

National Administrative Department of Statistics



DESIGN
DSO

Statistical Methodology and
Production Division-DIMPE

Technical Development and Innovation in
the Manufacturing Industry - EDIT

General Methodology

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FOREWORD

The National Administrative Department of Statistics (DANE) is committed to the strengthening and consolidation of the National Statistical System (SEN), as part of the Planning and Statistical Harmonization Project. This process involves producing strategic statistics, the generation, adaptation, adoption and dissemination of standards, and the consolidation and harmonization of the statistical information. It also requires the coordination of instruments, actors, initiatives and products in order to improve the quality of the strategic statistical information, its availability, timeliness and accessibility, as a response to the increasing demand for this type of products.

With this background and conscious of the need and obligation to provide the best possible products to its users, DANE has developed standard guidelines for the submission of methodologies that contribute to the visualization and clear understanding of the statistical process. These guidelines have been used for the elaboration of the methodological documents of its operations and statistical research. DANE makes them available both to the specialized users and to the public in general. These methodologies are presented in standard manner; they are complete and easy to read. The main technical characteristics of the processes of each research are presented in order to facilitate its analysis, control, replicability and evaluation.

These series of documents intends to favor the transparency, confidence and credibility in the technical quality of the institution and should contribute to a better understanding of the statistical information, produced following the principles of coherence, comparability, integrity and quality.

Along these lines, Dane's Methodology and Statistical Production Division has elaborated this document to present in a summarized form the methodology of the Survey on Development and Technological Innovation in the Manufacturing Industry (EDIT).

INTRODUCTION

The most important component of DANE's mission is to produce and disseminate general interest statistical information, with strategic value for the decision making processes of individuals, enterprises and governmental organizations, both in national and international environments.

By realizing its mission DANE has contributed to formalize the statistical characterization of the technical change and the innovation as highly important phenomena for the performance of the national economy. In Colombia, the economic policy in general, and the manufacturing and competitiveness policy in particular, recognize, nowadays, that the transfer, absorption, adaptation and generation of novel knowledge and technical solutions by the enterprises are factors that positively affect the productivity and competitiveness of the national economy, and consequently the economic growth in the long term.

The importance of the availability of strategic information, in the form of variables and indicators, for pursuing the technological development and innovation activities in the Colombian economy, has been shown by the National Planning Department (DNP) in its document "Bases of the National Development Plan, 2010-2014, Prosperity for all"; in the chapter "Cross-sectional Supports of the democratic prosperity" it mentions: "The knowledge and innovation are a cross-sectional support that will sustain the infrastructure, housing, farming and mining sectors, (considered as the four drivers of the economy), allowing to solve technical problems, to reduce costs, to extend coverage and to compete in globalised markets with diversified and sophisticated supply. In the same way, innovation is the strategy to transform and invigorate the sectors in which the economy has been traditionally concentrated".

The policy approach proposed for this area of development by the government is based on the diagnosis revealing that the Colombian productive sector presents a low capacity of innovation compared with other countries. This explains the proposal of a strategy sustained in three pillars for using knowledge and the innovation: funding, training and organizing. The Bases of the Plan say: "Funding implies to increase public and private investments in Science, Technology and Innovation as a percentage of GDP; training facilitates the availability of staff with skills and knowledge to implement the required innovations in the productive sector and organizing allows to specialize the institutions in taking care of the different stages of the process of generation and use of knowledge".

This methodological document is structured as follows: the first part, including this section, introduces the topics of the research; the second section presents its background research; the third part contains its design, its scope, the objectives and the conceptual base, the elements of statistical production (describing the relevant aspects of the preparatory activities, collecting, editing, coding, supervision and consolidation of data as well as the activities related to the dissemination of the final statistical data obtained. At the end a glossary of basic terms and some Annexes with the collecting instruments used in the operation are presented.

1. BACKGROUND

In its role as leader of the national statistical system, DANE has conducted for almost one decade the processes of collecting, controlling the information quality, processing, analyzing and publishing the results of the Survey on Development and Technological Innovation in the Manufacturing Sector (EDIT), contributing with this to fulfill the objective to institutionalize the production of national statistical information of high quality regarding technical change and innovation in Colombia. Between 2004 and 2011, within the framework of the Administrative Agreement 023, the National Planning Department (DNP) and the Administrative Department of Science, Technology and Innovation (COLCIENCIAS) participated and provided support for the realization of this objective.

The first measurement exercise of this type in Colombia was the Survey of Technological Development in the Manufacturing Industry (EDT) carried out by the DNP in 1996, referring to the 1994-1996 period. In 2005, DANE realized the Second Survey of Development and Applied Technological Innovation in the manufacturing sector (EDIT II) for the period 2003-2004; this survey made it possible to obtain data from 6,172 enterprises of the sector. The Third Survey of Development and Technological Innovation (EDIT III), implemented in 2007, corresponded to the 2005-2006 period and collected information for 6,080 manufacturing enterprises.

In 2009, DANE, supported by an inter-institutional committee of national experts in technological development and innovation matters, decided to submit EDIT to a significant redesign, with particular emphasis in improving the collecting instrument of the survey. In 2010, these methodological improvements were introduced and the Fourth Survey of Development and Technological Innovation in the manufacturing sector (EDIT IV) for the reference period 2007-2008, covering 7,683 manufacturing enterprises were launched. In 2011 a new collection operative took place in the manufacturing sector (EDIT V) for the period 2009-2010 and included information from 8,643 manufacturing enterprises.

By the end of 2012, based on the opinions of international experts and on the lineaments of the **Frascati Manual**, DANE reviewed again the collecting instrument. The changes were included in the operative EDIT VI covering the 2011-2012 period. Among those changes mention should be made of the introduction of some questions to increase the consistency of the information and the way in which employment was being treated: instead of referring to it in an aggregated mode, it was restricted to staff associated permanently or temporarily to **Scientific, Technological or Innovation activities (STIA)**, classified by gender. With this improved instrument the EDIT VI operative was carried out in 2013. Its results, including 9,137 enterprises, were published in the same year.

2. DESIGN OF THE STATISTICAL OPERATION

2.1. TOPICS SELECTION / METODOLOGICAL DESIGN

2.1.1. Information Needs

The Survey of Development and Technological Innovation in the manufacturing sector - EDIT, is the main source of statistical information about the dynamics of the technical and organizational change and of the relationships that exist between the economic activity of the enterprises and knowledge considered as a production factor.

This survey is also the main source of information available for the national government and the Colombian entrepreneurs on the trends of the investment in activities of development and technological innovation, its situation with respect to other countries and the kind of obstacles found; therefore, it is instrumental for designing public and private policies in agreement with the challenges raised by the environment of increasing competition.

Finally, EDIT is an indispensable tool for the research work of universities and centers dedicated to the production of secondary information on science, technology and innovation in Colombia, by means of publications of cases studies and scientometrics indicators.

2.1.2. Objectives

General

To characterize technological dynamics and the activities related to innovation and technological development in enterprises of the Colombian manufacturing sector.

Specific

- ✓ To identify the innovations achieved by manufacturing enterprises during the reference period;
- ✓ To identify which are the purposes of the enterprises of the sector in undertaking scientific, technological and innovation (STIA);
- ✓ To determine the investment realized by the enterprises in STIA during the reference years;
- ✓ To study which funding sources have been used by the manufacturing enterprises for insuring the development and technological innovation-STIA in the reference period;
- ✓ To determine the size and level of education of the enterprises staff involved in STIA;
- ✓ To characterize the relationships between the manufacturing enterprises and the rest of participants involved of the National System of Science, Technology and Innovation (SNCTI);
- ✓ To identify which are the sources of information and what is the origin of the innovating ideas that the manufacturing enterprises have for the development of STIA;
- ✓ To determine which instruments of intellectual property protection have been used by the manufacturing companies during the reference period, as well as the obstacles that they find to access them.

2.1.3. Scope

EDIT is a statistical operation open to constant review and improvement. Nevertheless, from the conceptual and methodological point of view, its design preserves a basic theoretical framework coherent with the main agreements reached by the community of national and international experts, on design, application and interpretation of national surveys on innovation. In particular, EDIT has incorporated most of the methodological paths drawn up by the Organization of Cooperation and Economic Development (OECD), in particular the Oslo Manual, and by the Latin American Network of Indicators of Science and Technology (RICYT), compiled in the Bogota Manual. Most of these recommendations have been adapted to the information needs and to technical restrictions identified for Colombia.

Following the guidelines of the Oslo Manual (2005), the primary statistical unit of the EDIT is the enterprise. Following the same guidelines, the survey is designed according to the “subject approach” “which starts from the innovative behavior and the activities of the firm as a whole. The idea is to explore the factors influencing the innovative behavior of the firm (strategies, incentives and barriers to innovation) and the scope of various innovation activities, and above all to get some idea of the outputs and effects of innovation” (Oslo Manual, 2005, paragraph 50 pp. 20).

The statistical operation developed is a census, since it covers all the manufacturing enterprises that fulfill the parameters of inclusion in the universe. These parameters define the manufacturing enterprises that have establishments with 10 or more employees or with annual production greater than COL \$136.4 million per year for 2012, reported by the enterprises registry of the Annual Manufacturing Survey (EAM).

2.1.4. Reference Framework

Theoretical framework

The “Proposed Guidelines for Collecting and Interpreting Technological Innovation Data” - (Oslo Manual, 2005) - is taken by OECD as a basic reference. Also, the Frascati Manual (OECD, 2002) is a proposal of practical standard for surveys of research and experimental development, and gives some recommendations and methodological guidelines, especially to improve R&D statistics.

For the case of developing countries, the Latin American Network of Researchers on Science and Technology (RICYT) designed the Bogota Manual. With the conceptual and methodological orientation provided by these manuals, the countries can measure, in conditions of international comparability, the variables that directly and indirectly affect the creation of new products, processes, trading techniques and organizational forms and their substantial improvement, as well as the impact on their economies.

Supported on the previously mentioned references, , the technological development and the innovation as observed in the Survey of Development and Technological Innovation - EDIT make reference to a wide spectrum of self realizations of the enterprises competing inside markets with defined borders, where innovation includes a set of new or significantly improved products (goods or services) introduced into the market, or new or significantly improved production processes implemented in the enterprise; or new methods of organization, or new marketing techniques, applied in the operations of the enterprise.

Thus, all innovation is always, by definition, a novelty or an improvement involving a given enterprise, although it is not necessarily an improvement with respect of the competitors in the market. However, the esthetic modifications of products or the simple changes in organization or in management are excluded from the definition of innovation.

Conceptual Framework

Innovation is a widely studied concept, based on novelty and specific application. Thus, an invention, or a creative idea, becomes innovation if used to satisfy a concrete need.

“Invention is the creation of an idea potentially generating commercial benefits. If it does not acquire concrete form in products, processes of service, the invention is not an innovation strictly speaking. Innovation is to turn ideas into products, processes or services, new or improved, that the market values” (Paiva, 2010).

