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SUBMITTED TO:

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Washington, D.C. 20523

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UTILIZATION OF SCIENTIFIC AND  
TECHNICAL INFORMATION IN LATIN AMERICA:  
Findings from the Dominican Republic

by

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LAC-0044-C-00-1048-00

SUBMITTED BY:

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Mr. James F. Smith  
Chief, LAC/DR/MAD  
United States Agency for  
International Development  
Washington, D.C. 20523

Dear Jim:

Attached is an interim report which outlines our activities to date and the preliminary findings on the evaluation of the NTIS project, under Contract No. LAC-0044-C-00-1048-00. It is entitled "Utilization of Scientific and Technical Information in Latin America: Findings from the Dominican Republic" and was prepared by the principal investigator for the study, Ms. Marina Fanning-Firfer.

While the scope of work outlined in the contract does not call for an interim report, we are pleased to submit one at your request since the NTIS project being evaluated is being reviewed for funding at the present time.

If we can be of any further assistance, please let us know.

Sincerely,

Jorge M. Pérez Ponce  
Vice President

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## A. INTRODUCTION

This is an interim report on the evaluation of the National Technical Information Service (NTIS) regional science and technology information transfer project No. 598-0572, which is being implemented by the Department of Commerce under a PASA arrangement. This evaluation is being carried out by InterAmerica Research Associates under AID Contract No. LAC-0044-C-00-1048-00 and it is intended to focus on the utilization of scientific and technical information provided by NTIS through its distributors in Latin America.

The key aspect of this evaluation is to determine, as far as possible, to what extent NTIS-supplied information contributes towards technological change. In other words, the evaluation is intended to focus on whether in fact the recipients of the information are utilizing it and what impact, if any, this is having on the accumulation of technological capacity; and thus, on the development process itself.

## B. SCOPE OF WORK

The scope of work calls for InterAmerica to develop a methodology based on a minimum sample of five NTIS distributors to determine how information obtained from the NTIS mechanism is being utilized. This methodology is to be applied through a series of data-gathering field trips. Based on an analysis of the data gathered, a report is to be developed detailing the utilization of the technical information.

Where appropriate, recommendations on improvements or changes necessary to enhance utilization of the information distributed will be made.

### C. ACTIVITIES TO DATE

#### Orientation

The first activity undertaken to date by the InterAmerica evaluation team was to become thoroughly familiar with NTIS operations and procedures and with the project to be evaluated. Visits were made to the NTIS facilities in Springfield, Virginia, and numerous meetings were held with key NTIS staff members and AID officials. Pertinent documents on utilization reports and evaluation activities, as well as annual reports and other project-related documentation, were reviewed.

#### Selection of Countries

The second activity undertaken was the selection of the countries to be visited for field data gathering. This activity was undertaken jointly with principal NTIS staff members and with the AID project officers. From the total number of Latin American countries served under the NTIS/AID program, a sample of countries was selected using criteria which included representation and geographical setting.

Countries were broken down by volume into three use groups. The first group was comprised of the two largest users, (which are also the largest countries in the region, from the standpoint of population,) together accounting for 53 percent of NTIS volume in 1980: Brazil (28%) and Mexico (25%). The second use group accounted for the next 27 percent of the volume and was comprised of countries which can be termed middle size: Chile (7%), Argentina (6%), Colombia (5%), Venezuela (5%), and Peru (4%). The third use group accounted for the remaining 20 percent volume and was comprised of the smaller countries in Latin America: Barbados, Bolivia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, Panama, and Paraguay.

The geographic groups defined were: the Caribbean, North America, Central America, and South America.

Due to the small number of countries, sample selection was purposive rather than random. Mexico was chosen as the representative of the first use group, since it was felt its diversity and size would offer the most insight for the project purposes from this group. Since it is also the only Latin American country in North America, it also is the representative from that geographic group.

Colombia was chosen from the second use group. This country is largely perceived to be the most assiduous and best organized user of.

NTIS materials in the region. From the third use group, which contains the most countries, three countries were chosen, each from a different geographic area: Ecuador from South America, Costa Rica from Central America, and the Dominican Republic from the Caribbean.

