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**MANUAL FOR THE COMPILATION OF  
SCIENCE AND TECHNOLOGY INDICATORS  
IN THE CARIBBEAN**

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# MANUAL FOR THE COMPILATION OF SCIENCE AND TECHNOLOGY INDICATORS IN THE CARIBBEAN

## Introduction

Most nations have one or more governmental or non-profit agencies charged with collecting and analyzing science and technology data. These are sometimes referred to as science and technology observatories. Herman Jaramillo, in writing about science and technology observatories, has noted that an observatory, as an agency for collecting and processing indicators *“helps society to understand science and technology development and the integration of science and technology variables with other measures of economic and social development. The resulting information becomes a public good and a necessary input for the development of society.”*<sup>1</sup>

The mandate of science and technology ministers of government, government ministries and institutions everywhere is to harness science and technology to support the social and economic development of the nation. In practice, this means that the overriding question to be addressed by quantitative studies of science and technology activities is “What is the state of science and technology in the nation?” In the case of Caribbean nations this becomes two questions -“What is the state of science and technology in the nation?” and “What is the state of science and technology in the Caribbean?”

The measurement of indicators of science and technology that could inform policy decisions and measure or promote innovation is relatively new in the English-speaking Caribbean countries. The region is characterized by very small States ranging in populations of 40,000 to 2.2 million inhabitants on land masses from 262 sq. km to 10,969 sq. km, with limited technological capacity. Although some science and technology data collection programmes exist in Jamaica, Trinidad and Tobago and, to a lesser extent, Barbados and Guyana, the other islands have not yet developed a systematic approach to the collection of the data on science and technology. Given the state of infancy of the programmes it is also doubtful whether the data presently collected in Jamaica and in Trinidad and Tobago are used to influence or analyze policy. With the countries facing growing competition from a globalized market, issues such as innovation and competitiveness, too, have become recent discussion topics in the region. Approaches to these issues are still not fully defined, but will require well-developed policies based on sound information and data particularly in the sphere of science and technology.

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<sup>1</sup> Jaramillo, Herman. *Towards a new observatory for science and technology in Colombia*, Research Evaluation. Vol. 6. No. 3. 1996.

## **Early Caribbean economy and the place of science and technology in the subregion**

From a historical standpoint the subregion has been a source of primary products for a protected market in Europe. As such, the “the plantation economy”, as the production patterns have been described by some Caribbean writers, has not promoted technological development either indigenously or through technology transfer mechanisms. Thus, from the production of sugar cane in its heyday in the 1700s, to coffee and bananas at present, there has been very little value added or transformation of the products to the upscale market. Research and development work in product development was done primarily in the metropole and, where some research was done in the region, it was centered primarily on cultivation of the crops. As early as 1965 Lloyd Best, a noted Caribbean Political Economist, made the following points about the Caribbean economy:

“.....The technological path followed by the economies is an imitative one. Indeed, the typical enterprise being a metropolitan subsidiary, affiliate or branch plant, the techniques of production are actually programmed abroad. Imitative technology and branch plant organization also provide the second reason for not controlling incomes. The pattern of supply and the character of the goods available are, in an important sense, beyond local regulation. Therefore, for the programme of “industrialization by invitation” to proceed at all, not only has there to be demand, but taste has first to be shaped by the importation of commodities from the source of the technology.”

On data and statistics:

“.....In the West Indies for example, we have elegant national accounts and on one assessment, some of the best statistical services on this side of the Atlantic. But we cannot easily find estimates of the effective price of sugar though so much of the politics turns on it”.

## **Immediate post-Independence scenario**

The preoccupation with governance, the lack of a large resource base, the lack of financing and mono-crop practices for the protected market all combined to militate against a strong technological culture in the region in the early post-independence period. Thus, in the absence of analysis, the line of least resistance was taken by the governments after independence and business continued as usual with the protected market arrangements. From sugarcane in the 1700s to coffee, citrus, cocoa and, later, bananas introduced on a large scale in the early 1960s, the primary interest was to produce raw materials for the overseas market and industries, with even the marketing arrangements out of the control of the local government or local elite. With such arrangements the only data sets perceived to be necessary were trade data and statistics for revenue projection purposes.