The change in an enterprise may occur through innovations that take place for the first time in the society, or through innovations that have arisen in another environment and are assimilated for the first time in a given enterprise practices. For this reason a twofold point of view exists for identifying and valuing innovations: those that are new for the society and those that they are new for the organization that integrates them.

In this sense and according to the conceptual guidelines outlined by the Organization of Cooperation and Economic Development (OECD) through the Oslo Manual ¹(2005), EDIT considers that innovation may appear as:

- A new or significantly improved good or service introduced into the enterprise;
- A new or significantly improved good or service introduced in the market (domestic or international);
- A new or significantly improved process introduced into the enterprise;
- A new organizational method introduced into the enterprise;
- A new marketing technique introduced into the enterprise.

Enterprises integrate innovations by very diverse forms, and they can do it for obtaining a greater quality in their products or services, diminishing costs, offering a larger range of products or services, or to introduce them rapidly to the market. What is required, in any case, is that a change has to be introduced in the enterprise.

Setting up typologies has called the attention of numerous scholars and researchers, whose works have led to different classifications. On the basis of the discussions on the conceptual and methodological aspects of the survey, the inter-institutional committee of EDIT has proposed a typology for classifying, a posteriori, the enterprises once the results on innovation for the reference period are known.

Following this proposal, four types of enterprise² are identified:

- Innovators, strictly speaking: enterprises that in the survey's reference period obtained at least one new or significantly improved good or service for the international market;
- Innovators, broadly speaking: enterprises that in the reference period obtained at least one new or significantly improved good or service for the domestic market or for the enterprise, or implemented a new or significantly improved process for its main production line or for the complementary ones, or a new form of organization or marketing;
- Potentially innovators: enterprises that when answering the survey had not obtained any innovation in the reference period, but reported to be in that process or to have given up some project of innovation;

¹ The Oslo Manual is the guideline collecting and interpreting data on innovation, developed by OECD for use of its member countries.

² An alternative typology was used in EDIT II (reference 2003-2004); two important aspects stand out: the qualifying criterion and degree of novelty of the innovation and the nature of this novelty. Nevertheless, this typology is not used since the analysis of EDIT IV.

- Non- innovator: enterprises that in the survey’s reference period did not produce innovations, neither reported to have any in process, or to have given up some project for producing innovations.

International references

EDIT also uses as reference the measurement of innovation experiences of other countries and regions through different instruments. Such is the case of the Survey of Innovation of the European Community (CIS); the Survey on Research Investigation and Development of Canada; the Survey of Innovation in Services of Uruguay, Spain’s NSO Survey on Innovation in Companies, and the Survey on Research and Development of Brazil.

2.1.5. Design of indicators

The main indicators of EDIT correspond to aggregates and distributions. The formulas for their calculation are:

Given a variable X observed in n elements of the population, the aggregate indicator is the sum of the variable corresponding to the n elements:

$$\text{Aggregate (X)} = \sum_{i=1}^n X_i$$

Given a variable X observed in n elements of the population, and the population is classified in j categories the distribution of the variable X for a particular group j is expressed as:

$$\text{Distribution (Xj)} = \frac{\sum_{i=1}^n X_{ij}}{\sum_{i=1}^n X_i} * 100$$

The aggregate of the numerator corresponds only to the elements of the population belonging to category j and the denominator is the aggregate of X for the whole population. Given that all the elements of the population belong to one and only one category j the sum of all the distributions j is 100%.

The main indicators or results defined in the survey are as follows:

- Number of innovations implemented by the manufacturing enterprises by type of innovation;
- Number of enterprises that qualified the importance of the innovations implemented by the manufacturing enterprises and the difficulties faced at the time of innovating.
- Distribution of the total amount invested by the enterprises in scientific, technological and innovation activities according to industry, type of capital of the enterprise and classification of the innovation for each year of the reference period;
- Distribution of the total amount invested by the enterprises in scientific, technological and innovation activities according to sources of financing, for each year of the reference period;
- Distribution of public resources invested by the enterprises in STIA by lines of co-financing and credit, for each year of the reference period;
- Total number of employees of the enterprise by level of education, for each year of the reference period;
- Number of employees of the enterprise participating in STIA by level of education, for each year of the reference period.

- Number of employees of the enterprise participating in STIA by functional areas of the enterprise, level of education, and gender, for each year of the reference period;
- Distribution of the employees with higher education, participating in STIA by area of educational skills and gender, in the last year of the reference period.
- Distribution of the employees who have received training/qualification related with STIA, by type of training or qualification.
- Number of manufacturing enterprises that found internal and external sources as origin of ideas to innovate.
- Number of manufacturing enterprises that established supporting links for the realization of STIA, by type of actor of the SNCTI.
- Number of manufacturing enterprises that cooperated with different partners in STIA realization, by type of partner and type of STIA.
- Number of intellectual property registries and certifications of quality, by type of registry and type of certificate.
- Number of enterprises that qualified the importance of the certifications obtained by them, by type of impact.

2.1.6 Planning of results

EDIT results are disseminated in DANE webpage and includes press bulletins, annexes and notes. The information presented refers to:

- The activity of development and technological innovation;
- The investment made in the reference period;
- The number of employees involved in STIA, by type of association with the enterprise; functional area, educational level, and special training/qualification;
- The sources of ideas for innovation;
- Financing for innovation, sources and value;
- Enterprise registries of intellectual property, product and process certifications.

2.6.1.1 Design of output (or results) tables

The output tables are used in the research in order to present the information obtained at different levels of aggregation, for instance by economic activity (ISIC Rev. 3), typology, staff categories or type of property of the enterprise.

In these tables the analysis of the variables is performed, as well as the verification of the results, calculation of indicators and their internal coherence. Finally, with the output tables the Annexes, published in DANE webpage are elaborated.

The list below presents some of the output tables published in the Annexes:

- Number of enterprises by kind of innovation and by manufacturing groups (ISIC.Rev.3.A.C.);
- Number of innovations by the manufacturing enterprises covered by the survey, by type of innovation and economic activity (ISIC.Rev.3.A.C.);
- Importance of the innovations of the innovative enterprises by type of impact of the innovation and economic activity (ISIC.Rev.3.A.C.);
- Manufacturing enterprises that invested in Scientific, Technological and Innovation Activities (STIA), by manufacturing groups (ISIC Rev.3.A.C.);

- Manufacturing enterprises that invested in STIA and invested amount, by type of property of the enterprise and economic division (ISIC Rev 3.A.C.);
- Amount invested in STIA by the manufacturing enterprises included in the survey, by source of financing and economic activity (ISIC Rev 3.A.C.);
- Incidence of the barriers of access to public resources on the manufacturing enterprises that financed STIA with those resources by type of barrier and economic activity (ISIC.Rev.3.A.C.);
- Employees that participated in STIA of the manufacturing enterprises, by educational level and economic activity (ISIC Rev 3.A.C.);
- Employees that received specialized training/qualification with resources of the manufacturing enterprises by type of training/qualification and economic activity (ISIC Rev 3.A.C.);
- Sources of ideas for innovative manufacturing enterprises*, and potentially innovative enterprises** that had the intention to innovate, by type of source and manufacturing activity (ISIC Rev 3.A.C.);
- Number of innovative manufacturing enterprises*, and potentially innovative enterprises**that had the intention to innovate, and use sources external to the enterprise as origin of the innovating ideas, by type of source and manufacturing activity (ISIC Rev.3 A.C.);
- Number of intellectual property registers by the manufacturing enterprises in the sample, by type of protection and manufacturing activity (ISIC Rev.3 A.C.);

2.1.7 Design of the form or questionnaire

In order to collect the information a unique enterprise identification page is used. The content of the six chapters depends on the reference period and has the structure described below³:

- *Enterprise identification card*: It contains the data on identification, location, general characteristics, type of organization and the social capital structured of the enterprise.
- *Chapter I - Innovation and its impact on the enterprise in the reference period*: it summarizes the information about the innovations made by the enterprise and the main objectives pursued with those; it identifies the impacts that these realizations have had on the enterprise; it determines the state of advance of the innovations, and reviews the factors that have prevented (if any) the achievement of the objectives in the development of innovations.
- *Chapter II - Investment in STIA in the reference period*: it registers the different STIA realized by the enterprise in its innovative process, and the total amount of resources invested in each of the activities.
- *Chapter III - Funding of STIA in the reference period*: it characterizes the structure of funding of the enterprise for STIA realization; it obtains data on the amounts funded by means of programs of co-financing and originating credit of different sources, and detect possible obstacles in the access to public financing and the existing tax incentives.
- *Chapter IV – Employees involved in STIA in the reference period*: it quantifies and characterizes the educational level of staff employed by the enterprise and the educational level of staff participating in STIA. It also characterizes the staff participating in STIA during the last year of the reference period according to functional areas and educative level and identifies the total number of people that they received, at the expense of the enterprise, either specialized training or qualification with STIA resources, during the reference period.

³ A complete questionnaire appears in Annex 1.

- *Chapter V - Relationships with actors of SNCTI and cooperation for innovation in the reference period:* it finds out which are the sources of ideas for the innovation, the relations of enterprise with the other actors of the SNCTI who support the STIA realization, and obtains information on the relations of cooperation for the innovation that were developed between the enterprises and the other actors of the SNCTI, according to the expected goals.
- *Chapter VI- Intellectual Property, certifications of quality, technical standards and regulations in the reference period:* the purpose of the first part of this chapter is to find out the types of protection of intellectual property requested or used during the reference period, as well as the possible obstacles that the enterprise found to use a system of protection of the intellectual property. In the second part the questionnaire enquires about obtaining quality certifications of the process or of the product obtained, and the level of importance that represented for the enterprise obtaining these certifications.

2.1.8. Norms, specifications or rules of validation, consistency and imputation

The collection of EDIT is realized by means of a self – completing electronic form on line, through DANE webpage. In order to guarantee the quality and consistency of the collected data, besides the activities realized during the process of collection and editing, an integral system has been developed that makes possible the automatic supervision for each of the stages of the survey and implements a quality control of the information reported by the enterprises through the collection program.

The process of correction of inconsistencies is supported by a series of crossed verifications of the information, as those described below:

- Enterprises without code for economic activity (ISIC Rev. 3 A.C.);
- Outliers, very high or very low values of investment in STIA;
- Verification of figures to confirm that values are reported in the proper value unit (thousand pesos);
- Comparison of the activity of the enterprise, according to ISIC Rev. 3 A.C, registered in the form, with the activity according to preliminary data taken from EAM for the reference period.
- Comparison of the total employment reported in the EDIT form,with the preliminary data taken from EAM for the reference period.

Imputation and/or adjustments of coverage

The figures in EDIT are not submitted to any imputation or adjustment of coverage. This is because it is accepted that neither the magnitudes nor the relationship between the innovation activities and technological development experienced by the enterprises at aggregated level, may be used for generalization by allocating of values based on historical or sectoral averages, given the non-linear and underdetermined character of the technological behavior of the enterprises. This is due to the fact that the enterprises may invest in technological reconversion in a given year, followed by a year with null or non significant investment for the same item.

2.1.9. Classifications used

This statistical operation uses the International Standard Industrial Classification (ISIC), Revision 3, adapted to Colombia (ISIC Rev. 3, A.C.).

