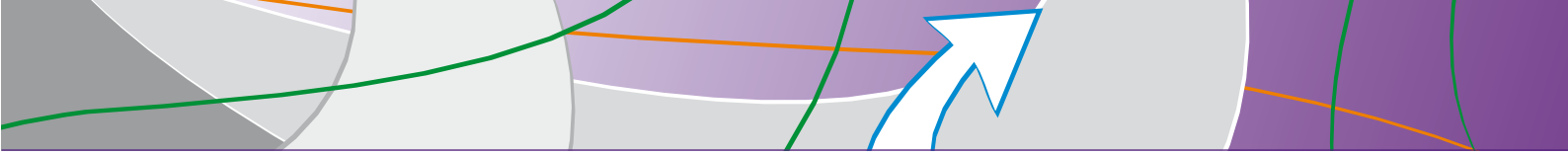
These recommendations are divided into three blocks: curriculum updates for students (basic vocational education, ongoing vocational education and labour market re-entry – further training); curriculum updates for teachers and technicians, and offering TTS.

Selection will depend on the specific demands faced by every training unit or centre, either for new courses and possible end or intermediate job openings, or for the possibility of including new fields in their curriculum design.

Monitoring

Monitoring activities allow feedback to be provided; at this stage, follow-up is performed on the results obtained by prospective and occupational trend studies. These outcomes will enable SENAI to carry out new actions in order to step up support for technological dissemination and the update of their operational units. Monitoring is performed through research into secondary and primary sources, depending on the scale of the segment under consideration, and it takes place within the following dimensions: technological, educational, investment and employment.

[14] SENAI's TTSs include metrology, analyses and laboratory tests on the quality of Brazilian products. Further information at: http://www.portaldaindustria.com.br/senai/iniciativas-senai/programas/programa-senai-de-apoio-a-competitividade/2012/06/1,3954/institutos-de-tecnologia.html



Technological monitoring is performed through the *Technological Fair Prospection and Surveillance Project*, the purpose of which is to follow the evolution of identified SETs and disseminate this technical information among entrepreneurs and teachers. These fairs are of a vertical nature[15] and should be representative, from the point of view of the supply of new technologies. The choice of a technological fair as a suitable setting is explained by the variety of exhibitors (small, medium and large) and of visitors (of medium and high purchasing power), the large number of related events and the participation of institutional organizations (Setúbal, 2004). This diversity generates an appropriate environment for a search for further information regarding SETs, in addition to representing a current depiction of the sector's technological status both in Brazil and in the world. The methodology used is based on three prospective actions:

- **Pre-Fair:** planning the fair.
- **During the Fair:** knowledge of the market, the competitive environment, providers and strategic partnerships, new product development and the institutional scenario.
- **Post-Fair:** gathering and processing information routines.

Educational monitoring makes it possible to support changes in vocational training regulation and promotes debate leading to the positioning of directors regarding such changes.

Investment and employment monitoring regularly follows evolution by sector and by occupation, is complemented by employment projections according to new investment and reports outcomes to institutional directors.

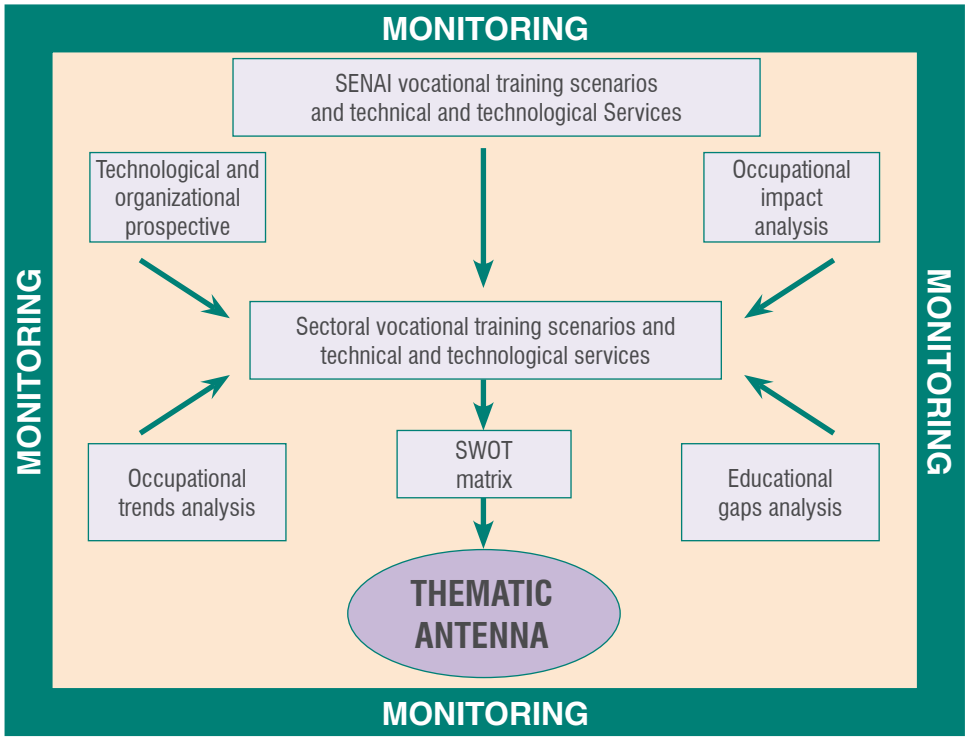
The evolution of SENAI's Prospective Model

A prospective scenario methodology was incorporated in order to increase accuracy rates, thus making it possible to perform analyses in contexts with different variables, other than those studied by the Model.

This methodology enabled SENAI to generate *sectoral scenarios*, which lead to a greater understanding of the future of the different sectors in Brazil. In this way it is possible to achieve better training for labour, reducing the negative effects arising from its absence, particularly at stages of economic growth. In addition, anticipating possible changes in the industrial sectors examined may lead to a number of technological services to be offered by SENAI, which would contribute to increasing business competitiveness. Figure 2 below provides a general outline of the Model with the incorporation of prospective scenario methodology.

[15] Professionals in specific fields are the target group of these fairs.

Figure 2 – General outline of the Model with the incorporation of prospective scenarios



(SWOT: Strengths, Weaknesses, Opportunities and Threats analysis)
Source: UNIEPRO/SENAI-DN

Stages included in the Transfer of the SENAI Model

The transfer process was carried out in the following stages:

- Technological prospective (by means of the Delphi tool and the expert panel).
- Occupational impact (by means of the expert panel).
- Recommendations for the VTIs.

The choice of these stages and their corresponding activities and tools was based on their forming a part of the Model's principal focal point and having a greater chance of being put into practice in training actions and knowledge management. Figure 3 provides a general outline of the Model activities that were transferred.

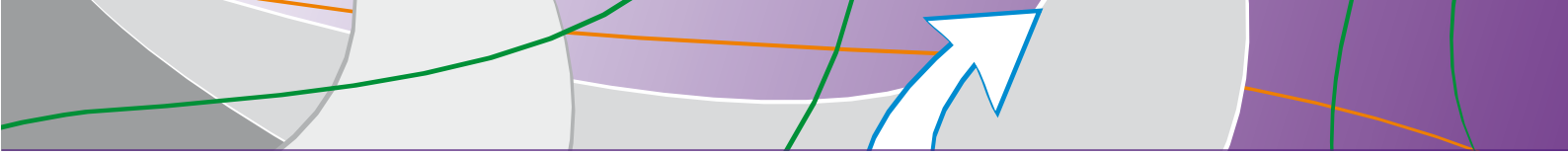
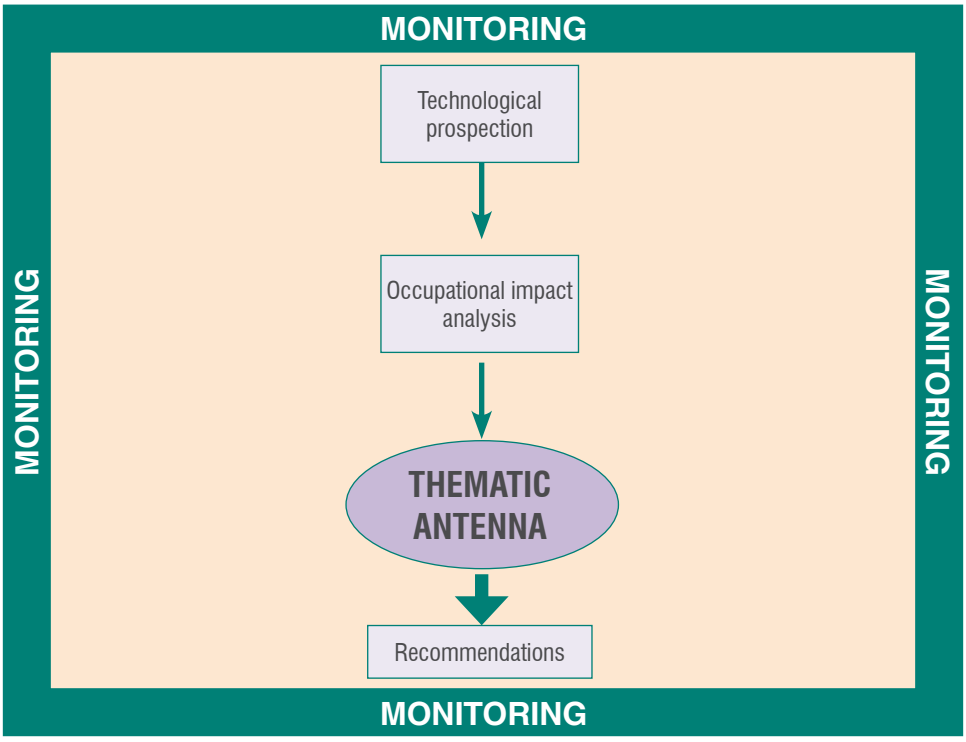


Figure 3 - General outline of activities transferred



Source: UNIEPRO/SENAI-DN

Outcomes of the first Model Transfer Programme

INA, Costa Rica[16]

Sectoral information

The civil construction sector has been very dynamic and has evolved rapidly, with new production activities, technological transformations and developments and the use of new material and equipment.

This industry has generated direct and indirect employment and, therefore, economic and social development. Its vitality demands qualified labour trained by the INA.

According to the report on the "State of the Nation", in 2006, the sectors that showed the greatest growth were construction (18%), agriculture and fisheries (10.8%), the manufacturing industry (10.4%) and transport and communications (10.3%). These results are explained by the connection between the performance of the exporting sector and increased investment in the private sector[17].