### Instrument Preparation

The third activity undertaken was the development of an interview schedule to be used in the field data-gathering activities. This schedule was composed of open-ended questions and was intended to be exploratory in its application. One of the most important lessons garnered from the review of previous NTIS evaluation activities was that questions that were too technically specific raised skepticism and hostility since there seemed to be a general reluctance on the part of NTIS end users to discuss application of information to any great detail. It was inferred that information which had been evaluated and applied, acquired greater value and become new original information. Thus, efforts to elicit information viewed as proprietary had not met with much success.

InterAmerica, with AID and NTIS concurrence, thus decided to base its methodology for data collection on executive interviewing techniques which rely primarily on the skill of the interviewer to guide the respondent through a loosely structured discussion. An integral part of this methodology is the scheduling of the interview with the end user him/herself. Thus, an equally important task for the

interviewer, in addition to conducting the interview, is to ascertain that it is scheduled with the appropriate person. A sample of the draft interview guide is appended.

### Field Test

The fourth activity undertaken was to conduct a field test of the methodology and interview schedule. The Dominican Republic was chosen to conduct data gathering interviews on a field-test basis with the understanding that these findings would be incorporated into the final report. The two principal investigators for the study, Marina Fanning-Firfer and Wilbur Knerr, spent one week in the Dominican Republic from November 2 through 6, 1981, and interviewed a total of eighteen end users of NTIS-supplied scientific and technical information. In addition, interviews were conducted with personnel involved in the information distribution process at the Instituto Dominicano de Tecnologia Industrial (INDOTEC), the local NTIS distributor, and with the USAID/DR Program Office.

### D. PRELIMINARY FINDINGS

Based on this field visit, an analysis of NTIS information utilization can be presented following the proposed analytic design. As the distribution network in each country determines the materials distribution process, and to an extent, the nature of the end users, a brief description of the Dominican center follows.

## Distribution Center

INDOTEC is an institution created by the Banco Central of the Dominican Republic for purposes of providing a scientific-technological tool to service national industrial development.

To carry out its work, INDOTEC has a staff of professionals from a variety of scientific and technical fields as well as complementary installations and facilities. Notable among these are:

- a laboratory of chemistry and physics;
- a laboratory of microbiology;
- a research laboratory;
- a pilot plant; and,
- an information center.

The department responsible for documentation and information services is the Centro de Informacion Cientifica y Tecnologica (CENICIT). It was established to provide specialized information to national industries and researchers and in so doing contribute to the development of their projects and scientific investigations. Briefly, CENICIT's objectives are:

- to contribute to the industrial development of the nation by means of providing continuous scientific and technical information to professionals and entrepreneurs;

- to establish a basis for the creation of a national network of technical information;
- to define participation of the country in information programs of a regional or international nature; and,
- to induce the transfer, adaptation, improvement, and application of technologies through technical information.

Among the services performed by CENICIT are industrial liaison visits, technical consultation, the selective dissemination of information, a library, and a publications program. The latter consists of a bibliographic bulletin (bi-monthly), a catalog of periodicals, an inventory of university theses, and a monthly Boletin de Noticias Tecnicas which includes information about NTIS publications.

When AMTID (Application of Modern Technology to International Development), an NTIS newsletter, is available, it is included with the Boletin. On spotting a publication of interest, recipients place an order with CENICIT payable in Dominican pesos. This is processed and sent via airmail to NTIS within 24 hours of the time the order is received. CENICIT reported that the average time for completion of an order cycle to NTIS is between 5-6 weeks but there have been isolated instances of delays of up to six months.

#### Sampling of End Users to be Interviewed

The selection of end users to be interviewed was arrived at using a stratified sample based on the following procedures and criteria. First, INDOTEC was asked to list all end users over the last two

years. Users were considered for inclusion if they were known to have received a publication at least six months prior to the interview, the minimum time deemed appropriate to determine if the information solicited had been utilized in some way. Users further away than one hour out of the Santo Domingo city limits were eliminated on grounds of relative inaccessibility. Phone calls were then made to this list of potential interviewees.