2.2 STATISTICAL DESIGN

2.2.1. Basic components of the statistical design

Universe and objective population

Colombian manufacturing enterprises having establishments with 10 or more employees or with annual production greater than COL\$136.4 million for 2012 and included in the Register of Enterprises of the Manufacturing Annual Survey (EAM).

Statistical Framework

This research takes as framework the universe that has been described in the precedent paragraph, that is to say, the same register of enterprises than the Manufacturing Annual Survey (EAM).

Definition of variables

The Manufacturing EDIT includes 512 variables which can be consulted through the collection instrument (See Annex 1).

In the following some of the main variables associated with each of the six chapters structuring the collecting instrument of this research are presented:

- Number of innovations realized by manufacturing enterprises according to the type of innovation;
- Total amount invested by the companies in STIA;
- Financing of STIA;
- Number of persons employed by the enterprise who participated in the realization of STIA.
- Number of manufacturing companies that used internal and external sources as origin the ideas to innovate.
- Number of registries of intellectual property and quality certifications according to type of register and certification.

Source of data

As was already indicated (2.1.3) the statistical operation is a census, given that all the manufacturing enterprises that satisfy the inclusion parameters defined for the universe are studied.

Coverage and geographical breakdown

EDIT uses a unique geographical reference. Results are therefore presented on the basis of national totals.

Information Classification

This research uses different levels of classification: economic activity (ISIC Rev. 3 A.C.), type of enterprise referred to STIA, classification of employees, type of property of the enterprise.

2.2.2. Statistical units

The statistical unit strictly corresponds to the definitions of the universe and objective population.

2.2.3 Reference and collecting periods

Reference period

The reference period EDIT in the manufacturing sector corresponds to the two years immediately previous to the collection of data. The reference period for EDIT VI is 2011-2012.

Collecting period

The collecting period is the year that follows the reference period.

2.3 DESIGN OF THE OPERATION

2.3.1. Training system

Previously to the beginning of the collecting activities a training program is organized by DANE Headquarters addressed to the technical assistants of the manufacturing sectors in the regional offices. They are directly in charge of getting the information and afterwards they will train the required staff in their respective regions. This training is done by means of video conferences, workshops and working tables.

In the same way, the team in charge of the research participates permanently in workshops organized by international organizations on innovation and technological development.

2.3.2. Preliminary activities

Motivation

The motivation starts with a letter addressed to the Executive Director of the enterprise (see Annex 2) informing him about the general purpose of the research. The letter includes the keyword to access the electronic application of the survey. In some cases, when the enterprise refuses to provide information or when it is considered necessary to give additional explanations, calls or visits are made to the sources as a resource for motivating the entrepreneur about the importance of the information for the country.

Staff Selection

DANE Headquarters elaborates the previous studies on the opportunity, convenience and volume of a given enrollment. These studies are loaded in SICO; the regional offices study them and if necessary propose adjustments. Once the final approval has been given and the SPGI procedures have been followed, the regional offices carry-out the hiring process.

Call

Once DANE Headquarters have the required budgetary availability for realizing the collection operation and the internal documents to provide resources to the territorial directions have been emitted, based on the previous studies also approved (they determine the total number of field coordinators and poll-supervisors, their remuneration and profiles and the starting date) a call will be published on DANE webpage with the details on the training courses that will be organized by every regional office.

For hiring more than four persons a call will be made, whereas for four or less persons, a direct invitation procedure will be used. In the latter case, twice as much persons as the staff required should be invited.

Training and selection of staff

It is recommended that the training for EDIT operative staff, be realized in each regional office under the responsibility of the staff that has led the collecting activities in the last years. The material requires will be provided by DANE

Headquarters (presentations, manuals, questionnaire, etc.). Once the training period is over, the staff will be evaluated and selected.

Profiles

The specific profiles for poll – supervisor and field coordinator appear in Annex 3.

2.3.3. Design of instruments

Collecting Instruments

EDIT Processing Manual: it explains the collection procedures, how to fill-out the control card and the correct way to provide the information requested by each module of the form. It is available for all the users.

EDIT Basic Concepts Manual: it explains the thematic significance of the form and specifically treats the definition of each specialized term that has been used in the formulation of the questions of the form.

EDIT editing Manual: it explains the procedures to perform an exhaustive revision of the data provided by the enterprise and the cross-checks that have to be realized with the information of other chapters of the form.

Systems Instruments

EDIT user Manual: it indicates to the user of the data capture system, its operation, the different screens and options that the program offers.

Validation and Consistency Instruments

EDIT Matrix of validation and consistency: it indicates the characteristics that the system must have in order to validate the information and the correct treatment for each field of the computer system for capturing the data. It also works as support for the design of the capture system and as explanatory document on the conditions that must fulfill the information to be consistent.

2.3.4. Information Collection

As for all the research activities of DANE, the survey on Development and Technological Innovation has an administrative and operative structure. This is a guarantee for the global development of the research. This structure includes, broadly speaking, the elements described below:

Operative chart

In order to develop the processes of distribution, collecting, editing and capturing the information, each regional level follows an operative chart similar to the one presented in Figure 1.

Figure 1. - EDIT operative chart (regional level)



Source: DIMPE

Methods and mechanisms for collecting the information

The collection of the information is realized through the regional directions of DANE; it takes in average four months, to follow the operative plan designed in the central level.

The planning of the operations requires the register of the census sources, their geographic location and the instruments of collection, aspects that demand human capital, transport, materials and computer science resources.

The number of collectors in each regional direction is determined by the number of sources and complexity of the collection instrument. When these two aspects are defined, the monthly charge of work assigned to each editor is also established.

The members of the staff present the research to each source and inform them about the time span established for the delivery of the information. They must also assist the reporting activity, and strictly follow the manuals and instructions of the operation until obtaining the data within the established parameters of quality and opportunity.

Information Transmission

The collection of the information is realized by **self-response** of the enterprise to the electronic form online, through DANE webpage, with the support of the previously trained staff. It may be also realized using direct interview of the owner and/or the administrator, with knowledge of the enterprise, or of the people in charge of each one of the areas involved in the activities of interest (engineering, quality, tests, experiments, research and development; production and human resources)

The process begins with a communication from the regional direction of DANE to the manufacturing enterprise, requesting the information for the census. A user name and a password for the responsible in the enterprise are

included so that this person may access DANE webpage and answer using the electronic form. In the same way, if the sources cannot give the information by electronic means, a physical form is available for them. In both cases, the enterprise counts with the support of a collector- editor who provides complementary information in those cases not covered by the manual.

The web applicative for data collection is part of an interactive module for the control and follows up the operation; it makes possible the daily monitoring of the different stages included in the process: distribution, collection, editing, capture, cleansing and transmission of the information from the sources to the regional directions and to DANE Headquarters. The quality of each step is guaranteed through the electronic application.

Classification and ordering of surveys or registries

In the processes of collection, editing, codification and capture, the information is classified and organized according to the register of manufacturing enterprises previously defined; it contains the identification and the location variables and a unique identification code for each enterprise, which is later used in the verification and analysis of consistency processes and in the production of the survey results.

Editing guidelines

The fundamental principle for the efficient handling of collected information is to have **unified criteria** among the different persons and through the different stages involved in its processing. This is the purpose of DANE for organizing an instruction device, with the norms and procedures to be used during the editing process, as a guideline to assure the consistency of the information with the methodological parameters established.

Codification

The classification and the codification are realized using the ISIC Rev. 3, A.C.

The manufacturing activity is classified and codified as follows:

1. In the opening listing select the corresponding category (A to Q);
2. In the listing of the category select the corresponding division (2 digits category);
3. In the listing of the division select the corresponding group (3 digits category);
4. In the listing of the group, select the corresponding class (4 digits category);
5. The product and the main raw material, depending of its use or destination, define the class;
6. When using the electronic form, the enterprise identification card presents a list of manufacturing activities in alphabetic order. Once the activity has been located and selected with the cursor, the system automatically generates de 4-digits ISIC code.

The ISIC Rev.3 A.C. establishes in a unique and concise way the main activity of the enterprise. It presents completely and exhaustively the manufacturing classes with inclusions and exclusions.

2.4. SYSTEMS DESIGN

Verification of the internal consistency of the data and adjustments

By means of the capture program of the electronic form, the data of each of enterprises are published and its consistency is verified. It should be underlined that this process is limited to restricted users according to established permits. Once the enterprise finishes reporting its information, the security of the system does not allow any changes; only the collector in the editing process will be able to introduce changes after contacting the source, to clarify the possible missing elements or the inconsistencies of information.

Storage and protection of the information

The Systems Office obtains backup copies of the servers with critical information under one of two schemes:

Fixed pre-programmed: the backup copy is done daily to the servers where the information of the users is located.

By request: a backup copy done to a specific location following a request by the users.

The backup copies are carried out in a system of specialized storage for backup and recovery on disc.

Monthly a backup copy is made on tapes that will be stored externally, outside DANE Headquarters, under environmental conditions that minimize the risks of damage of storage media.

The information collected from the enterprises is kept in the computer center at DANE Headquarters in specialized systems of storage accessible exclusively by users with permit.

Coherence of the information

The coherence of the results is obtained by means of the analysis of the data of each chapter of the survey and some variables of the EAM, by the logistics and self-response staff, paying particular attention to variables as economic activity, total employees and annual production.

The economics staff receives the databases and carries out an additional coherence analysis. The information with possible inconsistencies is handed back to the logistics staff, to verify the observations in the forms or to send these observations to the sources. Among the controls made it is crucial to verify the cases in which the enterprise does not report having invested in STIA. The supervisor and the operation assistant of the regional office should visit the enterprise to corroborate this situation. Once the answers are received, they are verified and, if the situation persists, the former procedure is repeated.

After having an adjusted database, the programs in SAS are applied to generate the output tables, defining the level of aggregation of the information and the inclusion or not of some enterprises depending on the quality of their data. Finally, once the output tables are read, the bulletin and other publications are prepared.

The instructive documents and manuals used in this process are:

The editing guidelines and the ISICRev.3 A.C. already mentioned (p.19)

Weights

As it has been mentioned this operation has a census structure and consequently there are neither weights nor expansion factors.

2.5 DESIGN OF METHODS FOR QUALITY ASSURANCE AND CONTROL MECHANISMS

Supervision instruments

The integral system available allows the automatic supervision of the execution, for each process of the survey. It makes possible to control the quality of the information of each enterprise. In order to take to carry out this activity, the instruments of control used may be grouped in five modules as follows:

First module. - It makes a follow up and control of the self-response, the technical assistance and the editing processes.

Second module. - It facilitates the continuous capture, cleansing and verification of the information, as well as the verification of the quality of editing and coding stages.

Third module. - It consolidates and sends the information to DANE Headquarters.

Fourth module.- It is used for verifying the consistency of the information and for correcting it when necessary.

Fifth module.- It facilitates the daily control and follow-up of the stages of distribution, collecting editing, capture-cleansing and transmission of information obtained from the sources.