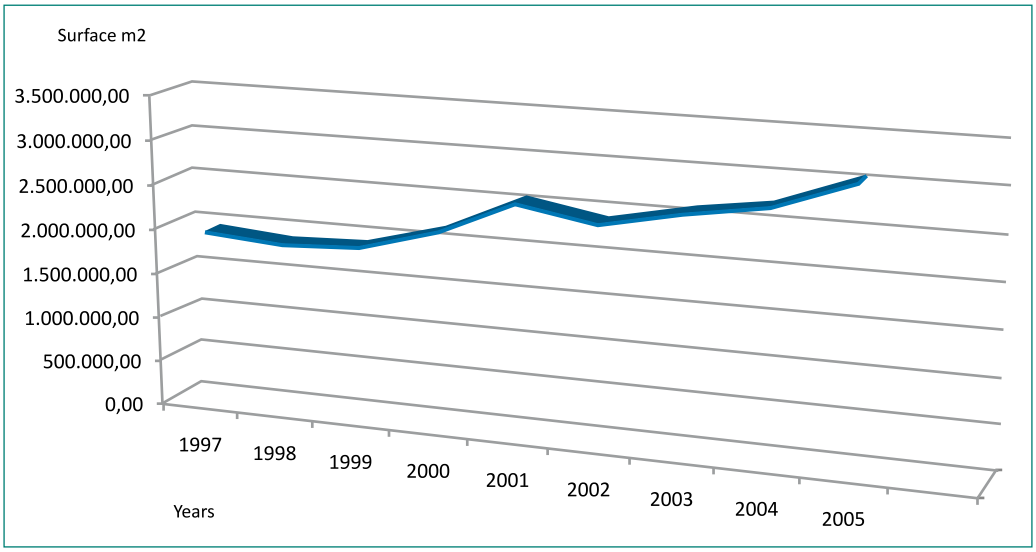
Figures published by the Federated College of Engineers and Architects show that during the first eight months of 2007, applications for permits were made for over 5.3 million square metres of construction, double the number than for the years 2004 to 2006.

According to the Households Survey conducted by the National Statistics and Census Institute (INEC, in Spanish), in recent years the production activities of the construction sector have increased very rapidly. The chart below shows the construction surface in square metres per year.

[16] The full report may be consulted at: http://www.oitcinterfor.org/documentos/estudiosprospectivos

[17] State of the Nation project. XIII State of the Nation report. 2007_1st ed. San Jose, C.R State of the Nation Project 2007

Construction and extensions. Costa Rica (1997-2005)



Source: National Statistics and Census Institute (INEC), 2008.

The importance of this sector for Costa Rican economy is not restricted to its direct effects, such as its contribution to the growth of national production and the generation of employment; it also fosters activities and employment in productive sectors that act as providers. Thus, this industry plays an essential role in national growth and development.

Technological prospection

Methodology employed

It was necessary to collect information from experts for this study, so the INA proposed conducting a survey by means of an electronic form system[18] which made it possible to tabulate results automatically and observe the trend and flow of answers. Statistics could be downloaded directly to a PDF file, spreadsheet or text file. Thus, the first round of questions was conducted using the Delphi questionnaire, which by being based on Internet tools constituted an adaptation of the SENAI Model methodology.

Over the course of two months, 102 answers were obtained from government, private and independent institutions and universities. Respondents were mainly engineers, architects, consultants and business people.

An open question was used to characterize SETs, in order to avoid ambiguities, or the inclusion of some technologies in several categories. In the answers, construction materials were among the most frequently mentioned technology. Construction and consulting were indicated as the processes subjected to the greatest impact as a result of technological change. The Internet was the most widespread source of information.

After the EG went through the answers, 99 SETs were identified; among them, IT received the most votes, followed by composite materials. A list of 30 was extracted from this group, and was used in the Delphi survey.

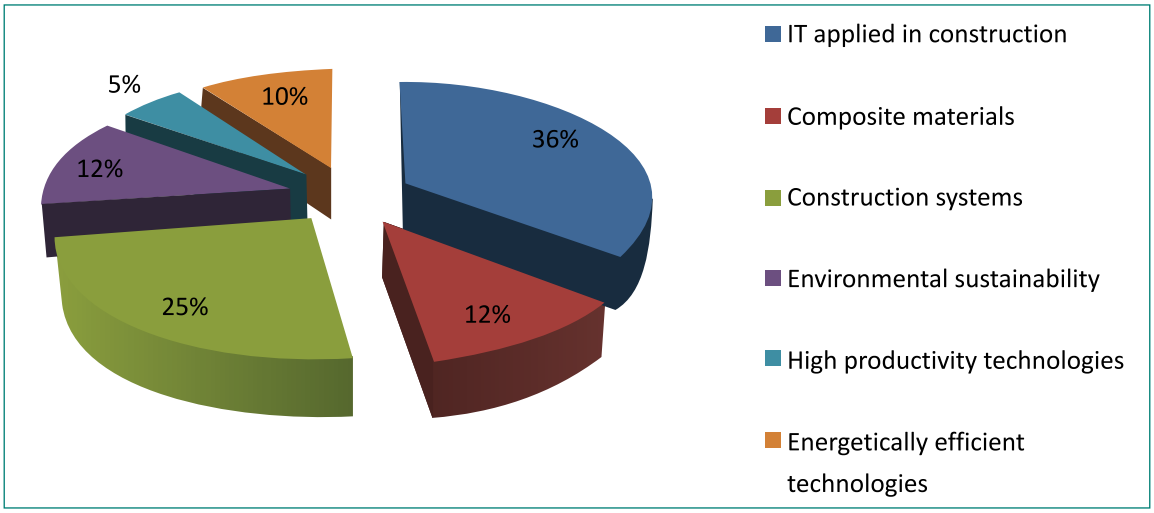
[18] Google Drive forms. Available from: https://docs.google.com/forms/d/1o7DPQsRnYBlBIClVg8qwbJ7tK4eQXIgI8buvm0PoHYY/viewform (Accessed 30 May 2013).

The broad technological areas used to classify them were:

- construction material,
- on-site testing,
- environmental sustainability, and
- IT tools.

This change made it possible to optimize the process and reduce the time involved in analysing and processing data, as well as generating new forms that were more suited to the expert informants.

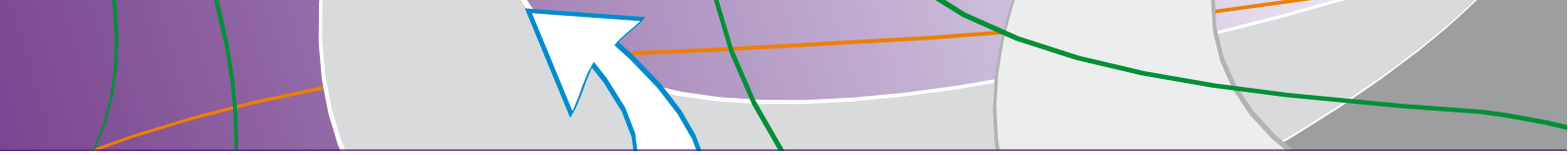
Thematic focus for emerging technologies



Each technology was analysed individually in relation to its implementation timeframe and analytical criteria were adapted on the basis of the SENAI Model's original template.

Results

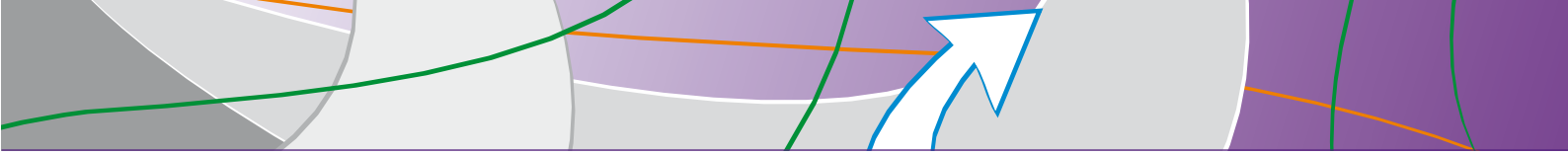
For the second round of the Delphi Web, experts were sent a file showing the general results of the study and another containing individual answers, with their names in code. In this round, only two of the experts modified their answers, and the final outcome did not vary.



Specific Emerging Technologies (SET) according to the Delphi Survey

Technological Areas	Description
IT tools	HI-1. Mapping software
	HI-2. Project management software
	HI-3. 3D modelling software
	HI-4. Design software
	HI-5. Rendering software[19]
Innovative construction material	MC-1. Special concrete
	MC-2. Nanotechnology
	MC-3. Fibre reinforced polymer (FRP)
	MC-4. Grids
	MC-5. Modular *Meccano*-style forms
	MC-6. Optic fibre
	MC-7. Smart electromechanical systems
	MC-8. Modular masonry
	MC-9. Prefabricated concrete elements
	MC-10. Improved earthquake-resistant systems
	MC-11. Security applications for construction
	MC-12. Thermo-acoustic insulation
	MC-13. Cold asphalt mixes
	MC-14. Pipeline connections
On-site testing	PS-1. On-site testing
	PS-2. Electromechanical installation testing
Environmental sustainability and energy efficiency	SA-1. Devices to reduce water consumption and maintenance costs
	SA-2. Water purification and/or reuse
	SA-3. Sustainable construction
	SA-4. Recycling and reusing construction waste
	SA-5. Sustainable material
	SA-6. Solar water heaters
	SA-7. Self-sufficient energy systems
	SA-8. Low power consumption devices

[19] The representation of a building, interior area, etc. in perspective; normally for the purpose of exhibition.



INA's thoughts regarding this stage of the Model:

- The use of online forms is an easy and efficient way of gathering information for surveys.
- Construction material technology and IT tools received the highest number of votes.
- The predominant technology processes were to be found in the construction area, followed by consultancy.
- Preferred sources for obtaining information on technology were: the Internet, conferences and seminars.
- Composite material and IT tools are the areas where most innovation takes place that will become consolidated technology in the future.

Occupational impact

Methodology employed

At this stage the impact on occupations of the technologies studied was determined. Initially, a review was performed using the Costa Rica Occupations Classification (COCR-2010[20]) of the National Statistics and Census Institute, which is based on the International Labour Organization (ILO)'s International Standard Classification of Occupations (ISCO-08).

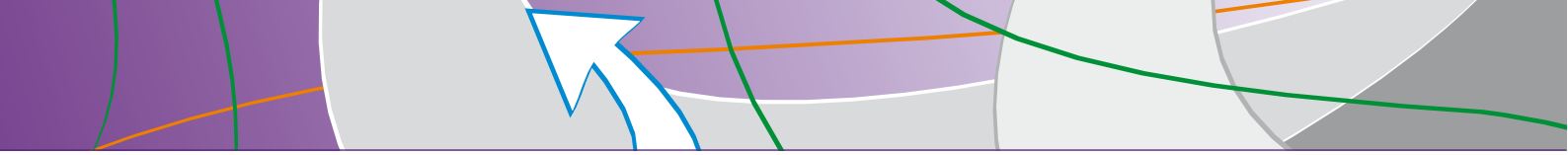
The configuration of the Production Sub-Sector was also analysed: civil construction, of the Materials Technology Group, which gives a description of each sub-sector in the group. In the specific case of civil construction, the processes composing it are:

- Civil works consultancy.
- Civil works construction.
- Civil works administration.
- Civil works maintenance.
- Testing and technical analyses for construction activities.
- Manufacture and sale of different construction materials.

Then the occupations linked to each of these processes were determined, according to COCR-2010, with reference to the group they belong to. Groups with occupations related to civil construction were determined and the following twelve occupations were chosen for the occupational impact analysis:

- Technical draughtsman and drawer.
- Mapping technician.
- Bricklayer.
- Plumber and pipe fitter.
- Welder.