When phone contact was made, receipt of an NTIS publication was confirmed and the identity of the actual recipient established. (Oftentimes, orders are placed by assistants, secretaries, or clerks.) Telephone contact was then attempted with the actual recipient of an NTIS publication. If it was not possible to establish contact for any reason (limited telephone service, people unavailable or out of town, etc.), the user was dropped from the list. Since actually reaching a known recipient was difficult, every effort was made to interview any that were contacted. A total of 20 interviews were scheduled, and 18 were actually conducted. Two respondents did not keep their scheduled appointments.

While this cannot be considered a truly representative sample of the end users of NTIS-supplied scientific and technical information, Table 1 reveals coverage of every category in which publications were ordered during 1981 by all NTIS end users in the Dominican Republic.

TABLE 1

	<u>Publications Ordered 1981</u>	<u>End Users Interviewed</u>	<u>Percent of Total</u>
Agriculture and Rural Development	79	2	3 %
Construction Industry Development	17	2	12 %
Energy	64	3	5 %
Environment	12	2	17 %
Health	4	1	25 %
Industry	31	6	19 %
Water Supply and Sanitation	<u>5</u>	<u>2</u>	<u>40 %</u>
TOTAL	212	18	8 %

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Source: Original data collected by InterAmerica Reserach Associates, Inc.,  
November, 1981.

## Characteristics of Respondents

All of the respondents ordered the publications in the course of their work. Eleven worked with private firms, six worked with autonomous public institutions and one with a governmental agency. The technical fields of interest represented by the respondents are as follows:

Agriculture and Rural Development fisheries, water control and related	2
Construction Industry highways, dams, construction materials	2
Energy petroleum refinery, marketing and distribution, solar and wind energy	3
Environment environmental policies, environmental impact appraisal, air and water pollution	2
Industry chemical and allied products, food and kindred products	6
Water Supply and Sanitation water supply, resources development, distribution, water quality	2
Health pharmaceuticals	1
	<hr/>
	18

Usefulness of the information

A majority of the respondents felt the NTIS information was useful, met their needs and expectations, and broadened their knowledge base.

When asked whether the information received covered the range of subjects and types of resources about which they requested information, 94% replied that it had. Of these, 44% said they were very satisfied. Only 6% replied that they were somewhat dissatisfied. When asked whether the information had met their needs, 83% answered affirmatively, with 22% indicating their needs had been fully met. When asked whether the information had broadened their knowledge on the subject, 55% stated that the information had very definitely broadened their knowledge. Another 28% felt their information had been somewhat broadened with the remaining 17% expressing some degree of dissatisfaction.

Table 2

	<u>Very Satisfied</u>	<u>Satisfied</u>	<u>Somewhat Dissatisfied</u>
Information covered range of subject and types of resources requested	44%	50%	6%
Information met needs	22%	61%	17
Information broadened knowledge	55%	28%	17%

The question of whether the information had been furnished promptly and efficiently elicited the most dissatisfaction. Seventeen percent

stated that they were very satisfied with the service, 33% were satisfied, 22% were somewhat dissatisfied, and 28% were very dissatisfied. Given that there is a minimum six week turn around time on all orders, the degree of dissatisfaction is not surprising.

When asked what they liked best about NTIS, the answer most often given was that it broadened their knowledge base and was a good source of technical information. The next most often given response was the very availability of the service since it allowed them to stay in touch with technological developments and kept them up to date in their field of interest. Another feature which many liked were the notices and abstracts circulated in the INDOTEC and AMTID bulletins. Two respondents mentioned the relevance and technological appropriateness of the information supplied through NTIS as a particularly attractive feature. Interestingly, two other respondents commented on the promptness of the service, one specifically comparing it to ordering a book from a bookstore, with the comparison highly favorable to NTIS.