The fifth module contains the information structure presented next:

1. Basic register of sources, taken from the previous survey.
2. New potential sources to be included, according to the results of the mini-survey.
3. Sources that have moved, as per incoming report from the regional directions.
4. Sources that have moved, as per report sent to the regional offices.
5. Total sources (based on the previous figures).
6. Distributed sources (date of delivery to the source).
7. Non- distributed sources.
8. Pending sources.
10. Collected sources (date of reception in DANE).
11. Edited sources and code of editor (completion date of editing).
12. Recorded sources (not cleansed as they present errors) and code of the recorder.
13. Sources cleansed not transmitted to DANE Headquarters.
14. Sources sent to DANE Headquarters.

The data obtained in this module are summarized in a table, where the different stages of the survey and its coverage, as well as the processing status of each form may be appreciated.

Indicators for quality control of the processes of the research

The ISO 9001/00, international standard concerning Quality Management Systems, is the basis for a series of indicators for the follow-up the production of results of EDIT, as described below:

Quality Indicators: They represent an approximated measurement of the quality for the editing and capture processes of the information at the moment it is sent to the headquarters by each regional direction. The consistency of the information fed into the system for final results production depends, to a great extent on this control.

In order to control the quality of each process and obtain an approximated indicator of the quality, each technical assistant must review 10% of the forms that the regional direction will send to DANE Headquarters; that is to say, 10% of the forms edited and captured by each of the persons responsible for the development of these processes.

The technical assistant calculates a quality indicator for each form after the editing process and after the capturing one, following a grading table. Each form will have two scores, one for each process. For each process there are direct responsible persons (one or more). For each form there is only one person responsible by process.

Quality indicator by responsible person:

$$QI_R = \frac{\sum_{FORM,R} (QI)_{FORM,R}}{\sum_{FORM,R} 1}$$

That is, the **average score for a responsible** person is equal total of the scores of the forms of a responsible person divided by the total forms of this person.

Where: $(QI)_{FORM,R}$ is the score given to a form processed by R

$\sum_{FORM,R} (QI)_{FORM,R}$ is the total of scores for the forms processed by R, and

$\sum_{FORM,R} 1$ is the total number of forms processed by R

Quality indicator by process:

The former formula corresponds to one responsible person of a process. To have an indicator of quality for a process to which correspond k responsible persons, then the QI_p will be:

$$QI_p = \frac{\sum QI_R}{k}$$

Quality indicator by regional direction: (See IDCL below, p. 24)

Reliability Indicators: they evaluate the level of fulfillment of the objectives of the research in matters like coverage of the sources, the information provided by them and the quality level of the operative processes supporting the survey. For its calculation a simple average of all the relevant indicators is taken. The indicators could be referred to answer quality, to coverage, to processes quality, starting with those established at the local level and ending with those of the central level as follows:

- **Sources answer rate (TRF):** it is the ratio between the number of sources providing information (F1) plus the sources sent with remarks (FE), different from those under remark **number 5**,⁴ and the total number of enterprises in the register sent for field work (TD). As has been indicated, the sources comprise all manufacturing establishments in operation in the national territory, that have 10 or more employees, and at least a given value of annual production, which is permanently updated.

$$\text{TRF} = \frac{[(F1+FE) / TD] * 100}{}$$

Where:

F1: Sources providing information

F2: Sources with remarks different from category 5

TD: Total sources in the register sent to the field.

- **Indicator of sources with pending information (IFD):** it shows the proportion of sources having remark 5 represent of the total reporting sources expected. This indicator determines the percentage of enterprises that must be contacted and questioned about information that has not been provided during the field operative.

$$\text{IFD} = \frac{(FNC/FES) * 100}{}$$

Where:

FNC: Sources with remark 5

FES: Total expected sources

- **Local quality indicator (IDCL):** it is the indicator of quality of the chain of processes that make possible obtaining the final results. It corresponds to the verification of the quality in the editing and capture stages (estimated from the number of errors and omissions given the specific volume of each activity) made in each regional direction

$$\text{IDCL} = \frac{(ICC+ICCA) / 2}{}$$

Where:

IDCL: Local quality indicator

ICC: Editing quality indicator

ICCA: Capturing quality indicator

- **Headquarters quality indicator (IDCC):** it is the indicator of quality of the operative processes of the research. It is calculated as the sum of errors and omissions generated in the regional directions (treatment as non conforming product) and detected in the Headquarters.

$$\text{IDCC} = \frac{[(FES-TPNC) / FES]}{}$$

Where:

TPNC: Sum of errors and omissions observed in the Headquarters production process

FES: Total expected sources

⁴ **REMARK 5** corresponds to the enterprises that still present pending information

Note: In EDIT there is not collecting quality indicator. The collection is replaced by the reception of information.

2.6 PILOT TESTS

When a research is approached for the first time, or when a long time has passed by since the last time that it was realized, or when there are significant changes introduced to improve operative and/or methodological aspects, it is recommendable to realize pilot tests. Pilot tests allow evaluating the performance of collection instruments; the more advisable operative design for obtaining the objectives is selected, based on quality assurance and within cost restrictions.

For the development of pilot tests associated with significant changes in the research, a sample or a very small sub-sample of the universe under study is selected and the form is applied to it, in such a way that the analysis of methodological and operative aspects clarifies the questions or doubts existing on the development of the research.

Since 2009, EDIT has not undergone any significant changes in operative and/or methodological aspects that justify the application of pilot tests through selection of samples or sub-samples.

As far as for general methodological aspects of the EDIT, previous to each collection operative, some tests are implemented to verify the correct operation of the electronic form to collect the information, and to review the formulation of questions, the wording and the follow-up of flows; in the same way, it is important to review that the instructions distributed through the different manuals and formats, especially in those related to processing and collecting, are totally clear for the participants in the implementation of the survey.

In operative aspects, the application of pilot tests is a fundamental tool to select the more appropriate collection scheme, to calculate the task allocation to the staff in charge, to develop the coordination, supervision, and other activities, and to define transportation requirements, honoraria, and per-diem allowances, among others.

2.7 DESIGN OF THE ANALYSIS OF RESULTS

2.7.1. Statistical analysis

EDIT performs a descriptive analysis of the main variables, (see pp. 15-16). The analysis is made with aggregates and graphs, by comparing the different variables and chapters of the survey. Particular attention is paid to the outliers which require a direct confirmation of the data with the corresponding enterprise.

2.7.2. Analysis of context

The analysis of context emphasizes in the study of the more important manufacturing activities during the reference period. This importance is defined by their investment in technological development and innovating results, or by their economic behavior in growth in production, employment or both.

This type of analysis requires first hand information on manufacturing dynamics, and knowledge of particular situations of enterprises that have undertaken important processes of technical or administrative reconversion or of accessing new markets to gain productivity and competitiveness.

2.7.3. Experts Committees

The analysis of context for EDIT is complemented with a presentation of results in the internal committees of study, previous to the publication of the information; in these meetings worthy feedback is received from participants. In these working sessions participate manufacturing sector experts, EDIT analysts, and economic and operative advisors to DANE;

from them it is possible to obtain unified criteria for the internal assessment of the quality of EDIT and to detect eventual anomalies of the results that must be verified.

EDIT has also a working committee, attended by the main actors in following-up and in development of the innovation in the country, conformed by COLCIENCIAS, the Observatory of Science and Technology (OCyT), the Ministry of Commerce, Industry, Trade and Tourism and the academia.

2.8 DISSEMINATION DESIGN

2.8.1. Data repository management

The information of the research is directly stored in the systems servers of DANE through a program that allows capturing the information in line (via webpage) in real time.

The information processing of EDIT has a SAS format and is stored in the DANE server assigned for this task. On the other hand, the information for dissemination is kept in aggregated form.

The statistical reserve does not allow the users to access micro-data, unless consultations are made through the Specialized External Processing Group in DANE headquarters in agreement with the criteria of statistical reserve established by the DANE.

2.8.2. Dissemination Products and instruments

The dissemination products of EDIT appear in DANE's webpage, through the press bulletin, annexes and a presentation, that make public the information on:

- The activity of development and technological innovation;
- The amount invested in the reference period;
- The objective of the investment;
- The staff employed by type of contract, area, level of education, type of qualification;
- The objectives and the results of the innovation procedure;
- The sources of ideas for innovating;
- The sources and value of the financing;
- The value funded by the innovation agents;
- The intellectual property registries of the enterprise and its product and process certifications.

The dissemination instruments for EDIT include:

- The results of the survey on DANE's webpage;
- The production and adjustment of magnetic files with information concerning micro-data for revision at DANE's consultation room;
- The metadata of the research located in the National Data Archive (ANDA) at DANE's webpage.

2.9. EVALUATION DESIGN

DANE, as coordinator of the National Statistical System - SEN, directs his efforts to assure the quality the statistical information, by establishing and promoting standards for its continuous improvement, and for controlling its own statistical production. The fundamental principles are those established by the United Nations and the good practices

defined by institutions as the Organization for Economic Cooperation and Development (OECD) and the Statistical Office of the European Community (EUROSTAT).

The evaluation and certification of the quality of the statistical information have the objective of assuring the quality of the statistical operations, within the framework of the fundamental principles of international reference and the quality criteria considered by DANE as relevant for fulfilling the requirements and needs of the users, to generate credibility, reliability, confidence and transparency in the production of statistical information within the National Statistical System - SEN.

The process is developed in five stages; selection, collection, evaluation, certification and follow-up, which are oriented to the measurement, evaluation and permanent improvement of the quality of the statistical production.

The improvement plan is one of the results of the evaluation of statistical quality realized by the Commission of Independent Experts – CIE. Their findings are included in the evaluation report, with the respective proposals for improvement, directed to strengthen those aspects that according to the opinion of the commission, affect the quality of the evaluated statistical operation. The plan is the main input for the follow-up stage, where the verification of execution of the improvement actions takes place, as well as the adoption and implementation of the standards of the SEN.

The Plan of Improvement of the Quality of the Information of the **Survey of Development and Technological Innovation in the Manufacturing Industry** is divided in two parts: the first one includes the improvement actions proposed by the CIS, and the second presents a time schedule for consolidating the quality of the survey, indicating who are the staff responsible of this improvement action. All the EDIT staff knows the plan and the follow-up is made in a joint task- force with DIRPEN.

3. RELATED DOCUMENTATION

EDIT has different types of instruments used throughout the process of planning and collection created with the purpose of guaranteeing the quality of the information. Among them, the Completion, Basic Concepts and Editing Manuals, mentioned previously. This information is available in the National Data Archive (ANDA) accessible through DANE's webpage.

EDIT also uses internal documents in the process of data collection, as the User Manual and the Matrix of validation and consistency; the last one specifies the characteristics required from the system to validate the information and its correct completion in each field of the capture system.

GLOSSARY⁵

Acquisition of machinery and equipment: Machinery and equipment, specifically bought for the production or implementation of goods, services, processes, technical methods, either new or significantly improved. This item does not include the acquisitions for regular replacement or enlargement of the installed capacity, i.e. those for traditional production.