[20] *Clasificación de Ocupaciones de Costa Rica* (Costa Rica Occupations Classification).



- Construction and associated works electricians.
- Concrete worker.
- Form-setter.
- Construction supervisors.
- Building maintenance person.
- Civil engineering technician.
- Sales assistant in shops and stores.

An analysis was carried out according to the Model in order to intersect these twelve occupations with the SETs and thus determine the estimated impact, together with the experts. Finally, detailed information was produced for three occupations: mapping technician, concrete worker and supervisor; as these were deemed to fulfil the criterion of receiving the greatest anticipated impact from technological changes.

Results

New technologies were described for each of the three occupations, as well as activities and knowledge that would become increasingly significant for each. An occupation and a breakdown of impacts for two technologies are shown below:

Occupational impact for mapping technicians

Technology: HI-1. Mapping software	
Activities that will become more important	**Knowledge that will become more important**
• Performing mapping surveys. • Drawing plans and sketches. • Producing field records. Data capture (downloading and handling). • Adapting information technology to project features. • Placing high technology measuring equipment in the station. • Using measuring device software. • Performing virtual terrain and building modelling. • Defining forms of execution for geospatial construction. • Carrying out fieldwork and data tabulation on the basis of this work and other activities that assisting other professionals entails. • Applying information to mapping surveys. • Fact-checking the outcome of electronic processes.	• Basic IT packages (Office, Windows). • CAD software. • Online information (handling the Internet). • Mapping techniques. • Basic concepts involving classic mapping. • Handling electronic precision devices. Mastering GPS devices. • Innovative technologies for work control. • Digital alpha-numeric data.

Technology: Project management software	
Activities that will become more important	**Knowledge that will become more important**
• Visiting the site. • Defining the stages of the project. Organization and control through various mobile devices. • Establishing a critical path according to the stages. • Identifying the necessary resources for each stage. • Horizontal and vertical work control (geometry). • Updating information remotely, in real time. • Performing field work. • Downloading information. Tabulating information. • Programming and developing activities related to the performance of the occupation in its different settings/approaches. • Implementing and assisting other personnel.	• IT packages. • Information processing software. • Software to control, programme and maintain construction projects. • Mobile equipment and devices. • Mapping techniques. • Planimetric and altimetric control methods. • GIS applications. • IT mapping survey instruments. • Updated versions.

New professionals

As a result of technological prospection, the study identified new occupations, which included: swimming pool construction workers, including finishing and related activities; road infrastructure projects inspectors, and high-density polyethylene pipe fitters. An example of this is:

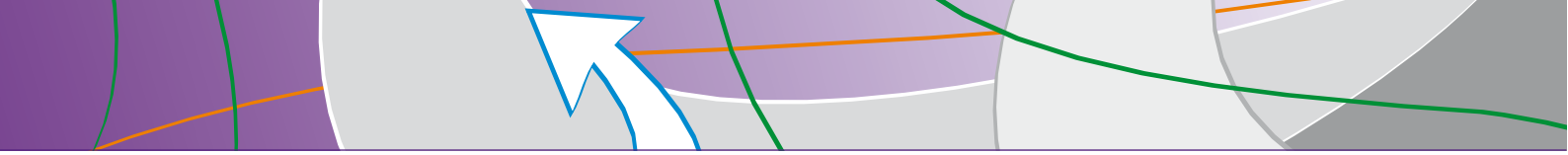
Swimming pool construction workers, including finishing and related activities

The construction of swimming pools is rapidly increasing in Costa Rica; however, there is little technical training in this field. In the United States, pool builders are regulated by the *National Swimming Pool Foundation* (NSPF), which also grants Certified Pool/Spa Operator® (CPO®) certification, which is recognized throughout the world.

The Free Trade Agreement between Costa Rica and the US means that any US company can join the national market with workers certified in this field, which would be detrimental to Costa Rican enterprises. At present, if workers wish to receive this certification they must travel abroad and bear the cost of their travel expenses and training.

Activities

- Performing preliminary pool construction activities, according to the project's specifications and requirements.
- Building the relevant structure, according to the building project's specifications and requirements.
- Implementing the finishing and surface protection process, based on requirements.



- Installing and maintaining all the devices required for the proper operation of the pool (skimmers, anti-entrapment grids, ornamental accessories, cleaning equipment and other items).
- Inspecting the work at all its stages.
- Carrying out whatever maintenance the pool needs.

Knowledge

- Earthquake Code.
- Soil mechanics.
- Concrete technology.
- Special mortar for veneers in pools and similar areas.
- Finishes for pools and edges.
- Masonry.
- Types of veneers for swimming pools and similar areas.
- Plumbing: pumps and filtres.
- Electricity: lighting and heating.
- Accessories: nozzles, whirlpools, counter-current swimming.
- Solar heating.
- Water treatment.
- Cleaning equipment.
- Health facilities code.
- Sustainable construction.

Recommendations

Recommendations were made in this study with regard to technological areas in connection with construction-related IT tools, innovative construction materials, on-site testing, environmental sustainability and energy efficiency. An example is given below of the recommendations made for “Construction-related IT tools” technology:

Contextualization

This type of technology, which covers software for design, management, control, programming, equipment fitting and maintenance of construction and building projects is evolving at such accelerated rates, that the tools used in the different design activities (from technical studies, preliminary project preparation and drawing up specifications, to the preparation of plans, modelling and designing the project itself) were considered by experts to be short-term impact technologies, mainly due to technological upgrading and the increase of productivity, as related to the competitiveness of enterprises.

It should be noted that this technology has an impact on occupational groups, such as mid-level professionals and technicians. It has practical applications which are often free and available on mobile devices, which makes it possible to transfer data from different locations in real time.

Recommendations

With this contextualization as a background, the following recommendations were made to the INA's Materials Technology Group:

- Update current training delivered by including software for design, project management, 3D modelling and rendering in all the relevant fields.
- Strengthen the mapping specialty curriculum by designing new programmes to incorporate the use of management, control, programming and project maintenance software, as well as mapping devices and the use of global positioning systems (GPS[21]).
- Deliver training in the use of management, control, programming and building project maintenance software by means of mobile devices.

INSAFORP, El Salvador[22]

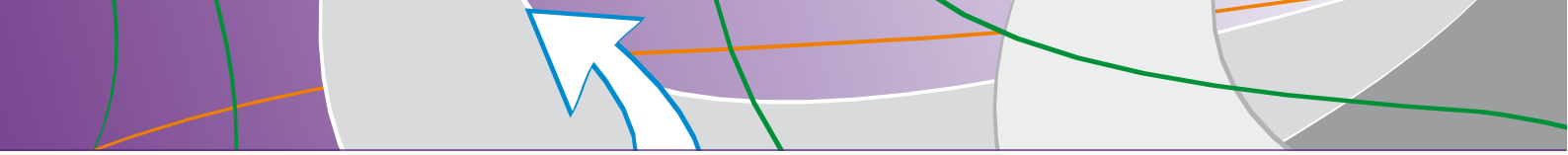
Sectoral information

In the early years of the 21st century, the evolution of the construction sector is slow in the Salvadoran economy. The sector's sluggishness is a reflection of reconstruction efforts and the continuation of projects which were in place before the earthquakes of 2001 and the launching of new public and private projects. The housing sub-sector has not been able to fully overcome the structural problems it has been undergoing for several years.

According to the VII Economic Census conducted by the General Statistics and Census Directorate (DIGESTYC, 2005), construction represented, in relation to the country's overall figures, 0.3% of enterprises (447), of which 18 devoted themselves to preparing terrain, 247 to the construction of buildings and parts of buildings, 131 to refurbishing buildings, 44 to finishing buildings and 7 to construction and demolition equipment rentals.

[21] Global Positioning System.

[22] The full report may be consulted at: http://www.oitcinterfor.org/documentos/estudiosprospectivos



Historically, the construction sector has always had little participation in national production, and in 2012, contributed only 4% of GDP.

An examination of the construction sector's GDP performance over the last 12 years shows oscillations of between 4.7% in 2001 and 3.6% in 2010. This performance reflects the scant importance of the sector in the economy of the country, as compared to other sectors such as the manufacturing industry and trade.

A further significant aspect observed in the construction sector is the occupation of the workforce. The sector accounts for only 5% of employed persons in the country (83,300), and of these, most of them – 54.6% – are included in the informal sector of the economy (45,500 people).

It should also be noted that while according to DIGESTYC, formal construction workers amounted to 37,700 in 2011, only 23,367 of the sector's workers contributed to the Salvadoran Social Security Institute in December of that year.

The average salary in the construction sector is USD 264.87; this low figure is due to the fact that most of the industry's workers are bricklayers and assistants.

In sum, it may be said that although this is an important industry in the development of the country's social and economic infrastructure, and absorbs a fair number of the workforce, there are few enterprises in the sector and average salaries are relatively low.

Technological prospective

Methodology employed

In order to perform the technological prospective, the first step was to form the EG. To this end, the country's principal universities and business associations were approached and the EG was formed on 23 November 2012.

To determine which technologies could, according to the EG, undergo the greatest dissemination in the country over the next five years, the list of technologies drawn up by the INA of Costa Rica was used as a starting point, as it was deemed that there were no great differences between the two countries as regards the construction industry.

Results

The technologies to be most disseminated over the next five years are:

Technological segments	Emerging technologies
IT systems	Revit MEP Software[23]
Other IT systems	The use of GPS in modern mapping
Construction materials and systems	Smart concrete
	Ductal® - Ultra-high performance concrete – high resistance concretes
	Permeable concrete
	Decorative concrete
	Architectural concrete
	Translucent concrete
	Controlled low-resistance concrete – mudcrete[24]
Other construction materials and construction systems	New structural material – fibre-reinforced plastic
	Cardboard tubes used for formwork
	Post-stressed slabs
	Domotics
Renewable energy	Clean renewable energy
	Solar heating
Environmental protection	Low-flow and low-maintenance toilets and plumbing systems
	Green roofing

Occupational impact

Methodology employed

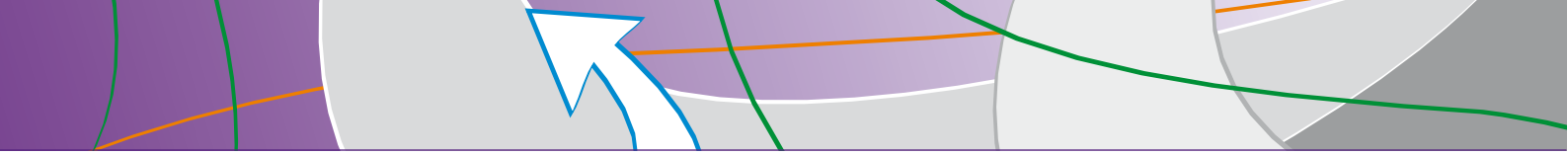
To determine occupational impact, the EG selected construction sector experts from universities as well as from associations and influential companies in the country.