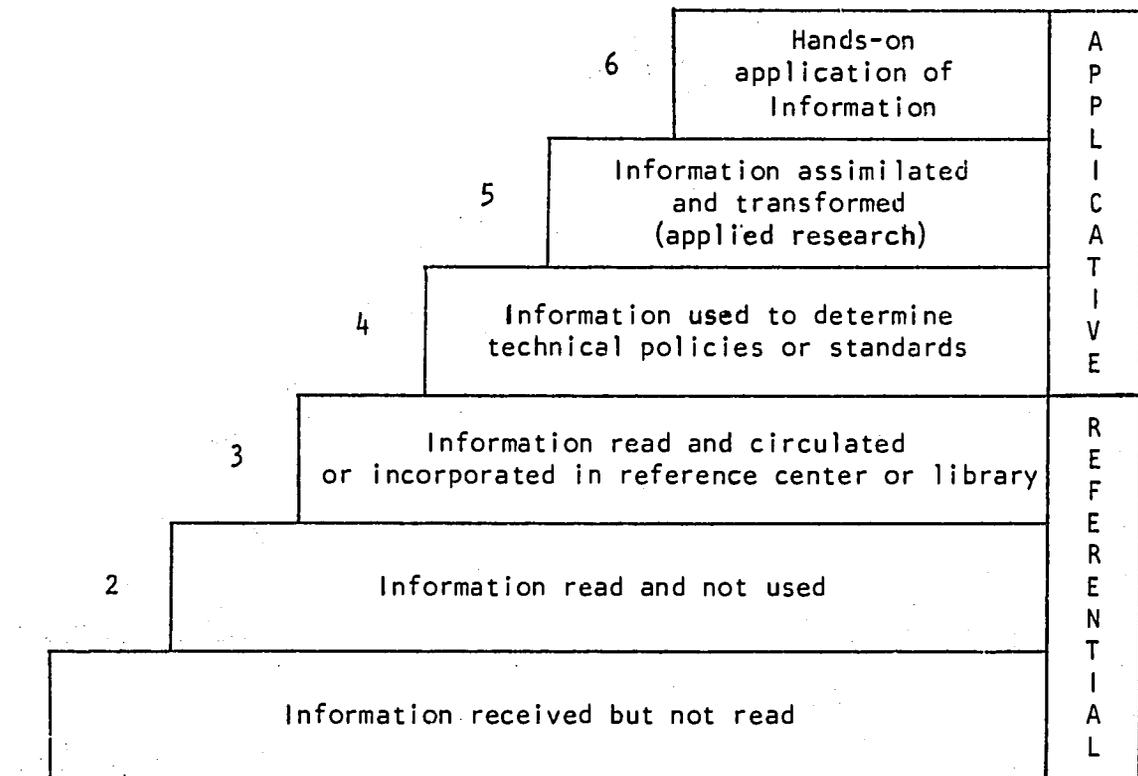
When asked what they liked least about the NTIS service there was a reluctance on the part of the respondents to find fault with what was generally seen as a valuable resource. The answer most often given was that there was nothing they liked least. Under probing, the answer most often given was that they did not like the fact that most of the publications were only available in English. Other answers given were that they did not feel there was enough awareness of the availability of the service, the procedures and delay in ordering, and that some materials did not meet their expectations.

## Utilization Hierarchy

In an attempt to describe the range of uses to which information can be put, a utilization hierarchy composed of six levels was developed and is depicted in the accompanying graph. At the first level, the information is received but not read. At the second level, it is read but with no specific use or purpose in mind. At the third level, the information is read with a use or purpose in mind and is stored or circulated to interested parties, often, though not necessarily, forming part of a reference center or library. At both levels 2 and 3, the information can be considered referential, in that it serves to broaden one or several peoples' knowledge, but does not serve an operational purpose beyond serving as reference material. At the fourth, fifth and sixth levels, the information is acted upon and serves as a basis for the development or implementation of a specific purpose, plan or project. At these levels, the information becomes applicative.

The utilization hierarchy is intended to be applied to all respondents in each of the five countries. It is supposed that some will have received, but not read the material (Level 1), and it is anticipated that the majority of respondents will utilize the information for reference purposes, Levels 2 and 3. An attempt was made to distinguish between the unstructured information seeker who is merely seeking information to keep abreast or broaden his knowledge base (Level 2) and the more systematic information gatherer who seeks information with a purpose in mind (Level 3), the latter includes information gathered to form part of a reference center or library.

UTILIZATION HIERARCHY




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InterAmerica Research Associates, Inc.

The highest three levels on the utilization hierarchy are intended to describe and distinguish between the different uses of information in application settings. Level 4 is for information that is used in the determination of technical policies or standards at the national, industrial or company level. Level 5 is intended to include information that has been assimilated and also incorporated into new information sources such as the development of a research paper or in the conduct of a research experiment. Level 6 is to include operational, hands-on applications of any sort, such as when someone uses the information to manufacture, build or create something.