Doctorate: This is the post-graduate academic program that delivers the highest educational degree. Formation for advanced level researchers that takes into account their aptitudes, experience and knowledge acquired in previous levels of education. The doctorate must culminate with a thesis, or articles published in indexed scientific magazines, in which new knowledge is generated.

Engineering and industrial design: Changes in the methods or standards of production and quality control. Working out drawings and designs oriented to define technical procedures for producing or implementing new or significantly improved goods, services or processes in the enterprise.

Enterprise own resources: Funds belonging to the enterprise. They originate in the exercise of its economic activities, in operational and non-operational income and share capitalization and may be used to fund investments in scientific, technological or innovation activities, or to serve as counterpart when the financing program so requires.

Good or service significantly improved for the international market: The good or service is already produced by direct competitors of the enterprise in the international market, nevertheless the enterprise has improved it significantly.

Impact on the market: There is an impact on the market when the innovations fulfill the objective to maintain or to increase the participation of the enterprise in the international or national market.

Impact on the process: Action that bring about changes or improvements in the performance of the production processes, through which enterprises may increase their competitiveness in the markets.

Impact on the product: Changes related to the increase of the quality of goods or services or to the enlargement of the diversity of goods or services offered.

Incubators of Technologically based Enterprises (IEBT): The consideration behind this approach is that the innovating ideas are generated in the projects supporting the creation and development of small businesses (or micro-enterprises) in the first stages of their lives, in a concrete geographic zone, with private, mixed or public financing.

Industrial Design registration: This register concerns the particular appearance of a product. It is different from a patent; it protects the external form of the products, resulting from combinations of lines or two-dimensional or three-dimensional external forms, or colors, line contour, configuration, material texture, without changing the basic design or purpose of the product. This design characterizes the product not only with secondary differences (those that are not easily differentiable at first glance with the existing designs). The validity of an industrial design registration is 10 years from the date of its request at the Industry and Trade Superintendent Office.

Industrial Secret: It is any non-disclosed information that a natural or legal person legitimately owns and may use in some productive activity (commercial or industrial) or be transmitted to a third party. The information that must be disclosed by legal dispositions and warrant is not considered industrial secret (Articles 260 - 261 of Decision 486 of the Andean Community).

Innovation: New or significantly improved good or service introduced in the enterprise or in the market, or a new or significantly improved organizational method or a new or significantly improved technique of commercialization introduced in the enterprise. The changes of esthetic nature and the simple changes of organization or management are not considered as innovation.

⁵ The definitions presented in this section are the result of adapting, to the Colombian context, the conceptual guidelines presented by international handbooks for statistics applications and analysis of data on Science, Technology and Innovation. They have been published by OECD (Frascati Manual and Oslo Manual) and by the Latin-American Network for Research on Science and Technology – RICYT (Bogotá Manual).

Innovations Marketing: Activities consisting in the introduction in the market of new or significantly improved goods or services, including market research and launching publicity.

Innovation of Processes: Adoption of new or improved methods of production or distribution. These methods may imply changes in equipment, or in the organization of the production or distribution, or a combination of both, or the use of new knowledge.

Intellectual Property Rights. Software registration: Registries that protect the authorship of books, publications, works of art, databases and any product of the human intellect to assure their commercial exploitation by the creator. These registries are formalized in the office of Intellectual Property Rights of the Ministry of Interior.

Internal Activities of Research and Development (R+D): Systematic works of creation carried out within the enterprise with the purpose of increasing the volume of knowledge and its use to devise goods, services, or new or improved processes.

Lines of Co-financing: Non-reimbursable resources granted to fund a percentage (smaller than 100%) of the total value of a research, technological development and innovation project. In this type of financing the enterprise is required to provide a counterpart in money or goods or both.

Lines of Credit: Reimbursable resources that are granted to fund until 100% of the total value of a research, technological development and Innovation project.

Logos and trademarks: They are all the product brands, commercial names of products, services or of processes, logos, symbols (characteristic of the commercial name with which a product or an enterprise is characterized), registered by the enterprises at the Industry and Trade Superintendent Office, with the purpose of protecting these signs so that they cannot be copied or used by competitors in the market, who can affect their commercial and competitive position.

Masters: Post-graduate academic program oriented to scale-up and develop knowledge for the solution of problems of specific, interdisciplinary or professional nature and to provide the basic instruments that qualify as researcher in a specific area of sciences or technology.

National System of Science, Technology and Innovation (SNCTI): It is an open system to facilitate the interaction of policies, strategies, programs, methodologies and mechanisms for management, promoting, financing, protection and spreading scientific research and technological innovation, as well as the public, private or mixed organizations who realize or promote the development of scientific, technological or innovation activities.

New good or new service for the enterprise: The good or service is supplied by competitors of the enterprise in the national market, either imported or produced in the country. The enterprise was not producing it in the past and it is substantially different, from the technological point of view, from other products of the enterprise.

New good or service for the international market: The good or service is not produced by direct competitors of the enterprise in the international market and has been developed, produced and traded by the enterprise.

New good or new service for the national market: The good or service is not produced by direct competitors of the enterprise. The good or service already exists in the international market, but not in the national market. The enterprise is imitating the product of other producers (who do not participate in the national market) to develop and produce it in the country.

New good or service: Its fundamental features (engineering specifications, components and materials, built-in software or predicted uses) differ significantly from those of other products previously produced by the enterprise.

Obstacles to Innovation: Internal or external causes preventing the scientific, technological and innovating activities undertaken by the enterprise, to fulfill the expected results, assigned in agreement with strategic plans or projects that justify them. |

Patents of invention: It is the registry of protection at the Industry and Trade Superintendent Office, of inventions of products or procedures. They may correspond to all the fields of technology. They must be new, represent a certain inventive level and must be liable of industrial application.

Productivity: It involves the improvement in the use of the human and physical resources available to the enterprise, i.e. the increase in production capacity with fixed capital and human resources.

Qualified worker: The person who in order to fulfill the requirements of certain occupations has to follow an apprenticeship program, or has secondary basic education complemented with advanced training courses, training at work and experience. The students receive the Certificate of Professional Aptitude (CAP) of SENA.

Regional Centers for Productivity: They are created by the social and productive dynamics that groups the different public and private actors in order to work in strategic and long term programs of productivity and innovation. Example, the Tolima Center for Productivity leads the cotton-textile products cluster.

Research Centers: This is an option for the enterprise to grasp ideas or methods that arise from explicit and/or implicit contracts with people working in this type of organizations.

Private Capital Funds: Provision of funds originating in the contributions of investors who get involved in the enterprise through funds of private capital, funds of risk capital, and operations in stock market or specific investments as investors angels. They exclude share capital.

Resources of Cooperation or Endowments: Non-reimbursable Funds, granted by governmental organizations of a foreign country or by NGOs (the funds can be in cash, goods or services). Endowments done by international national organizations may be public, private or mixed.

Resources of Other Enterprises of the Group: Funds pertaining to other enterprises of the same group (with which a close legal or financial relation exists) that is granted to the enterprise as loan or endowment to finance investments in scientific, technological or innovation activities.

Resources of Other Enterprises: Funds pertaining to other enterprises that are not part of the same group and that the enterprise obtains as loan or endowment to finance investments in scientific, technological or innovation activities.

Resources of Private Banks: Funds granted by private financial corporations that receive deposits and provide credits.

Scientific, Technological and Innovation Activities (STIA-ACTI): Those activities that the enterprise undertakes to produce, promote, disseminate and apply scientific and technical knowledge, or for the development or implementation of goods or services, processes, new or significantly improved technical or organizational or commercialization methods.

Significantly improved good or service for the enterprise: The good or service is already produced by the enterprise. The enterprise improves the product to increase its competitiveness in the national market.

Significantly improved good or service for the international market: The good or service is already produced by direct competitors of the enterprise in the international market; nevertheless the enterprise improves it technologically in a significant manner.

Significantly improved good or service for the national market: The good or service is already produced by direct competitors of the enterprise in the country. The enterprise improves it technologically in a significant manner.

Significantly improved good or service: Product whose performance has been improved to a great extent, as a result of the use of components or materials of better performance, or by changes in one of the technical subsystems that compose a complex product.

Specialization: Post graduate programs that provide possibilities for improvement in the same occupation, profession, discipline or in compatible or complementary areas.

Specialized qualification: Formation at master and doctorate level, involving a significant degree of complexity (requires a highly specialized personal advisor). It includes the pertinent activities financed with resources of the enterprise and those organized directly within the enterprise.

Specialized Training: Training involving a significant degree of complexity (requires a personal instructor highly specialized) and with a minimum duration of 40 hours.

Technical Assistance and Consultancy: assistance for using applied knowhow, by means of an art or technique, specifically contracted for the production or implementation of goods, services, new processes or the significant improvement of them. This activity also includes market intelligence and technology monitoring.

Technical Standard: It is the document that summarizes the characteristics of a product or the processes and methods of production related with it, including the applicable administrative dispositions, and whose observance is compulsory. It may include prescriptions on terminology matters, symbols, packing, marking or labeling applicable to a product, process or method of production, or deal with them exclusively.

Technological Development Centers (CDT): These centers are dedicated to the generation and appropriation of specialized knowledge and technologies for specific sectors or economic activities. For example, the plastics sector works with the chain that develops polymers and new materials and in the metallurgical industry the Metallurgical Technological Center Network (CRTM) research and transfer technology for smelting, iron and steel metallurgy, equipment and assembly lines.

Technological up-grade: It is the renewal of the technological base of the enterprise in terms of products and processes of last generation with the purpose of improving its performance in relation to that of competitors.

Transfer of technology: Acquisition or use under license from other enterprises or organization, of patents or other registries of intellectual property, non-patented inventions and technical knowledge or of another type, to apply in the innovations of a given enterprise.

Utility model: Describes any new form, configuration or disposition of elements of some device, tool, instrument, mechanism or another object or a part of it, which allows a better or different operation, use or manufacture of the object that incorporates it. It brings advantages or technical characteristics that were not present before, which are protected by means of a patent. It may be used during 10 years from the date of request to the Industry and Trade Superintendent Office.

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ANNEXES

Annex 1. Questionnaire (2011-2012)

CHAPTER I - INNOVATION AND ITS IMPACT ON THE ENTERPRISE DURING 2011-2012

One innovation is defined in this survey as a good or service, new or significantly improved, introduced in the market, or a new or significantly improved process introduced in the enterprise, or an organizational procedure introduced in the enterprise, or a new marketing technique introduced in the enterprise.

- a. An innovation is always new for the enterprise, not necessarily for the market where the enterprise operates.
- b. Aesthetic changes or simple organizational or managerial changes are not considered innovation.
- c. Goods and services that the enterprise introduce in the market are considered products. The services, use to be intangibles, non storable, and their production and marketing may be done simultaneously.
- d. The provision of a service may be complemented or require as support the supply of a good and reciprocally.

Who should answer to this chapter?

Persons with a first-hand knowledge of the scientific, technological and innovating activities of the enterprise

I.1 Please indicate if your enterprise introduce any of the following mentioned innovations in the period 2011-2012. If the answer is positive please specify how many.