Two expert panels were formed in order to determine the impact of new technologies on construction sector occupations, and two procedures were followed: first, the impact of new technologies on occupations was determined, on the basis of the following scale:

- Low impact: the operating group does not modify its work routines to adjust to the SETs, and thus requires no new knowledge.
- Medium impact: the operating group requires a certain degree of competency upgrading to adjust to the SETs.

[23] Construction information modelling software. It enables users to design using parametric modelling and drawing elements.

[24] Mudcrete is a cement, lime and water composite. In addition to inserting itself into hollowed spaces, it is very resistant.



- High impact: the operating group requires new knowledge and competencies to adjust to the SETs.

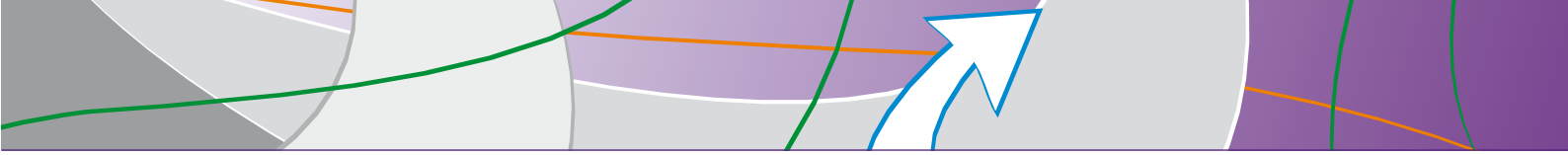
Subsequently, occupational impact was analysed and the new activities, knowledge, skills and attitudes that would be required in the construction sector occupations were identified.

Results

After analysing the Occupational Impact Matrix, occupations with the highest impact were selected:

- Architect
- Civil Engineer
- Architectural Technician
- Civil Engineering Technician
- Master Builder
- Bricklayer
- Environmental Designer
- Cost and Quality Control Operator
- Electrical Engineer
- Electrical Engineering Technician

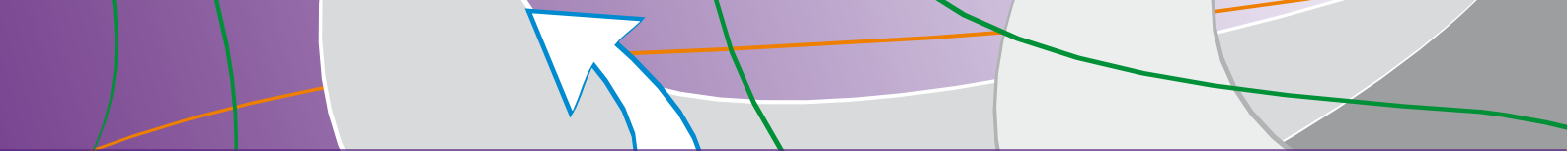
By way of an example, a detailed description is provided for the Architectural Technician occupation, which includes technologies, activities, knowledge, skills and attitudes required.



Occupational impact for architectural technicians

Emerging technologies that will have the greatest impact on the occupation: Construction materials (special concretes, cardboard tubes used for formwork), construction systems (post-stressed slabs), clean renewable energy (solar heating), environmentally friendly sanitation equipment (low-flow and low-maintenance toilets and plumbing systems), construction elements (green roofing), facilities (domotics).

Activities that will become more important	Knowledge that will become more important
▪ Representing the architectural space for projects that incorporate the use of materials, domestic generation solar power systems and construction elements and facilities with higher probability of being disseminated in the country. ▪ Ensuring compliance with emerging technology technical specifications. ▪ Ensuring compliance with the technical specifications of prepared concretes acquired from enterprises that specialize in preparing them. ▪ Calculating the quantity and cost of material to be used in construction works, including: special concretes, slabs (to be used in post-stressed slabs), fibre-reinforced plastic, cardboard for formwork and pipes and accessories for low-flow toilets. ▪ Supervising concrete work, ensuring compliance with the work specifications and the applicable standards and regulations in force in the country. ▪ Supervising finishes, ensuring compliance with work specifications and applicable standards and regulations in force in the country. ▪ Supervising the installation of post-stressed slabs, ensuring compliance with work specifications and applicable standards and regulations in force in the country. ▪ Supervising the installation of cardboard tubes for formwork, ensuring compliance with work specifications and applicable standards and regulations in force in the country. ▪ Supervising waterworks, ensuring compliance with work specifications and applicable standards and regulations in force in the country. ▪ Supervising the installation of piping and accessories for low-flow and low-maintenance toilets. ▪ Supervising the installation of bathroom fittings and accessories for low-flow and low-maintenance toilets. ▪ Supervising the installation of fibre-reinforced plastic, ensuring compliance with work specifications and applicable standards and regulations in force in the country. ▪ Supervising the construction of green roofing, ensuring compliance with technical specifications and applicable standards and regulations in force in the country. ▪ Training personnel in the preparation and installation of new materials.	***Special concretes*** ▪ Properties. ▪ Testing procedures. ▪ Material used to manufacture them. ▪ Technical specifications. ▪ Handling and fitting. ▪ Checking construction processes. ▪ New construction processes. ▪ Applicable standards and regulations. ***Post-stressed slabs*** ▪ Basic concepts. ▪ Manner of installation. ▪ Applicable standards and regulations. ***Fibre-reinforced plastic*** ▪ Basic concepts. ▪ Scope and limitations of the technology. ▪ Technical specifications. ▪ Applicable standards and regulations. ***Cardboard for formwork*** ▪ Basic concepts. ▪ Scope and limitations of the technology. ▪ Technical specifications. ▪ Applicable standards and regulations. ***Low-flow toilets*** ▪ Scope and limitations of the technology. ▪ Special installation features. ▪ Basic concepts. ▪ Technical specifications. ▪ Applicable standards and regulations. ***Green roofing*** ▪ Basic features (operation, waterproofing, watering system, maintenance, cost and components, usage care, etc.). ▪ Equipment required. ▪ Forms of installation. ▪ Environmental advantages. ▪ Technical specifications. ▪ Application regulations



Recommendations

In its final report, the prospective study provides a detailed analysis of the context for each SET identified and makes a number of recommendations:

- For INSAFORP
  - Update the curriculum design content of its training.
  - Deliver ongoing training courses for company workers to update their skills.
- For universities and technological institutes
  - Assess the relevance of including new subjects in study programmes.
- For new prospective studies
  - For a technological prospective study to synchronize with new information technologies (for example: IT applications designed to support construction processes), it is suggested that the experts invited to participate should have been practising their profession for less than 15 years, as they are more likely to have been in contact with and be familiar with this kind of new technology. In INSAFORP's experience, all participating experts had been in the profession for over 15 years, and they were all unanimous in stating that they were not the best people to give opinions regarding IT applications for construction. Due to time limitations for the presentation of the results of the study, this "section" will be addressed later.
  - During the second stage of the occupational prospective (determination of activities, knowledge, skills, attitudes), it is suggested that the occupational profiles or functional maps of the occupations experiencing the greatest impact from the SETs should be made available. This will make it easier for experts to identify the activities that workers must perform as a result of the dissemination of new technologies.
  - In connection with the previous suggestion, it is advisable that the facilitation of new activity identification be led by an occupational or functional analysis expert.
  - Because of the limited time during which experts can meet, it is advisable to have a minimum of two consultants in INSAFORP with work experience in the sector or branch being prospected, in order to support the researchers and explain technical aspects that they may not have entirely grasped regarding the opinions of the experts.

INTECAP, Guatemala[25]

Sectoral information

Tourism is one of the principal economic activities in Central America; in Guatemala it has evolved to become the second foreign exchange-earning activity, compared to the country's principal export products.

According to data provided by the Bank of Guatemala, in 2006, the country's tourist activity generated a total of USD 1,012.7 billion, overtaking coffee and sugar exports, which generated USD 529.4 and USD 530.9 million, respectively. In 2006, tourism-generated foreign exchange earnings represented 26.6% of foreign exchange income and 28.1% of the total amount of family remittances. Indicators in 2006 were favourable in comparison to 2005, both for foreign exchange earnings and for international visitors, with increases of 16.6% and 14.2%, respectively.

According to statistics prepared by the Guatemalan Tourism Institute (INGUAT, for its acronym in Spanish), in 2006 there was a total of 1,502,069 international visitors. According to the projections of the World Tourism Organization (WTO), a total of 5 million international tourists will arrive in Central America in 2010 and 7.5 million in 2020, which indicates an annual growth rate of 4.5% between 2000 and 2010, and of 4.3% for the period 2010-2020. For Central America, this means an increase in its market share of tourist arrivals in the Americas from 2.4% in 1995, to 2.7% in 2020.

National growth targets

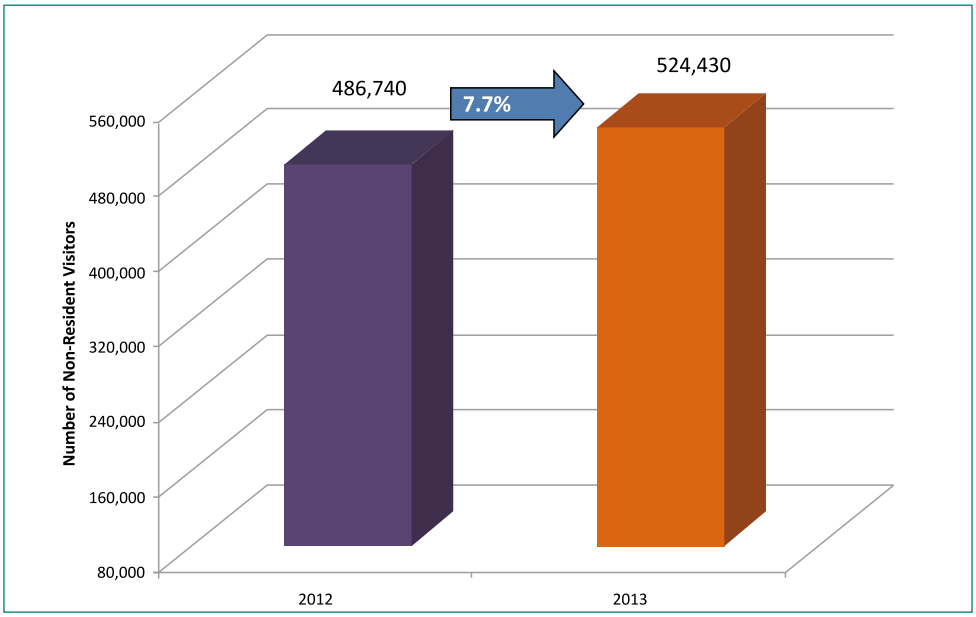
On the basis of National Agenda 2008-2011 of the Research and Social Studies Association (ASIES, in Spanish), an outcome of the National Sustainable Tourist Development Policy 2004-2014, it is forecast that an annual growth rate of 10% in the arrival of international tourists will be reached. This increase will occur within specific priority segments, in keeping with promotional efforts to satisfy the needs and expectations of tourists.