#### Utilization Breakdown in the Dominican Republic

It had been anticipated that the majority of the NTIS end users would fall into the first three levels, however, this did not prove to be the case in the Dominican Republic. The respondents fell overwhelmingly into the applicative category (Levels 4, 5 and 6) with 84% actually putting the information received to a specific use. Half of the respondents (50%) used the information in a direct, hands-on, operational application (Level 6). Specifically, respondents in Level 6 used the information to:

- manufacture antibiotics
- manufacture food products
- establish a shrimp farm
- distill water for fish farming
- install a boiler in a refinery

TABLE 3

Utilization Breakdown of  
NTIS-Supplied Information  
in the Dominican Republic

6	Hands-on application of information	50%	A P P L I C A T I V E	84%
5	Information assimilated and transformed (applied research)	17%		
4	Information used to determine technical policies or standards	17%		
3	Information read and circulated or incorporated in reference center or library	5%	R E F E R E N T I A L	16%
2	Information read and not used	11%		
1	Information received but not read	none		

- manufacture animal feed
- develop and publish a pharmaceutical catalog, and,
- cultivate energy efficient trees for wood burning.

Respondents in Levels 4 and 5, determination of policies or standards and applied research, utilized the information received from NTIS to:

- design experimental applications in wind and solar energy,
- design new products for an electrical company,
- designing a manufacturing process to produce glucose from starch,
- set national policies on water pollution,
- set water quality standards for a water distilling company, and,
- set national policies on agricultural irrigation.

Table 3 shows a breakdown by levels in the utilization hierarchy of the interviews conducted in the Dominican Republic of end users of NTIS-supplied scientific and technical information.

Almost half (47%) of the respondents in the applicative category (Levels 4, 5 and 6) felt that the NTIS-supplied information had been of primary importance to their activities.

In trying to ascertain how they had become aware of their need for information and why they had ordered it from NTIS, it became apparent that the notices and abstracts published in AMTID and in INDOTEC's own bulletin were an excellent marketing vehicle. Almost three-fourths

(72%) of the respondents mentioned the Boletin when replying to awareness of need or as their source of information on the existence of the service or the documents purchased, or as a particularly attractive feature of NTIS. Several respondents went so far as to say that NTIS was the only reliable source of technical information they had access to.

### Distribution of the Information

While INDOTEC offers and provides access to several scientific and technical published abstracts and information services, notably the British Library Lending Division, Chemical Abstracts, Engineering Index, National Research Council of Canada, VITA, INFOTEC, Food Science and Technology Abstracts, and Abstracts on Tropical Agriculture, the NTIS services are utilized to a much greater degree than all the rest combined. Resources did not permit a compilation of statistics, but the personnel involved in the information distribution process at INDOTEC estimate the NTIS services are used 80% more often than all of the other services. The reasons given for this appear to be intrinsic to INDOTEC's mission and purpose since it was felt that NTIS was geared to service precisely those end users which INDOTEC is mandated to serve. It was felt that at the small industry level, NTIS was practically the only service available for relevant scientific and technical information.

Additional data collected on the information distribution process will be analyzed in the final report.

## Conclusions

While it is premature to draw conclusions at this point in the study from the data gathered in the Dominican Republic, several important facets are readily apparent. One is that given that 84% of the respondents actually used the information requested to set technical policies or standards, in applied research, or to manufacture, build or create something, the clientele INDOTEC serves appears to be a particularly appropriate clientele for NTIS information.

Another important facet is the fact that almost three-fourths (72%) of the respondents referred to the AMTID and Boletin Tecnico de Noticias notices and abstracts as either their source of knowledge on the availability of the information requested or as a particularly attractive feature of NTIS. These bulletins appear to significantly facilitate the use of NTIS information.