Please take into account that a **new good or service** is one whose characteristics (technical specifications, number of components and materials, incorporated software or foreseen uses) considerably differ from those previously produced by the enterprise

| | | | | Innovations in 2011-2012 | |
|---|-----|-----------------------|----|-----------------------------|---|
| 1. New goods or services for the enterprise | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |
| 2. New goods or services for the national market | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |
| 3. New goods or services for the international market | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |

Please take into account that a **good or service significantly improved** is one that already existed and whose performance has been enhanced to a great extent. This may be given by the use of better performing materials or by the change in one of the technical sub-systems that constitute a complex system

| | | | | Innovations in 2007-2008 | |
|--|-----|-----------------------|----|-----------------------------|---|
| 4. Improved goods or services for the enterprise | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |
| 5. Improved goods or services for the national market | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |
| 6. Improved goods or services for the international market | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |

Other type of innovations

| | | | | | |
|--|-----|-----------------------|----|-----------------------|---|
| 7. Introduced new or significantly improved production systems, distribution or logistics implemented in the enterprise | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |
| 8. Introduced new organizational methods implemented internally, or in the management of knowledge, or in the external relations of the enterprise | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |
| 9. Introduced new or significantly improved marketing techniques (promotion and sales channels, packaging or design of the products to increase or maintain the market (Does not include changes in the functionality of the products) | YES | <input type="radio"/> | NO | <input type="radio"/> | <input style="width: 50px;" type="text"/> |

If your answer is NO to all questions 1-2-3-4-5-6-7-8-9 in the previous section I-1 please proceed to section I-3

I-2 Please mark the degree of importance of the impact that the acquisition of new goods or services significantly improved, new processes or significantly improved, new organizational methods or significantly improved, new marketing techniques or significantly improved, had during 2011-2012 on the following aspects of your enterprise:

| | Degree of importance | | |
|--|-----------------------|-----------------------|-----------------------|
| | High | Medium | None |
| <u>Product</u> | | | |
| 1. Improvement in the quality of goods or services | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. Increase in the number of goods or services offered | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <u>Market</u> | | | |
| 3. The share of the geographical market of your enterprise remains stable | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4. The enterprise has entered into a new geographical market | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <u>Process</u> | | | |
| 5. Increase in productivity | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 6. Reduction in the labor cost | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 7. Reduction in the consumption of raw materials | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 8. Reduction in the consumption of energy | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 10. Reduction in water consumption | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <u>Other impacts</u> | | | |
| 10. Improvement in norms and technical regulations compliance. includes compliance of norms on reduction of residual disposal or in toxic emissions, and improvement in industrial security conditions | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 11. Improvement in the use of residuals of the production process | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

If your answer is NO to questions 1-2-3-4-5-6 of section (I-1) please continue in section (I-3)

| TO THE INFORMANTS |
|---|
| <p>How to report financial and monetary figures? Please report financial them in THOUSAND pesos Example :If the figure to report is \$ 179.125.825 The figure you have to write in this form is \$ 179.126</p> |

I.3 Please indicate the value of domestic sales and exports made by your enterprise in 2012 (Thousand pesos).

Value of domestic sales Value of exports

I.4 Please indicate the percentage of the sales value represented by the indicated items. Columns add-up to 100%

| | | (%) of sales | |
|---|---|--------------|---------|
| | | Domestic | Exports |
| 1 | Goods or services, new or considerably improved, for the enterprise. Already existing in the corresponding markets) | | |
| 2 | ods or services, new or considerably improved, for the domestic mkt. Already existing in the international market | | |
| 3 | Goods or services, new or considerably improved, for the international market. | | |
| 4 | ods or services, without change, or with no significant changes (No innovating products) | | |
| | | 100% | 100% |

I.5 Did the enterprise have any developping proyect, in course by the end of 2012, for introducing new or significantly improved goods or services, and/or new or significantly improved productive processes, or new organizational methods, or new marketing techniques?

YES NO

I.5 Did the enterprise undertake have any developping proyect, in course by 2011-2012, for introducing new or significantly improved goods or services, and/or new or significantly improved productive processes, or new organizational methods, or new marketing techniques, that was later given-up?

YES NO

I.5 Did the enterprise have the intention to carry out in 2011-2012 any developping proyect for introducing new or significantly improved goods or services, and/or new or significantly improved productive processes, or new organizational methods, or new marketing techniques?

YES NO

I.6 Please indicate the level of importance that the following obstacles had for introducing new or significantly improved goods or services, and/or new or significantly improved productive processes, or new organizational methods, or new marketing techniques in your enterprise, in the period 2011-2012.

| Level of importance | | |
|---------------------|--------|-----|
| High | Medium | Low |

Obstacles related to information and internal capacity

| | | | |
|--|-----------------------|-----------------------|-----------------------|
| 1.Scarcity of own resources | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2.Lack of qualified personnel | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3.Difficulties for compliance of norms and technical regulations | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4.Scarcity of market information | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5.Scarcity of information on available technology | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 6.Scarcity of information on ublic support instruments | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Obstacles related with risks

| | | | |
|--|-----------------------|-----------------------|-----------------------|
| 7.Uncertainty face to the demand of innovating goods and services | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 8.Uncertainty face to the success in the technical implementation of the project | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 9.Low profitability of the innovation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Obtacles related to the environment

| | | | |
|--|-----------------------|-----------------------|-----------------------|
| 10.Cumbersome access to financial rессources | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 11. Low possibilities of cooperation with other enterprises and institutions | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 12. Innovation liable to easy imitation by third parties | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 13. Limited capacity of the existing intellectual property system to protect the innovation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 14. Low availability of ispection, testing, calibration, certification and verification services | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**CHAPTER II - INVESTMENT IN SCIENTIFIC, TECHNOLOGICAL AND INNOVATION
ACTIVITIES IN 2011 and 2012**

The Scientific and Technological Innovation Activities (STIA) are all those that the enterprise carries out to produce, promote, disseminate and/or apply technical and scientific knowledge, and for the development or **introduction of goods and services new or significantly improved**, of new or significantly improved processes, of new organizational methods or new marketing techniques.

Who should answer to this chapter?

Persons of the finance area, who know investments and expenses of the enterprise in STIA

| TO THE INFORMANTS |
|---|
| How to report monetary figures? Please report financial and monetary figures in thousand pesos If the figure to report is \$ 179.125.825 The figure you have to write in this form is \$ 179.126 |

II-1 Please report the investment of the enterprise in the 2011-2012 period, in each one of the following scientific, technological and innovation activities, looking for the introduction of new goods or services, substantially improved, or new or improved processes, new or improved organizational methods, or new or significantly improved marketing techniques

| | Amount invested 2011 <u>000 current pesos</u> | Amount invested 2012 <u>000 current pesos</u> |
|---|---|---|
| 1. Internal R&D activities Creative systematic work performed in the enterprise to enlarge the knowledge and use it in the creation of goods, services and processes or to improve them | <input type="text"/> | <input type="text"/> |
| 2. R&D acquisition (external) Acquisition or financing of the R&D activities already mentioned but realized by other public or private entities | <input type="text"/> | <input type="text"/> |
| 3. Machinery and equipment acquisition Machinery or equipment specifically purchased for producing or developing goods, services, or processes, new or significantly improved (do not include those already registered in item 1.) | <input type="text"/> | <input type="text"/> |
| 4. Communication and Information Technologies Acquisition, generation, outsourcing or leasing of hardware, software and services for managing or processing information, specifically oriented to producing or developing goods, services, or processes, new or significantly improved | <input type="text"/> | <input type="text"/> |
| 5. Marketing innovations Activities for introducing in the market goods and services, new or significantly improved, including market studies and launching publicity | <input type="text"/> | <input type="text"/> |
| 6. Transfer of technology Acquisition or use of licenced or purchased patents and other registered intellectual property rights, or other technical know-how without patent, to support innovations in the enterprise. Includes know-how transfer, understood as related with unwritten knowledge non protected by patents. | <input type="text"/> | <input type="text"/> |
| 7. Technical assistance and consulting services Consulting services to use technical know-how, contracted for applying a particular art or technique, for producing new goods or services or improving existing ones. Includes market intelligence and technological watch | <input type="text"/> | <input type="text"/> |
| 8. Engineering and industrial design Change in methods or patterns for production and quality control, designs and technical drawings oriented to define technical procedures required for new or significantly improved goods, services or processes in the enterprise. | <input type="text"/> | <input type="text"/> |
| 9. Specialized education and training Staff education and training, in-house or externally, specifically oriented to the introduction of new products or processes or significantly improved. | <input type="text"/> | <input type="text"/> |
| TOTAL AMOUNT INVESTED | <input type="text"/> | <input type="text"/> |

II.2 Did your enterprise carry out activities related with biotechnology in the period 2011-2012?

Biotechnology is a technology involving scientific techniques using live organisms or its parts to obtain plants or animals or to develop microorganisms for specific uses.

YES Go to II.3 NO Go to Chapter III

II.3 Out of the total invested in STIA, please indicate the amount corresponding to biotechnology related activities carried out by your enterprise in 2011 and 2012.

| Amount invested 2011 <u>000 current pesos</u> | Amount invested 2012 <u>000 current pesos</u> |
|---|---|
| <input type="text"/> | <input type="text"/> |

CHAPTER III - FINANCING THE INVESTMENT IN SCIENTIFIC, TECHNOLOGICAL AND INNOVATION ACTIVITIES IN 2011-2012

The enterprise may assign its own resources (resources obtained in the development of its economic activity) for financing the investments in scientific, technological and innovation activities. It is also possible to finance them with public funds (reimbursable or not), or with private resources from third parties, such as credits, capital resources, private banks, private institutions or agencies (national or international), among others.

Please recall that scientific, technological and innovation activities are those that the enterprise implement to produce, promote, disseminate and apply scientific and technical knowledge

Who should answer this chapter?