Tourism as a job-creating activity

Data provided by the World Travel & Tourism Council indicate that the tourist industry hires one in ten workers in the world (thus constituting the world's largest employer). For each of these jobs, between five and nine indirect jobs are created in other areas. In view of this, Guatemala, with its great potential, has opportunities to create jobs in metropolitan and rural areas, leading to progress in new areas in the short term. As the chart below shows, the number of visitors who arrived in the country during the first quarter of 2013 exceeded 2012 figures by 7.7%, which shows that there is great tourist interest in Guatemala.

[25] Full report available from: http://www.oitcinterfor.org/documentos/estudiosprospectivos

Arrival of non-resident visitors during the first quarter



Source: INGUAT's Newsletter for the First Quarter of 2013

Technological prospective

Methodology employed

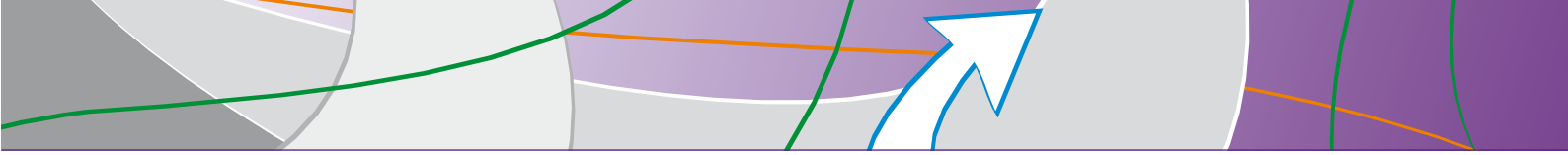
Primary and secondary sources were used to determine the SETs. The methodology included desk or secondary research using paper and electronic documents, as well as Internet-based information.

During the desk research, several tourism-related sources of information were consulted: prospective studies, self-generated and external reports from Guatemala and other countries, as well as others related to new technological trends in this field.

Digital research was conducted through the Internet on the basis of information provided by technical experts in the field, which included visits to a large number of sites.

The primary source used was the experts panel. This included, firstly, consulting internal and external databases of experts in the field of tourism, from which the most representative professionals, with the most experience, were selected. Later, contact was made with these persons by telephone and e-mail, in order to invite them to a first meeting, during which the Model and its application in VT planning were explained, as were the tools they would use to provide support, according to their field of specialization.

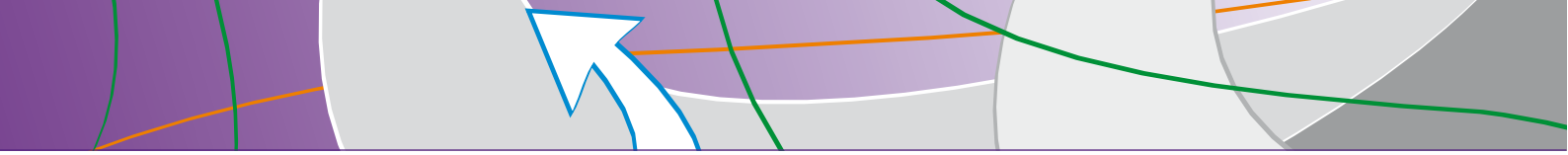
In order to identify SETs in the tourist sector, a general list of the technologies that appeared most often was drawn up, based on a list of 35. Using a checklist, each expert decided which, in his or her opinion, were the technologies that would be applied to the greatest extent in Guatemala, over the next 10 years.



List of Specific Emerging Technologies (SET)
1. Fifth-range food products
2. Geomarketing applications
3. ASP-based IT applications
4. Sustainable buildings
5. Multi-protective construction elements
6. SME industrial equipment
7. Thalassotherapy[26] equipment for hotels
8. Equipment and systems to improve accessibility for disabled persons
9. State-of-the-art electronic translation devices
10. Smart labels for containers
11. Electronic forfeits[27]
12. Satellite-enabled environmental management
13. Sustainable management of tourist resources
14. Personalized electronic guides
15. Telecommunications integration
16. Electronic booths
17. Energy saving micro-systems
18. Supply replenishing micro-systems
19. Non-polluting transport models
20. New laundry and dishwashing systems
21. Natural disaster prevention
22. Telecommunications protection
23. Mobile telephone services
24. Peripheral terminal services
25. Modular and versatile construction systems
26. CRM customer service systems
27. Food hygiene control systems
28. Global booking IT systems
29. Telephone IT systems for data-transmission via the Internet
30. Automatic hotel check-in and check-out IT systems
31. Tourist promotion virtual reality systems
32. Local communication systems and equipment in hotel and tourist enterprises
33. GPS systems and devices
34. Comprehensive corporate management software
35. Electronic service charge cards

[26] A form of therapy based on the use of different marine media, used together or separately (sea water, algae, mud and other substances extracted from the sea).

[27] A payment system.



In addition, some other socio-economic trends were also identified and included in the study:

- Claiming holidays as a vested right.
- Specifically age-related tourism.
- Retirement and laws related to pension rights.
- Increase in the economic status of younger persons.
- Variations in non-traditional family structures.
- Increase in the population's knowledge and culture, as a result of the use of the Internet.
- More frequent travelling and to a greater number of locations in developed countries with good tourist support.
- Demand for more sophisticated tourist services.

In order to validate the SETs, the University Academic Committee of the country's tourist sector and other experts were consulted.

Results

The technologies which will be applied the most over the next ten years in Guatemala are:

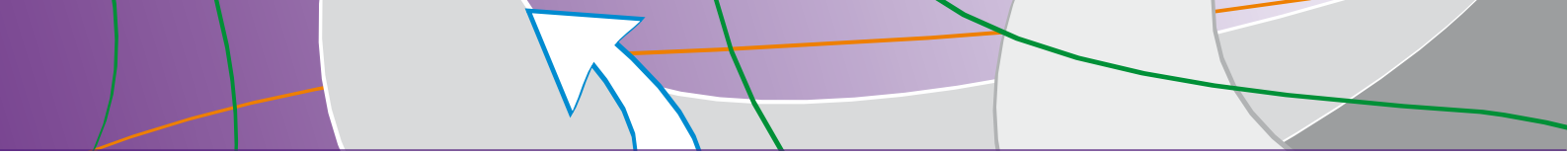
- Telephone IT systems for data-transmission via the Internet.
- GPS systems and devices.
- Global booking IT systems.
- State-of-the-art electronic translation devices.
- Local communication systems and equipment in hotel and tourist enterprises.
- Personalized electronic guides.
- Electronic forfeits.
- Equipment and systems to improve accessibility for disabled persons.
- Thalassotherapy equipment for hotels.
- Automatic hotel check-in and check-out IT systems.
- Tourist promotion virtual reality systems.

Occupational impact

Methodology employed

The identification of occupational impact was achieved through the same group of experts who acted during the technological prospection stage. At the end of the prospection they were told that they would receive a matrix for the identification of the occupation that would undergo the greatest impact, via e-mail, for each of them to analyse and return as quickly as possible. The following occupations were identified initially:

- Hotel business administrator.
- General tourist guide.
- Tourist enterprise business administrator.
- Local tourist guide.
- Cruise travel agent.
- Tourist informer.
- Forum leader or moderator for virtual communities.
- Hydrotherapy installation engineer.
- Hotel leisure leader/ water-based activities leader.
- Online tourist services advisor.
- Professional conference, fairs and events organizer.
- Exhibition curator.
- Planning and development of tourist enterprises and institutions.
- Tourist sites and destinations leader.
- Food administrator for catering services.
- Food and beverage manager.
- Wine taster.
- Thematic park designer.
- Adventure sports technician.
- Socio-cultural services manager.
- Hotel technician.
- Travel manager.
- Tourism technician.
- Community guide.
- Local tourist planning technician.
- Mountain guide.
- Rural tourism technician.



Subsequently, these occupations were analysed by the experts. They took the courses delivered by INTECAP, as well as information provided by the Chamber of Tourism as a reference and identified the most significant occupations in this field:

- Hotel business administrator.
- Tourist enterprise business administrator.
- Tourism technician.
- Hotel technician.
- General tourist guide.
- Specialized tourist guide.
- Local tourist guide.
- Community guide.

After analysing the occupational impact matrix and bearing in mind the comments made by both the experts group and the academic committee, the occupations which would undergo the greatest impact as a result of SETs were selected.

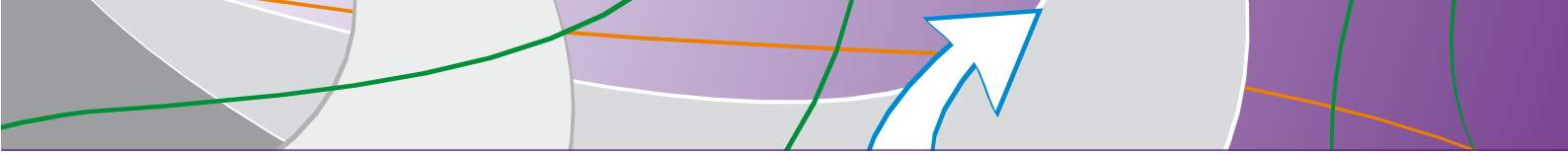
Results

Occupations undergoing greatest impact:

- Hotel business administrator.
- Tourist enterprise business administrator.
- Tourism technician.
- Hotel technician.

These occupations included a total of seven technologies identified as high impact:

- Telephone IT systems for data-transmission via the Internet.
- Global booking IT systems.
- State-of-the-art electronic translation devices.
- Local communication systems and devices in hotel and tourist enterprises.
- Electronic forfeits.
- Equipment and systems to improve accessibility for disabled persons.
- Automatic hotel check-in and check-out IT systems.



The occupational impact of these technologies is shown below, for the occupations of “Hotel and tourist enterprise business administrator” and “Tourism technician”.

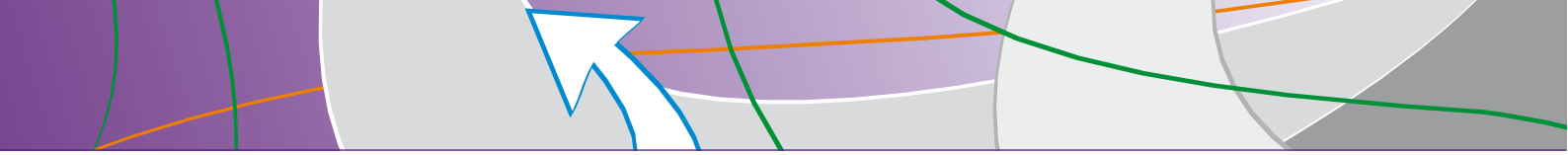
Occupational impact for

Hotel and tourist enterprise business administrator

Activities that will become more important	Knowledge that will become more important
• Handling data-transmission telephone systems. • Handling forfeits. • Using global booking devices (AMADEUS). • Using GPS devices. • Handling electronic translation devices. • Using and handling devices to improve accessibility for disabled persons. • Using thalassotherapy equipment for hotels.	• Existing types of telephone systems. • Characteristics of local communication systems in enterprises. • Types of programmes available for virtual reality tourist promotion. • Types of electronic translation IT systems (advantages and limitations of the different models). • Characteristics of systems to improve accessibility for disabled persons. • Types of thalassotherapy systems and procedures in hotels and their use in the tourist industry. • Types of devices used for global booking. • Types of devices used for automatic hotel check-in and check-out. • Cards and devices used for personalized electronic guides; use and advantages. • Characteristics of thalassotherapy equipment for hotels. • Environmental management. • Technological innovation management.