A review of the uses to which the respondents put the information received yields important data on a key aspect of the study. In almost every instance, there is indication that the information received through NTIS will impact directly on the accumulation of a technological capacity and thus, indirectly, on the socioeconomic development process itself. In several instances the implications are far-reaching as in the case where NTIS-supplied information was utilized in the manufacture of glucose from starch by a Dominican government research agency. One needs only to consider the fact that sugar is an important source of foreign exchange for the Dominican Republic to understand the possible development implications. In

other instances the implications are not so far-reaching but equally impressive. One respondent stated that they had started in business without really knowing what they were doing, adding that without access to the information contained in the documents ordered from NTIS, they would have made serious mistakes and probably would have had to close down. Another respondent had imported a power boiler for a refinery and was unable to install and operate it, even after receipt of the manufacture's instructions, until the arrival of an NTIS publication. Yet another respondent, a distributor of drinking water, realized from an NTIS document that they were distilling valuable minerals out of their water while leaving others, that in concentration, were harmful to pregnant women.

#### E. COMPLETION OF THE STUDY

Based on the field test of the methodology and interview schedule in the Dominican Republic, it appears that the methodology outlined at the outset, while successful, has important considerations. The first is that the logistics of scheduling the interviews and carrying them out is considerably more laborious and complicated than anticipated. It took two people on the phone over most of four days to schedule 20 interviews. A corollary of this is the fact that, since contacting a known recipient of NTIS information is difficult, every attempt must be made to arrange an interview with any that are contacted. In the Dominican Republic, this resulted in having to criss-cross the city each day since arranging interviews by location added an untenable complication to the process. Without the active involvement and generous assistance of INDOTEC, it would not have been possible to

undertake the data collection in the time allotted. Therefore, the methodology will be modified to allow for longer stays in countries not providing the same degree of commitment and support to the study.

The interview schedule will also be modified to reflect the experience gathered in the Dominican Republic as well as the additional information which surfaced in the conduct of the field test interviews. Specifically, a lesser number of open-ended questions will be included since it is now felt that there is a better gauge on how much technical specificity can be elicited before skepticism or hostility is raised. Also, additional information will be gathered on the AMTID bulletin, on the awareness of need, on the awareness of sources for technical information, and on the utilization of the information.

INFORMACION SOBRE EL USUARIO

Razón social \_\_\_\_\_

Dirección \_\_\_\_\_

Teléfono \_\_\_\_\_

Nombre de la persona entrevistada \_\_\_\_\_

OBSERVACIONES

I. REACCION A LA INFORMACION PROPORCIONADA

Favor de indicar la respuesta que mejor corresponde a su punto de vista sobre la información proporcionada por el Centro de Información

- |   |   |   |   |   |
|---|---|---|---|---|
| 1. La información abarcó la gama de tópicos y recursos sobre los cuales ud. solicitó información. | 1 | 2 | 3 | 4 |
| 2. La información cubrió sus necesidades  | 1 | 2 | 3 | 4 |
| 3. La información amplió su conocimiento de los recursos disponibles                              | 1 | 2 | 3 | 4 |
| 4. La información le fue proporcionada eficazmente y a tiempo                                     | 1 | 2 | 3 | 4 |

II. PLANIFICANDO PARA EL FUTURO

5. Qué es lo que mas le gusta del Centro de Información?

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6. Qué es lo que menos le gusta del Centro de Información?

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7. Nos interesa saber mas sobre sus necesidades de información. Nos quisiera indicar cinco tópicos o áreas en las cuales usted cree que hay necesidades críticas de información.

(1) \_\_\_\_\_

(2) \_\_\_\_\_

(3) \_\_\_\_\_

(4) \_\_\_\_\_

(5) \_\_\_\_\_

III.. UTILIZACION DE LA INFORMACION PROPORCIONADA

Al contestar las siguientes preguntas, le suplicamos piense en una solicitud de información que haya usted hecho en los últimos seis meses.

8. Cómo usó la información recibida?

- (1) La información no fue leída.
- (2) Sirvió como referencia general
- (3) Fue usada para desarrollar un plan de proyecto
- (4) Fue fundamental para el desarrollo del proyecto, pero el proyecto no ha sido puesto en marcha
- (5) El proyecto ha sido terminado.

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9. Cómo fue que usted se dió cuenta de la necesidad de esta información?

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10. Qué tan apropiada fue la información recibida?

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11. Por qué fue que solicitó usted la información del Centro y no de otra fuente?

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12. Si utilizó otra información además de la proporcionada por el Centro, podría decirnos qué grado de utilidad (en términos relativos representó la información recibida del Centro?

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COMENTARIOS ADICIONALES