Persons of the finance area, who should know investments and expenses of the enterprise in scientific, technological and innovation activities

| |
|--|
| TO THE INFORMANTS |
| How to report monetary figures? |
| Please report financial and monetary figures in thousand pesos |
| If the figure to report is \$ 179.125.825 |
| The figure you have to write in this form is \$ 179.126 |

III-1 Please give the detail of the financial resources employed to finance scientific, technological and innovation activities (total investment Chapter II). It must be indicated if they are the enterprise own resources, or from any of the other sources listed below. You should also indicate their origin (national or foreign) both for 2011 and 2012.

| | (000 pesos at current prices) | | | |
|--|-------------------------------|---------|----------|---------|
| | 2011 | | 2012 | |
| 1. Enterprise own resources | | | | |
| Resources belonging to the enterprise obtained as operational and non operational income, or from share operations, devoted to finance scientific, technological and innovation activities, and those that serve as counterpart when the enterprise is beneficiary of national or international organizations (public, private or mixed) | | | | |
| 2. Resources of other enterprises of the group | | | | |
| Resources provided by enterprises of the same group (with them there is a close financial or legal relationship) as donation or loan, to finance scientific, technological and innovation activities | | | | |
| 3. Public resources | | | | |
| Resources obtained through any of the lines of public financing to realize any of the activities mentioned before (listed in section III.2). They could be reimbursable or not, as well as those that had own resources counterpart (section III.1, option 1) | | | | |
| | 2011 | | 2012 | |
| | National | Foreign | National | Foreign |
| 4. Resources from private banks | | | | |
| Credit resources granted by financial institutions, privately owned, that practice financial intermediation | | | | |
| 5. Resources of other enterprises | | | | |
| Resources from other enterprises that do not belong to the same group. The resources are given as donation or loan, to finance scientific, technological and innovation activities | | | | |
| 6. Capital resources | | | | |
| Resources coming from private entities that participate in the enterprise through private investment funds, or by stock exchange operations or even a business angel. | | | | |
| 7. Cooperation and donation resources | | | | |
| Non reimbursable resources, given by GOs of a foreign country or by NGOs. The resources may be cash, goods or services. Donations may be given by national or international organizations (public, private or mixed) | | | | |
| TOTAL (must be equal to the total invested) | | | | |

If you DID NOT use public resources in 2011-2012, that is your answer is 0 in the cases for item 3 of the previous section III.1, please go to question III.3

III.2 Please indicate the distribution by origin of the public resources received in the period 2011 -2012 to finance scientific and technological activities of innovation (Section III.1, Option 3)

Co-financing lines

Non-reimbursable resources granted to fund a percentage (smaller than 100%) of the total value of a research, technological development and innovation project. In this type of financing the enterprise is required to provide a counterpart in money or goods or both.

(000 pesos at current prices)

2011 2012

1. FOMIPYME-INNPULSA Mepymes. Thematic line: Innovation, Development and Technological transfer

| | |
|--|--|
| | |
|--|--|

2. SENA. Innovation and Technological Development Program

| | |
|--|--|
| | |
|--|--|

3. COLCIENCIAS. University CIA-CDT-Enterprise

| | |
|--|--|
| | |
|--|--|

4. COLCIENCIAS. Contingent Recovery. Financing line for intangibles. (Patents and Certificates of vegetal varieties obtention)

| | |
|--|--|
| | |
|--|--|

5. Ministry of Agriculture and Rural Development. Research, Technological Development and Innovation Programs and Projects for Productive Chains.

| | |
|--|--|
| | |
|--|--|

Credit lines

Reimbursable resources that are granted to fund until 100% of the total value of a research, technological development and Innovation project.

(000 pesos at current prices)

2011 2012

6. BANCOLDEX. Support to productivity and competitiveness program (before PROGRESAR)

| | |
|--|--|
| | |
|--|--|

7. BANCOLDEX. Innovation incentive. Credit alternative for entrepreneurial projects of productivity, innovation and technological development

| | |
|--|--|
| | |
|--|--|

Other lines

(000 pesos at current prices)

2011 2012

8. Department or Municipality Funds for Science and Technology

| | |
|--|--|
| | |
|--|--|

TOTAL (Must be equal to item 3 in section III.1)

| | |
|--|--|
| | |
|--|--|

III.3 Did your enterprise have the intention to request public resources for financing investment in scientific, technological and innovation activities in the period 2011-2012?

YES NO

III.4 Please qualify the level of importance that the following obstacles had for your enterprise to have access to Public Resources for financing STIA in your enterprise in the period 2011-2012.

| | Level of importance | | |
|--|-----------------------|-----------------------|-----------------------|
| | High | Medium | None |
| 1. Lack of knowledge about the existing lines of credit | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. Lack of information on conditions and procedures | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. Difficulty to comply with the conditions or to complete the procedures | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4. Procedures demanding very long time | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5. Financing or cofinancing conditions unattractive | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 6. Delay in the intermediary procedures between the commercial bank and the public lines of credit | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

III.5 Please select one of the following options concerning tax incentives (reductions and exemptions) for investments in scientific and technological development during 2011-2012:

Your enterprise got tax incentives

You requested tax benefits but you did not obtained them

You had the intention to request tax benefits and finally you did not

You did not wanted to request tax benefits

III.6 Please indicate which of the following listed factors became obstacles for requesting or obtaining tax benefits for investment in scientific and technological development in 2001-2012.

| | Taxable income deduction due to STIA investments | Taxable income deduction due to new medicines or software |
|--|---|---|
| | 1. Lack of information on benefits and conditions | <input type="radio"/> |
| 2. Difficulties with the Integrated System of Project Management (SIGEP) for presenting the request online | <input type="radio"/> | <input type="radio"/> |
| 3. Difficulty to complete the electronic form. | <input type="radio"/> | <input type="radio"/> |
| 4. Excessive or cumbersome conditions or procedures | <input type="radio"/> | <input type="radio"/> |
| 5. Very long time to process the approval of the request | <input type="radio"/> | <input type="radio"/> |
| 6. Low value of tax benefits | <input type="radio"/> | <input type="radio"/> |
| 7. Did not find any obstacles | <input type="radio"/> | <input type="radio"/> |

CHAPTER IV- AVERAGE PERSONNEL EMPLOYED 2011-2012

The employees who take part in scientific, technological and innovation activities, are those who work in promotion, production, dissemination and application of scientific and technical know-how and in the implementation of new goods, services or processes significantly improved, of new organizational methods and new marketing techniques.

Who should answer to this chapter?

Persons working in the Human Resources area, with access to personnel information.

IV-1 Please indicate the average number number of employees that were working in the enterprise in the period 2011-2012, and the average number of them working (full or part-time)in the activities object of the survey, according to the maximum level of education reached .

| <u>Maximun level of education reached</u> | Total number of employees | | Total personnel in scientific and innovation activities | |
|---|---------------------------|------|---|------|
| | 2011 | 2012 | 2011 | 2012 |
| 1. Doctorate | | | | |
| 2. Magister | | | | |
| 3. Specialization | | | | |
| 4. Professional | | | | |
| 5. Technologist | | | | |
| 6. Technician | | | | |
| 7. Secondary school | | | | |
| 8. Primary school | | | | |
| 9. Industrial Prodeessional Training-SENA | | | | |
| 10. Noner | | | | |
| TOTAL EMPLOYMENT | | | | |

IV.2 Please indicate dthe average number of employees with certification of laboral capabilities associated tith tha main activities developed by the enterprise.

| 2011 | 2012 |
|------|------|
| | |

IV-3 Please indicate the average number of employees participating in scientific, technological and innovation activities in 2012 by funcional areas and gender. .

| <u>Funcional areas</u> | Men | Women | Total |
|-----------------------------|-----|-------|-------|
| 1. General direction | | | |
| 2. Management | | | |
| 3. Marketing and sales | | | |
| 4. Production | | | |
| 5. Accounting and finance | | | |
| 6. Research and development | | | |

Please detail in the following 4 groups the employees in R&D including external consultants

| | | | |
|--|--|--|--|
| 6.1 Researchers | | | |
| 6.2 Trainees or asistants in R&D | | | |
| 6.3 Technicians in R&D | | | |
| 6.4 Auxiliary or administrative staff in R&D | | | |

Total personnel in STIA (Categories 1 to 6)

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

IV.4 Did your enterprise passed contracts with external advisors for STIA during 2012. If your answer is YES, please indicate the number of these consultants with a working place in the enterprise or working out of it.

NO YES Consultants with working place in the enterprise facilities

| |
|--|
| |
| |

Consultants without working place in the enterprise facilities

| |
|--|
| |
|--|

IV-5 Please indicate the average number of employees in 2012 whose maximum level of education corresponds to categories 1 to 6 in question IV.1, according to area of higher education and gender.

| <u>Area of studies</u> | Men | Women | Total |
|--|-----|-------|-------|
| <u>1. Exact sciences</u> Includes Physics, Chemistry, Mathematics, Statistics and associated | | | |
| <u>2. Natural sciences</u> Includes Biology, Microbiology, Biotechnology and associated | | | |
| <u>3. Health sciences</u> Includes Bacteriology, Nursing, Chirurgical Instrumentation, Medicine, Nutrition ans Dietetics, Optometrics, Dentistry, Public Health, Therapy and related. | | | |
| <u>4. Engineering, Architecture, Urbanism and related</u> Includes Architecture, Urbanism, Engineering (Agricultural, Forestry, Agro-industrial, Environmental, Food Science, Sanitation, Civil, Bio-medical, Systems, Mining) | | | |
| <u>5. Agronomy, Veterenary and related</u> Includes Agronomy, Veterenary, Animal Science and related | | | |
| <u>6. Social sciences</u> Includes: Economics, Management, Accounting, Political Science, International Relations, Social Communication, Journalism, Law, Army and Police Education, Sociology | | | |
| <u>7. Human Sciences and Fine Arts</u> Includes: Languages, Literature, Anthropology, Visual Arts, Library Science, Sport, Physical Education, Design | | | |
| Total employees with high educational level involved in STIA | | | |

IV.6 If your enterprise invested in specialized education and training (your answer was more than 0 in option 9, question II.1) for 2011 or 2012, please indicate the number of persons who received this education or training (given or financed) in years 2011 and 2012.

| | Number of persons trained | |
|---|---------------------------|------|
| | 2011 | 2012 |
| 1. Doctorado. Academic program oriented toward a title (Ph.D) related to scientific, technological and innovarion activities realized in the enterprise. | | |
| 2. Masters degree. Academic program orientyed to a Masters Degree(MSc, MA), related to scientific, technological and innovarion activities realized in the enterprise. | | |
| 3. Specialized training . Activity for training insidede or outside the enterprise, with a duration of 40 hours or more, related to scientific, technological and innovarion activities realized in the enterprise. | | |
| Total personnel trained or financed | | |

CHAPTER V- RELATIONSHIP WITH PARTICIPANTS OF THE NATIONAL SYSTEM FOR SCIENCE, TECHNOLOGY AND INNOVATION AND RELATED COOPERATION (2011-2012)

The National System for Science, Technology and Innovation (SNCTI) is an open system including the policies, strategies, programs, methodologies and mechanisms, for managing, promoting, financing and disseminating the scientific research and the technological innovation. It also intends to support the organizations (public, private or mixed) that develop or promote this kind of activities.

Developping scientific, technological and innovative activities inside the enterprise depends, to a great extent, on the diversity and type of relations established with other organizations (public or private), and on the degree of use of specialized information for developpers of new ideas that help in the implementation of innovations. These relations may be established with sources **inside** or **outside** the enterprise.

Who should answer to this chapter?

Persons in charge of Innovation Projects Management, acquainted with information on agreements (contractual or not) with other acting enterprises

V.1 Which of the following sources of information were conductive for developping or implementing innovations on goods, services, processes, or to significantly improved them in 2011-2012 in your enterprise. If the answer is YES for sources extenal to the enterprise (9-32) please precise if it is a national or foreign source.