Occupational impact for tourism technicians

Activities that will become more important	Knowledge that will become more important
• Handling data-transmission telephone systems. • Handling local communication systems in hotel businesses. • Handling programmes available for virtual reality tourist promotion. • Using electronic translation devices. • Using systems and processes to improve accessibility for disabled persons.	• Characteristics of existing data-transmission telephone systems. • Characteristics of local communication systems in enterprises. • Types of programmes available for virtual reality tourist promotion. • Characteristics of devices used for: global bookings, automatic hotel check-in and check-out, personalized electronic guides, GPS, electronic translation, electronic forfeits, improving accessibility for disabled persons, thalassotherapy in hotels • Environmental management.



New occupations

It was determined that *Hotel and Tourism Technician* was a new occupation that could be created, merging two separate occupations, in view of the similarity of content and knowledge required by each of them. INTECAP has already designed it and it will be included in the training courses to be offered for 2014. A description is provided below:

Hotel and tourism technician

Activities that will become more important	Knowledge that will become more important
• Handling data-transmission telephone systems. • Basic handling of local communication systems in hotel businesses. • Handling programmes available for virtual reality tourist promotion. • Using electronic translation devices. • Using systems and processes to improve accessibility for disabled persons.	• Characteristics of existing data-transmission telephone systems. • Characteristics of local communication systems in enterprises. • Types of programmes available for virtual reality tourist promotion. • Characteristics of devices used for: global bookings, automatic hotel check-in and check-out, personalized electronic guides, GPS, electronic translation, electronic forfeits, improving accessibility for disabled persons, thalassotherapy in hotels • Environmental management.

Recommendations

Contextualization

A) The dissemination of communications, connectivity and promotion-related systems:

This technological prospection determined that the technologies that are most likely to be disseminated in the communications, connectivity and promotion systems of tourist services enterprises are:

- Telephone IT systems for data-transmission via the Internet.
- Local communication systems for hotel and tourist enterprises.
- Tourist promotion virtual reality systems.

The probable use of these systems will eventually allow enterprises devoted to tourism to improve their market positioning and attract foreign customers, as well as reduce their communications and promotional costs.

It was established that these technologies will have a possible impact on the following occupations: hotel business administrator, tourist business administrator, tourism technician and hotel technician, although at different levels of competency.

In the case of Guatemala, specifically, the possible application of this technology is feasible, as telephone-enabled system updates, as well as data transmission, are available to most of the population. Some hotels have already begun to use this technology for internal and external communications.

B) The dissemination of systems related to direct tourist services:

This technological prospection determined that the technologies most likely to be disseminated among systems related to direct tourist services are:

- Global booking IT systems.
- Automatic hotel check-in and check-out IT systems.
- Personalized electronic guides.
- GPS systems.

The probable use of these systems will eventually allow businesses devoted to tourism to improve their direct services to tourists, as well as streamline procedures and access to information in support of their customers (location, information regarding sites, itineraries, services, etc.). It was established that these technologies will have a possible impact on the following occupations: hotel business administrator, tourist business administrator, tourism technician and hotel technician, although at different levels of competency.

C) Updating equipment in relation to improving services for tourists:

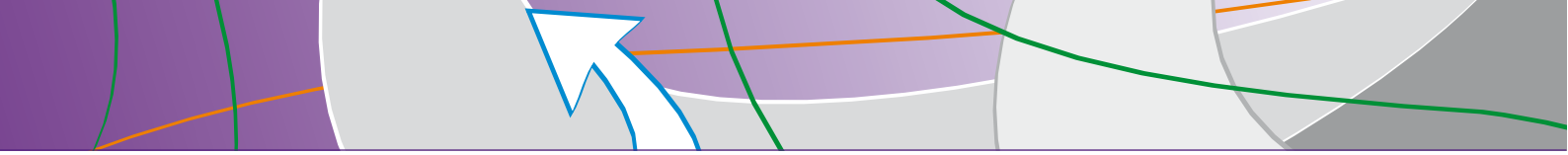
This technological prospection determined that the technologies most likely to be disseminated among systems related to direct tourist services are:

- State-of-the-art electronic translation devices.
- Electronic forfeits.
- Equipment to improve accessibility for disabled persons.
- Thalassotherapy equipment for hotels.
- Satellite-enabled GPS devices.
- Local communication devices in hotel and tourist enterprises.

Recommendations

The probable use of these technologies will eventually allow businesses devoted to tourism to offer new and better services, thus attracting tourists with higher purchasing power because of the added value being offered.

It was established that these technologies will have a possible impact on the following occupations: hotel business administrator, tourist business administrator, tourism technician and hotel technician, although at different levels of competency.



On the basis of the contextualization provided, the following general recommendations are made:

1. Revise the professional profiles of occupations in order to include knowledge related to the technologies involved, according to level (operational, medium and executive).
2. Update the design of the training being delivered, on the basis of the revised professional profiles (entry standard or element), in order to include knowledge and activities related to the technologies involved; if possible, within existing modules, but if necessary, adding new ones.
3. Offer continuing training courses in the form of seminars, reports, diploma courses and open modular training, in subjects specifically related to each technology.
4. Offer additional courses related to the use and handling of systems and equipment regarding which the occupation will undergo an impact.

INFOTEP, Dominican Republic[28]

Sectoral information

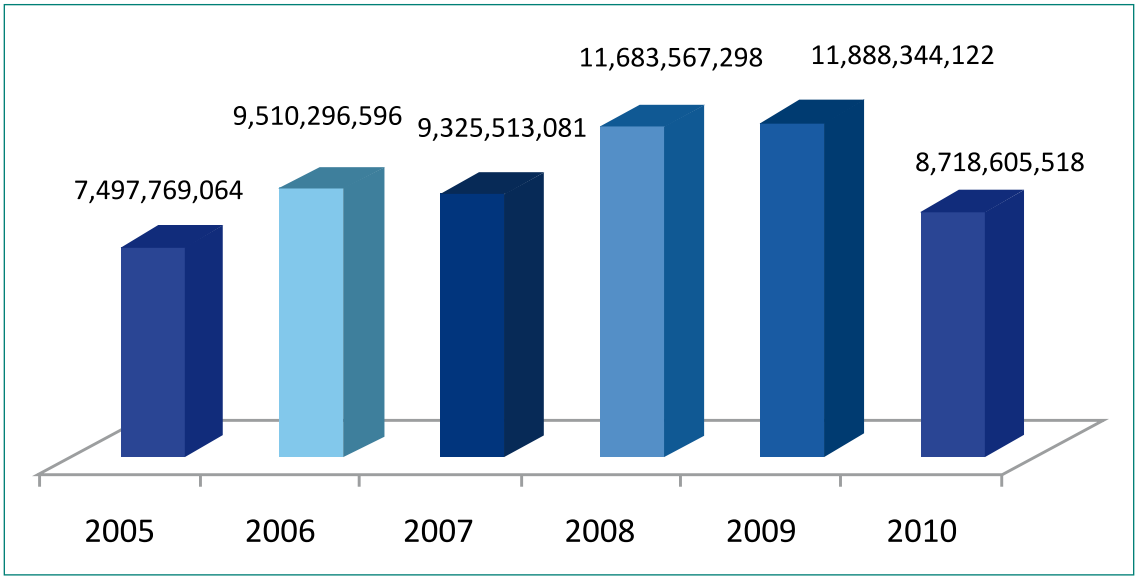
The construction sector has exhibited a constant and sustainable rate of growth; however, the sector often lacks qualified workers, as well as efficient and innovative construction techniques.

Construction is mostly concentrated in Santo Domingo and the tourist areas. In 2011, the activity's added value experienced a growth of 1.4%, fostered by private investment, which was encouraged by a 2.9% increase in loans granted by financial institutions; essentially, credit given by Saving and Lending Associations, which underwent a 35.5% expansion. Conversely, commercial bank payments dropped (-3.4%), as did those of the remaining deposit outfits (-3.6%).

In 2012, the construction industry generated DOP $92,737 billion (USD 2,650 billion), which represented 4.1% of gross domestic product and created some 300,000 direct jobs and close to one million indirect jobs. This makes the industry one of the most important sectors in the Dominican Republic.

[28] Full report available from: http://www.oitcinterfor.org/documentos/estudiosprospectivos

Private sector investment in construction between 2005 and 2010



The labour market

The principal labour market indicators have been stable and the occupation rate rose from 48.0% in 2010 to 48.1% in 2011. In absolute terms, in 2011, 162,425 persons joined the workforce to engage in productive labour.

The economically active population (EAP) in 2011 comprised 4,559,451 persons; of these, 62.4% were men, while 37.6% were women, according to the results of the Central Bank's National Workforce Survey, conducted in 2010 and published in 2011. There were 260,201 people employed in the construction sector in 2011, which represents 5.71% of the EAP for that year. The key indicators of the Dominican labour market, according to the National Workforce Survey conducted in October 2012, which referred to the last week in September, showed that the labour supply Open Unemployment Rate (OUR) increased by 1.1 percentage points, rising from 5.9% in April 2012 to 7.0% in October 2012. This was mainly explained by an employment drop in the agricultural sector. A further factor that explains the increase in unemployment is the growth in expectations to join the labour market, owing to the new strengthening programmes for small and medium enterprises and the agricultural sector, among others.

Technological prospective

Methodology employed

The following activities were carried out for this study:

1. The key bodies and/or persons in the sector were identified in order to request their support in the implementation of the process.
   - Ministry of Public Works.
   - Ministry of Labour.
   - Dominican College of Engineers, Architects and Surveyors (CODIA, in Spanish).
   - University representatives.
   - Construction sector business representatives.
   - Institutional facilitators connected with the field.
   - Technical staff of the Department of Labour Market Research and Statistics.
   - Technical staff of the Department of Curriculum Design and Development.
2. These persons and/or institutions were contacted by telephone to inform them of the objectives of the study and invite them to collaborate with the institution in its development.
3. A communication signed by the institution's Director General was sent to the selected individuals explaining the objectives of the study and inviting them to participate.
4. Various institutions were visited in order to explain the objectives of the study to the selected individuals.
5. A first meeting was held with the experts panel in order to introduce the methodology. At this meeting, the experts were given the Delphi questionnaire so that they could assess the possible dissemination of the technologies identified, over the next ten years. It was agreed that they would respond to the questionnaire and send it via e-mail to the institutional staff members responsible for coordinating the study.
6. The completed Delphi questionnaires were received and the data they provided was processed in order to identify the technologies that would undergo the greatest dissemination, according to the experts' opinion. SPSS[29] software was used for the data processing.
7. After the workshop carried out in Costa Rica as part of the Transfer Programme, the information that resulted from the first round of the Delphi questionnaire application was checked. This validation was conducted via e-mail and new experts were included.

[29] Statistical Package for Social Sciences

Results

As a result of the validation, 18 technologies were identified (see table below) as having the highest projection trend – between 50% and 70% – over the next 10 years, according to the experts consulted.