Internal sources of the enterprise

- | | | |
|---|---------------------------|--------------------------|
| 1. R & D internal Department | YES <input type="radio"/> | NO <input type="radio"/> |
| 2. Production Department | YES <input type="radio"/> | NO <input type="radio"/> |
| 3. Sales and Marketing Department | YES <input type="radio"/> | NO <input type="radio"/> |
| 4. Other Department in the enterprise | YES <input type="radio"/> | NO <input type="radio"/> |
| 5. Multi-disciplinary groups | YES <input type="radio"/> | NO <input type="radio"/> |
| 6. Enterprise staff | YES <input type="radio"/> | NO <input type="radio"/> |
| 7. Other related enterprise of the same group | YES <input type="radio"/> | NO <input type="radio"/> |
| 8. Foreign Enterprise headquarters | YES <input type="radio"/> | NO <input type="radio"/> |

Sources external to the enterprise

- | | YES <input type="radio"/> | NO <input type="radio"/> | Origin | |
|---|---------------------------|--------------------------|--------------------------------|-------------------------------|
| | | | Domestic <input type="radio"/> | Foreign <input type="radio"/> |
| 9. R & D Dpmt. of other enterprise in the same sector | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 10. Competitors or other enterprises in the same sector (except the R&D Department) | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 11. Clients | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 12. Suppliers | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 13. Enterprises in other sectors | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 14. Sectoral groups or associations | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 15. Chambers of Commerce | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 16. Technological Development centers | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 17. Research centers | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 18. Business incubators technologically oriented | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 19. Technological parks | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 20. Regional Productivity Centers | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 21. Universities | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 22. Training and technoparks (SENA) | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 23. Experts and consultants | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 24. Fairs and exhibitions | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 25. Seminars and conferences | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 26. Books, mmagazines, catalogues | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 27. Industrial property systems of information | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 28. Intellectual property systems of information | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 29. Internet | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 30. Science and technology databases | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 31. Standards and technical rules | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 32. Public institutions (ministries, secretaries...) | YES <input type="radio"/> | NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

V.2 Please indicate if your enterprise had any relationship with any of the following scientific organizations in the 2011-2012 period

Relations supporting scientific, technological and innovation activities including: information exchange on policies, strategies, support, transfer of knowledge, consultancy, tutoring, financing, and joint-venture initiatives

| | | |
|---|---------------------------|--------------------------|
| 1. COLCIENCIAS | YES <input type="radio"/> | NO <input type="radio"/> |
| 2. SENA | YES <input type="radio"/> | NO <input type="radio"/> |
| 3. ICONTEC | YES <input type="radio"/> | NO <input type="radio"/> |
| 4. Commerce and Trade Superintendency | YES <input type="radio"/> | NO <input type="radio"/> |
| 5. National Direction of Intellectual Property | YES <input type="radio"/> | NO <input type="radio"/> |
| 6. Ministries | YES <input type="radio"/> | NO <input type="radio"/> |
| 7. Universities | YES <input type="radio"/> | NO <input type="radio"/> |
| 8. Technological Development Center | YES <input type="radio"/> | NO <input type="radio"/> |
| 9. Research Centers | YES <input type="radio"/> | NO <input type="radio"/> |
| 10. Business incubators technologically oriented | YES <input type="radio"/> | NO <input type="radio"/> |
| 11. Technological parks | YES <input type="radio"/> | NO <input type="radio"/> |
| 12. Regional Productivity Centers | YES <input type="radio"/> | NO <input type="radio"/> |
| 13. Science and Technology Departmental Councils | YES <input type="radio"/> | NO <input type="radio"/> |
| 14. Regional Commission for Competitivity | YES <input type="radio"/> | NO <input type="radio"/> |
| 15. Sectoral associations and Chambers of Commerce | YES <input type="radio"/> | NO <input type="radio"/> |
| 16. Consultants on Innovation and Technological Development | YES <input type="radio"/> | NO <input type="radio"/> |
| 17. PROEXPORT | YES <input type="radio"/> | NO <input type="radio"/> |

V.3 Did your enterprise cooperated with any of the following types of partners for implementing Scientific, Technological and innovation activities in 2011-2012? In your answer is yes please indicate the reason of the cooperation.

| | | R & D | Machinery and equipment Acquisition | Information and Communication Technologies | Innovation marketing | Technology Transfer | Technical Assistance and Consultancy | Engineering and industrial design | Education and specialized training |
|-----------------------------------|--|-----------------------|-------------------------------------|--|-----------------------|-----------------------|--------------------------------------|-----------------------------------|------------------------------------|
| 1. Other enterprises (same group) | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. Suppliers | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. Clients | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4. Competitors | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5. Consultants | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 6. Universities | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 7. Technology Development Centers | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 8. Research Centers (Autonomous) | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 9. Technological parks | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 10. Regional Competitive Centers | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 11. International organizations | YES <input type="radio"/> NO <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

CHAPTER VI- INTELLECTUAL PROPERTY, QUALITY CERTIFICATIONS, TECHNICAL STANDARDS AND TECHNICAL RULES IN THE PERIOD 2011-2012

Who should answer to this chapter?

A person acquainted with intellectual property concepts, patents, authorship rights, copyrights

VI-1. For each one of the protection mechanisms listed below, please indicate if your enterprise was the holder of valid registrations in **December 2012**, and the number of them.

Intellectual property registrations

Total valid registrations in Dec. 2012

1. Patents of invention

YES NO

These titles protect all inventions, manufacturing processes, machines, devices, products, new solutions, fulfilling novelty, creativity and industrial applicability criteria. They are requested to the National Industrial Property Offices. In Colombia the Industry and Commerce Superintendency is the responsible entity.

2. Utility models

YES NO

These are titles protecting all new form, configuration or element disposition of a device, tool, instrument or a part of them, making possible a better or different operating condition, use or manufacturing of the object, bringing about a technical effect or advantage that it did not have before and useful for the industry. They are requested to the National Industrial Property Offices. In Colombia the Industry and Commerce Superintendency is the responsible entity.

3. Authorship rights

YES NO

Title granted to the creators of art and literary works. Among the written ones there are poems, novels, drama; artworks as paintings, sculptures, films and choreographies, architectural works, and maps and technical drawings. The inherent rights appear simultaneously with the work itself but for legal security purposes and constitute probatory evidence, they may be registered in the National Office of Authors' Rights. In Colombia the responsible entity is the National Direction for Authors' Rights, a Special Unit of the Ministry of the Interior. Registers for software are

4. Software registrations

YES NO

Titles protecting, under the modality of Authors' Rights, the applicatives and computer systems, that may be part of a computer or of other device. As with the other Authors' Rights they are registered at the national offices in charge. In Colombia the responsible entity is the National Direction for Authors' Rights.

5. Industrial design registrations

YES NO

Titles protecting all external forms or aesthetical appearance of functional or decorative elements serving as models or patterns for manufacturing or craft production. The requests are presented to the national offices for industrial property. In Colombia the responsible is the Industry and Commerce Superintendency.

6. Trademarks and copyright

YES NO

Titles for protecting marks, slogans, and denominations of origin. The requests are presented to the national offices for industrial property. In Colombia the responsible is the Industry and Commerce Superintendency.

7. Certification of vegetal varieties developer

YES NO

Titles protecting the improvements of vegetal varieties used in agriculture. This may include better yields and a better resistance to plagues and diseases. Requests are presented to the national offices of vegetal developments. In Colombia, this entity is the Colombian Agriculture Institute (ICA).

Total number of valid intellectual property registrations, December 2012

VI.6 Did your enterprise get quality processes certifications, during 2011-2012? If your answer is YES, please indicate how many (i.e if you got 2 processes with ISO-14001 and one process with ISO-9001 you must register 3 certifications)

YES NO

Number of certifications

VI.7 Did your enterprise obtain get product quality certifications, during 2011-2012? If your answer is YES, please indicate how many (i.e if have 2 product with ISO-9000 you must register 2 certifications)

YES NO

Number of certifications

VI.8 Are the good or services produced by your enterprise in 2011-2012 subject to fulfill technical requirements?

YES NO

VI.9 Please indicate the level of importance that the following aspects had for obtaining quality certifications of process or product during 2011-2012:

| | Level of importance | | |
|--|-----------------------|-----------------------|-----------------------|
| | High | Medium | None |
| 1. Generation of innovating ideas | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. Increase in productivity | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. Greater access to domestic markets | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4. Greater access to international markets | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5. Greater technological update | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 6. Greater technological transfer toward the enterprise | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 7. Improved relations with other enterprises of the sector | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Source : DANE-DIMPE

Annex 2. Presentation letter (format)

COMMERCIAL NAME OF THE ENTERPRISE

MAIL ADDRESS (Headquarters)

Telephone

City

Gentlemen:

Within the modernization of its statistical research activities and with the aim of offering useful information for decision making in the economic environment of the country, DANE develops a biennial survey of the different development and technological innovation activities of the manufacturing and commercial sector. This survey purpose is to characterize the dynamics of technological changes and to analyze the innovation and technological development within manufacturing and commercial enterprises in Colombia, as well as the evaluation of public policy instruments, both in promoting and protecting innovation.

In order to carry out this task, we count on your valuable cooperation by adequately completing the research form. In order to facilitate your work and to improve the quality and timeliness of the results, DANE has developed a system so that the companies render the information by means of an electronic form. You can access it as of the [day, month, and year] by means of our webpage: www.dane.gov.co, through the following route: "BUSCAR INVESTIGACION/ Encuesta de Desarrollo e Innovación - EDIT/ Formulario electrónico Industria", using the following user name and password assigned to your enterprise:

USER NAME: USER ACCORDING TO REGISTER
PASSWORD: PASSWORD ACCORDING TO REGISTER

Data provided to DANE have confidential character and enjoy of statistical reserve; consequently this password is not for public use, and should be known only by the person that your enterprise authorizes for the completion of the form; **we strongly recommend its change through system, after accessing electronic form for the first time.**

For any additional explanation, please call (Phone Number of the Regional Direction- Extension of the Responsible person) or (Phone and Extension of the Responsible in Bogotá Headquarters).

Sincerely,

Regional Director or Responsible of the Survey

Annex 3. Profiles used in the staff selection stage

Poll-Supervisor:

Technology title in economics, business administration, financial administration, accounting, statistics, foreign trade, finance and international business, financial engineering, finance, project formulation, public administration, public accounting, marketing engineering, human resources management, cost and auditing, industrial engineering, systems engineering, food engineering, chemical engineering, mechanical engineering, electrical engineering, electronics engineering, industrial systems, and six months of related experience.

Equivalence 1. - Technical vocational title in the above mentioned specialties and 9 months of related experience.

Equivalence 2. - Four semesters of university education in the above mentioned specialties and one year of related experience.

Field coordinator:

University education ended (academic curricula completed) in economics, business administration, financial administration, accounting, statistics, foreign trade, finance and international business, financial engineering, finance, project formulation, public administration, public accounting, marketing engineering, human resources management, cost and auditing, industrial engineering, systems engineering, food engineering, chemical engineering, mechanical engineering, electrical engineering, electronics engineering, industrial systems, and six months of related experience.

Equivalence 1. - Eight semesters approved in the above mentioned specialties and 18 months of related experience.

Equivalence 2.- Technology title in the above mentioned specialties and two years of related experience.

Equivalence 3. - Technical vocational title in the above mentioned specialties and three years of related experience.