Technological Areas	SETs
Structural systems	Self-compacting concrete – super plastifying additives for concrete
	Concrete block structural masonry
	Prestressed concrete structures
	Combined concrete and steel structures
	Metal structures Light steel frame structures
	On-site reinforced concrete structural walls
	Drywall panels for internal enclosing walls and partitions
Coating systems	Flexible adhesive mortar for tile fitting
	High-durability paint systems
	Single-layer decorative coating
Information technology	Wireless or palmtop and tablet systems for construction work data-collection
	Internal communication systems on the site
Automation systems	Energy control / site lighting automation
	Water-saving hydraulic automatic shut-off kits
	Automated lifts, cranes and hoists
Material	Rigid CPVC tubing, automatic fire safety systems
	Flexible tubing (PEX[30] and aluminium with polyolefin coating[31])

Occupational impact

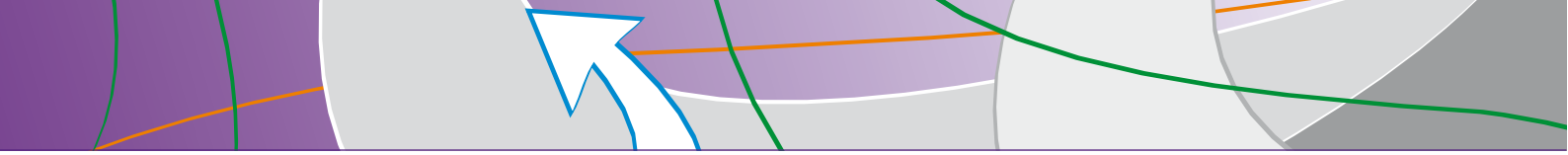
Methodology employed

The occupations involved in the construction sector were identified by consulting the experts. The ten occupations with the highest participation in the construction process were:

- Engineer.
- Architect.
- Foreman.
- Bricklayer.

[30] PEX tubing: plastic tubing made of crosslinked polyethylene, which makes it highly resistant and flexible.

[31] A type of plastic composed mainly of polyethylene or polypropylene.



- On-site electrical installer.
- Plumber.
- Carpenter.
- Welder.
- Master Builder.
- Construction painter.

A template was produced with the 18 technologies arising from the technological prospective and the occupations of the construction sector (10 occupations).

The results received were analysed and processed and seven occupations were identified as those that would experience the greatest impact as a result of the dissemination of the new technologies:

- Engineer.
- Architect.
- Bricklayer.
- On-site electrical installer.
- Plumber.
- Carpenter.
- Master Builder.

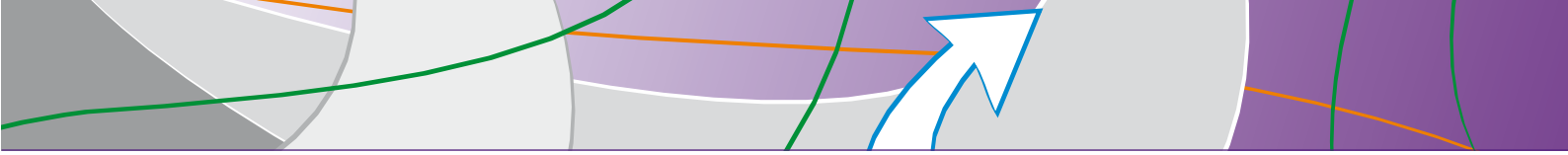
Of these occupations, five were selected and training programme upgrade recommendations were made with reference to these five; the first two were not included as they require university training.

The group of external and internal experts was convened in order to validate the occupational impact information and to make recommendations regarding modifications to the sector's training programmes.

Results

Activities and knowledge were identified that would gain in importance for these occupations: master builder, bricklayer, carpenter, on-site electrical installer and plumber[32]. An example is provided below for "master builder":

[32] The full study may be consulted from: http://www.oitcinterfor.org/documentos/estudiosprospectivos



Occupational impact for master builder

Activities that will become more important	Knowledge that will become more important
• Making formwork. • Designing the concrete and mortar mix. • Administrating construction materials related to new technologies. • Handling communication systems.	• Making concrete mixes. • Reinforced concrete. • Reinforcing steel. • Soil mechanics. • Topography. • Measuring systems (metrology). • Levelling. • Concrete performance. • Metal structures. • The properties of plaster. • Applied geometry. • Paint chemistry and application. • Basic knowledge of computers, SW[33] handling. • Residential electricity.

Emergence of new professionals

According to statements made by the experts consulted, it was determined that for this sector it would be necessary to create the occupation of construction works supervisor, targeting: civil construction technicians and master builders. For this new occupation, the group of experts proceeded to identify the following relevant activities and knowledge.

Construction works supervisor

Objective: to provide support in works supervision in order to verify compliance with construction specifications and technical requirements regarding quality and safety as established by the project.	
Activities that will become more important	**Knowledge that will become more important**
• Works supervision. • Personnel administration. • Construction materials administration (handling inventory). • Controlling compliance with construction specifications. • Works specifications and quantification. • Tracing and levelling.	• Reading and interpreting plans. • Installing reinforced steel. • Concrete. • Applied mathematics. • Geometry. • Volume calculation. • Quality control and environmental care. • Industrial safety and hygiene. • Administration techniques.

[33] SW: system software, also known as base software, controls and interacts with the operating system, providing control over hardware.

Recommendations

Contextualization

The need to create functional and comfortable structures, as well as the growth this sector has experienced in recent years are evidence of changing trends involving the technologies used in equipment, machinery, materials, communication systems and other areas; which will be necessary in the Dominican Republic in the years to come.

Construction trends require that processes should be performed swiftly and with a greater control over the various sub-systems that comprise it.

The need to reduce response times, as well as to have access to accurate and reliable data to facilitate the handling of the construction process leads to the development of technologies that aim to simplify the administration and control of the different sub-systems that intervene in the process.

For the professionals involved, such as engineers, building technicians, architects and master builders, there is a need to rely on technological tools that facilitate the management of civil construction processes.

Analysis of this sector's technological prospection shows a tendency towards the dissemination of technologies that improve process efficiency, achieving greater speed in execution and a greater rationalization of resources, as well as looking for materials that contribute to protecting the environment.

Introducing these technologies in the region will imply change and the need for adaptation in the various construction processes, which will modify the activities and knowledge of workers.

Recommendations

In view of the importance of upgrading the different technologies involved in the construction process, it is recommended that INFOTEP should renew the curriculum design of the occupations that will receive the greatest impact from the dissemination of these technologies over the next few years. These occupations are: master builder, bricklayer, carpenter, plumber and electrician.

An example is provided below for a plumber:

Plumber

- Update the training programme for this occupation with regard to objectives related to handling automatic water-saving hydraulic systems and material such as rigid CPVC tubing and flexible tubing (PEX and aluminium with polyolefin coating).
- Update the curriculum design for the basic plumbing programme to include competencies related to handling water-saving hydraulic automatic shut-off kits.
- Include in the programme, knowledge related to installing rigid CPVC tubing for fire safety systems, PEX flexible tubing and aluminium tubing with polyolefin coating for hot and cold water distribution and gas distribution.

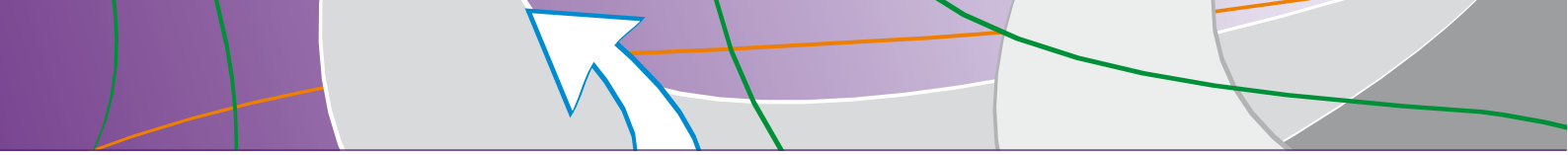
Programme evaluation

This practical application made it possible to determine that team interaction is a source of knowledge and innovation. The principal results of the programme evaluation performed by participants are:

- The programme was described as highly significant and strategic.
- The SENAI Model was described as complex, but applicable.
- The Delphi tool was deemed to be complex, but applicable.
- The experts panel is a tool that, on the whole, is not considered to be complex, but difficult to form and maintain.
- Drawing up a guide for conducting prospective studies may be useful.
- The applicability of the Model is related to the feasibility of the experts' participation.
- There should be a link on the ILO/Cinterfor platform to make it possible to consult on information, developments, experiences and achievements of the VTIs that have used the Model.
- It is deemed to be productive that VTIs should participate in re-editions of this programme in order to share their knowledge and experience.
- The joint evaluation of the programme at its different stages was successful and showed that it was easy to transfer by means of team work.

Lessons learned

- Working in a network led to collaborative learning and methodology innovation and adaptation.
- The Model could be simplified on the basis of the adaptations applied by the VTIs.
- An online tool should be developed to facilitate the interaction of the experts consulted and the handling of information by everyone involved.
- Partnerships should be encouraged with other VTIs or universities, research centres, scientific communities and international agencies.
- A strategy should be available to motivate and mobilize the experts.
- Training recommendations should be drawn up preventing any group from influencing others, particularly when curriculum designers are involved.



- The prospective study should be limited to a few technologies and occupations in order to avoid handling large quantities of information.
- Obtaining the support of managerial levels of VTIs and the sector under examination is essential in order to attract the panel of experts.
- Every effort should be made to form, convene and maintain the experts panel, inasmuch as they constitute a link to enterprises, research centres and participating universities.
- EGs should comprise professionals who are willing to participate and work and make a commitment to do so.
- A technical team should be available to the VTI, which should be easy to call up as a back-up in case of experts panel nonattendance.
- Means to follow-up and evaluate the impact of the adoption of the recommendations in VT should be implemented.
- Prospective studies should be updated systematically and the EG and experts panel should remain active in order to enable following up the technologies identified, as well as the occupational impact and its evolution.
- Full advantage should be taken of meetings with experts, with planned consultation instruments, and even proposing alternative means to the original Model, when so required.
- Prospective studies facilitate working jointly with enterprises and creating new channels of communication. It is advisable to introduce the concept and characteristics of prospective methodology at the beginning of the study.
- Adapting the SENAI Model to conditions and resources available to the VTIs turned out to be easy and practical and generated interesting alternatives to the original methodology.

Establishment of a prospective and South-South cooperation network

One of the outcomes expected as a result of this programme was the creation of a network of prospective experts among ILO/Cinterfor VTI members. Thanks to exchanges among participants, the following proposal has been outlined, which is open to contributions and the consideration of the VTIs.

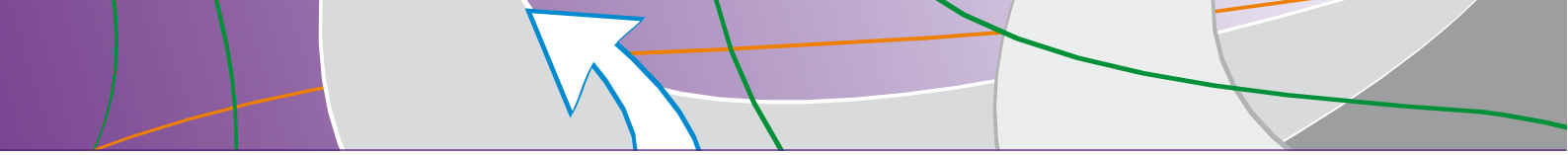
A) General network-forming procedure

1. Based on the results of the SENAI Prospective Model transfer programme, the creation of a learning and practice network will be proposed to the VTIs[34]. VTIs should express their interest in joining before 30 September 2013.
2. Network participants will agree on a work plan together with SENAI and ILO/Cinterfor.
3. When they express their interest, VTIs should also indicate the prospective studies to be carried out, as well as the team assigned to it.
4. SENAI and ILO/Cinterfor will structure a second edition, to be implemented in 2014.
5. The VTIs that were involved in the first SENAI Prospective Model Transfer Programme will provide support in the execution of subsequent editions.

B) Network objectives and activities

- General Objective: to promote knowledge dissemination and management with regard to prospection applied to VT.
- Specific Objectives:
  - Skill development in prospective studies for VTIs.
  - Sharing developments and outcomes.
  - Systematization of experiences.
  - Ongoing updates regarding different prospection models, innovations and significant events.
  - Reciprocal technical assistance.

[34] At the 41st ILO/Cinterfor Technical Committee Meeting, Port of Spain, 8 to 10 July 2013.



- Activities:
- ILO/Cinterfor's knowledge management platform (KMP) will include:
  - A section on prospection.
  - Prospective study database.
  - A virtual community.
  - A database of experiences and good practices.
- The production of a guide on conducting prospective studies.
- Work plans for each VTI.
- Face-to-face meetings of VTI members of the network.
- VT prospective studies.
- Re-editions of the prospective programme.

During the second half of 2013 and with the support of the INA and the FOIL project, prospective studies will be conducted in several Central American countries in the field of green jobs and including: clean technologies for land transport, basins and aquaculture, photovoltaic power and wind power, gastronomy and eco-tourism, carbon emission inventories, carbon neutral system certification.

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Appendix 1

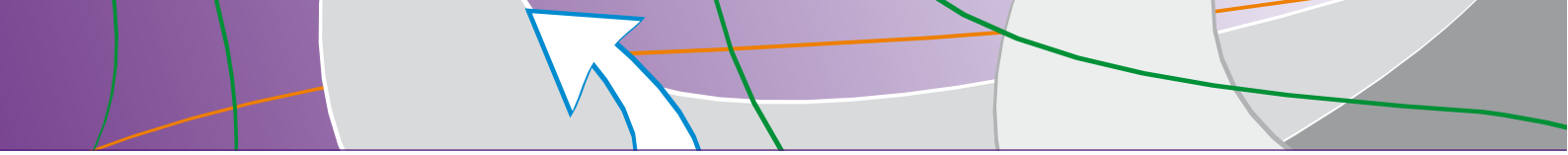
National teams participating in the Model Transfer Programme

Institution	Name
Serviço Nacional de Aprendizagem Industrial SENAI - Brazil	Luiz Caruso Marcio Guerra Amorim Marcello José Pío
Instituto Nacional de Aprendizaje INA - Costa Rica	Kenneth Acuña Segura Jimmy Sanabria Couto Silvia Campos Zárate Gloria Acuña Navarro Javier Bonilla Herrera
Instituto Nacional de Formación Técnico Profesional INFOTEP – Dominican Republic	Yanira Núñez Ortiz de Espinal Arelis Tolentino Colorado Nancy Altagracia Salcedo Santos
Instituto Salvadoreño de Formación Profesional INSAFORP - El Salvador	Ricardo Escobar Bernal José Mario Martínez Quintana José Roberto Ponce Ariza Ricardo Antonio Escobar
Instituto Técnico de Capacitación y Productividad INTECAP - Guatemala	Bidcar Darinel Herrera Castillo Carlos Eduardo Ávila Palma Emanuel Alexander Gálvez Castellanos Ronald Osberto Ochoa Saldaña
Instituto Nacional de Formación y Desarrollo Humano INADEH - Panama	Benjamín Sánchez Leonardo Betegón Domingo Saavedra
Servicio Nacional de Adiestramiento en Trabajo Industrial SENATI - Peru	Sergio Tokumori Kiyota Carlos Hernández Mendocilla

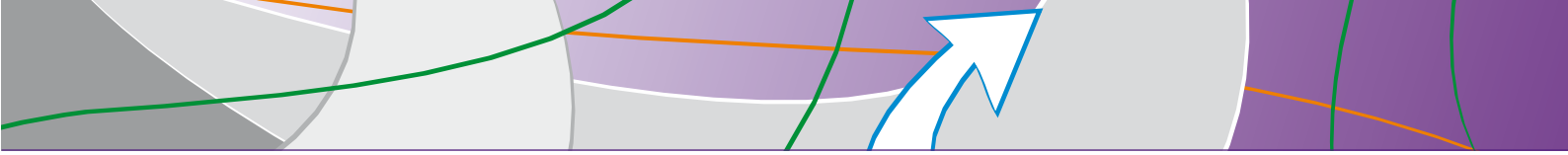
Appendix 2

Teams participating in the prospective studies

Country / Sector	Work Team	Name	Institution/Enterprise
Costa Rica / Construction	Executive group	Laura Chinchilla Flores	Fomento Urbano S.A
		Ana Grettel Molina	Colegio de Arquitectos de Costa Rica
		Ana Grettel Leandro	Instituto Tecnológico de Costa Rica
		Roberto Meza	Sphere Sustainability Consulting
		Marisel Umaña Morera	COCCASA S.A.
		José Mena Carmona	INA
		Daniel González Vargas	INA
		Jimmy Sanabria Couto	INA
		Silvia Campos Zárate	INA
		Gloria Acuña Navarro	INA
	Occupational impact panel	Daniel González Vargas	INA
		Ramón Gerardo Loria Sáenz	INA
		José Sáenz Zúñiga	INA
		Roy Ramírez Quesada	INA
		Rafael López Rodríguez	INA
		Hannia Castellá Araya	INA
		Álvaro H Chaves Piedra	INA
		Mario Campos Sánchez	INA



Country / Sector	Work Team	Name	Institution/Enterprise
El Salvador Construction	Executive group	Roberto López Meyer	Universidad Politécnica de El Salvador
		Emperatriz Guardado	Universidad Politécnica de El Salvador
		Carlos López	Universidad Politécnica de El Salvador
		Karla de Escamilla	Instituto Salvadoreño del Cemento y el Concreto
		Edgar Peña	Universidad de El Salvador
		Mario Martínez	Universidad de El Salvador
		Raúl Castañeda	Cámara Salvadoreña de Industria de la Construcción
		Mario Hernández	Asociación Salvadoreña de Ingenieros y Arquitectos
		Reynaldo Zelaya	Facultad de Ingeniería y Arquitectura de la Universidad Centroamericana José Simeón Cañas-UCA.
		José Mario Martínez	INSAFORP
		José Roberto Ponce	INSAFORP
		Ricardo Antonio Escobar	INSAFORP
	Occupational impact panel	Alonso Valdemar Saravia	AVS Datos
		Edgardo Melara Ruiz	ICIA
		Fredy Herrera Coello	FHC Ingenieros
		Juan Ramón Portillo	Planes, S.A de C.V
		Mabel Molina	CASALCO
		Ricardo Lagos	ASIA
		Roberto Alfredo Borja	INSA
		Mario Martínez	Universidad de El Salvador
		Roberto Ramírez	GRM
		Marlon Vigil	Instituto Salvadoreño del Cemento y el Concreto
		Jaime Ávalos	Instituto Salvadoreño del Cemento y el Concreto
		Reynaldo Zelaya	Universidad Centroamericana José Simeón Cañas



Country / Sector	Work Team	Name	Institution/Enterprise
Guatemala Tourism	Executive group	Ramiro Tejada	Universidad Mariano Gálvez
		Patricia Gálvez	Universidad del Itsmo
		Maximiliano Siguí	Casa de la Cultura. Profesor Historia del Arte Guatemalteco.
		Lisbeth Barrientos	CAMTUR
		Bidcar Darinel Herrera Castillo	INTECAP
		Carlos Eduardo Ávila Palma	INTECAP
	Occupational impact panel	Adira Castillo	Universidad del ITSMO
		Mahli Palma Guerra	Universidad Mariano Gálvez
		Claire Dalliés de Masaya	Universidad del Valle
		Estuardo Aldana Ugal	Universidad Galileo
		Julie Castillo García Ugal	Universidad Galileo
		Lisbeth Barrientos	CAMTUR

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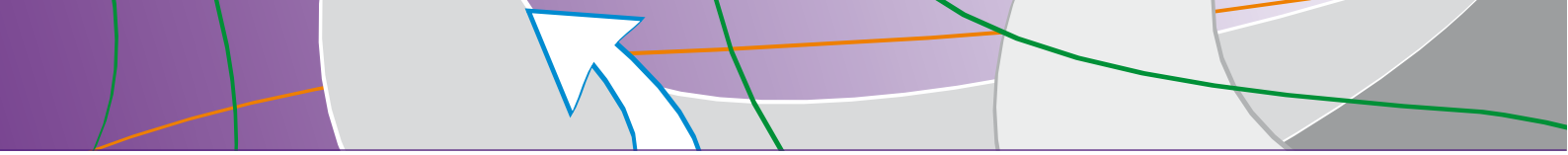

Country / Sector	Work Team	Name	Institution/Enterprise
Dominican Republic Construction	Executive group	Héctor Bretón	Asociación. de Constructores de Viviendas ACOPROVI
		Altagracia Espaillat	Ministerio de Trabajo
		José Miguel Méndez Cabral	Constructora MC, C x A
		Sonia Merán	Colegio Dominicano de Ingenieros, Arquitectos y Agrimensores (CODIA).
		Pedro Batista	Pontificia Universidad Católica Madre y Maestra (PUCMM)
		Carmen Leyda Mora	Viceministro de Obras Públicas
		Miguel Hernández	INFOTEP
		Michelle Fernández	INFOTEP
		Dante de los Santos	INFOTEP
		Mirtha Ditrén Técnico	INFOTEP
	Technological prospective panel	Mario Marcano	ODEBRECH
		Carlos Peralta Director	Acero Estrella
		Félix Ravelo	Ravelo, Domínguez y Asociados
		Juan Martínez	Universidad Autónoma de Santo Domingo
		Ileana Polanco	Arq. Empresa constructora
		Rosanny Contreras	INFOTEP
	Occupational impact panel	Héctor Bretón	ACOPROVI
		Pedro Batista	PUCMM
		José Báez	Escuela Nacional de Construcción (ENACO)
		Félix Ravelo	Ravelo, Domínguez y Asociados
		Mario Marcano	ODEBRECH
		Dante de los Santos	INFOTEP
		Rosanny Contreras	INFOTEP

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