The establishment of a Caribbean Free Trade Association (CARIFTA) grouping in the late 1960s, later to become a Common Market, the Caribbean Community (CARICOM) in 1983, coupled with the transformation of the University College of the West Indies to a full-fledged independent university, and the establishment of the University of Guyana provided the avenues

and forums for discussion on the production patterns and trading regimes in the region. At the same time, increases in prices of such commodities as bauxite and eventually hydrocarbons, provided the impetus by the two larger Caribbean producers of these respective commodities to critically examine marketing arrangements and to begin to recognize the benefits of added value through technology applications and processing. Thus, in 1960 Jamaica established its Scientific Research Council (SRC); Trinidad and Tobago established the National Science Advisory Council in 1968 to be followed by the Caribbean Industrial Research Institute (CARIRI); Guyana established a National Science Research Centre (NSRC) in 1975 followed by the Institute for Applied Science and Technology (IAST). These institutions were mandated to undertake research and development work for the promotion of industrial development at the national level.

Ironically, although part of their mandate, the collection of data, analysis of trends and priority setting were not the primary undertakings of the institutions, so that work programmes developed without serious critical and scientific approach to resource allocation and returns. Instead, short-term projects with immediate results were favoured over data collection, in an effort to continuously justify the existence of these institutions. Further, these institutions developed within a policy vacuum. There were no long-term, national development plans in which the technological requirements were clearly enunciated, nor was there a regional science and technology policy to guide research in the region, given the relative small size of these States and the obvious need to cooperate and pool resources as provided for under the CARICOM Agreement. A science and technology policy was not developed for Jamaica until 1987 and for Trinidad and Tobago in 1997. Grenada had an active science and technology council during 1979-1983 but the collection of data or development of indicators was not part of its mandate. The council also lacked financing on a sustained basis and at a sufficient level to carry out its mandate.

Continued agitation by such agencies as the United Nations Conference on Trade and Development (UNCTAD) and the United Nations Centre on Transnational Corporations (UNCTC) increased the awareness of the need to invest in science and technology. However, with the private sector predominantly foreign owned and operating as branch plants, the task of convincing the political directorate to provide funding through the public sector for science and technology was never successful. Ministers of finance would argue that funding was already being provided through ministries of agriculture, communications and works, and education. However, these funds were primarily for salaries and to support the administrative costs of these ministries and not for increased research and development. The call for research and development and investment in science and technology was also taken up by academia which, unfortunately, with its strong emphasis on teaching, was not seen as making a significant contribution to the solution of problems of the State by the politicians, since the universities did not have a direct relationship with the productive sectors. Regional and international agencies also agitated for science and technology and research and development policies and held a number of seminars on the topics. These seminars, though, focused more on the writing of a policy rather than on the justification of the policy since there were no indicators available to support the kind of analyses necessary to make the case for a change in direction.

By the time the United Nations Vienna Programme for Science and Technology for Development was adopted in 1979, six of the 12 English-speaking Caribbean countries, if Guyana and Belize are included, had attained political independence. The Programme created and promoted the awareness, especially in developing countries, of the role of science and technology in the development process and highlighted the need for increased spending at the national levels in order to put systems and institutions of research and development in place for the productive sectors. The Programme set a minimal target of 5% of Gross Domestic Product (GDP) to be spent on science and technology. Unfortunately, the Caribbean countries, strapped for finances, never achieved that benchmark, especially when there was much to do in putting administrative structures in place to govern the newly independent States. The Programme also proposed increased avenues for technology transfer in the hope that such transfers would assist the developing countries in building capacity in research and development. It is now acknowledged that in order to benefit from technology transfer the receiving State itself must have some minimal capability in indigenous technological capacity, and also, that technology transfer can, in some cases, introduce wrong or inappropriate technologies that most often create more problems than solutions.

As a result of these forces, Caribbean governments established The Caribbean Council for Science and technology (CCST) in 1981 and one of its first activities was to write a regional science and technology policy for the Caribbean. Although the Council was established by governments, the driving force for its establishment was not the governments but regional bureaucrats in international organizations including the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Economic Commission for Latin America and the Caribbean (ECLAC). Because that exercise was not driven by the political directorate's recognition of the need for such a policy, but rather by the efforts of some bureaucrats primarily in international organizations, the policy document remained on the shelves of these agencies. The cause was also not helped by the myriad of institutions, both regional and international, operating in the subregion, each calling for separate individual policies for their areas of activity. Thus, the United Nations Industrial Development Organization (UNIDO) agitated for industrial policy, the Food and Agriculture Organization (FAO) for agricultural policy and UNCTAD for trade policy. Disaggregation and a disjointed approach became the norm, with no national or regional agency coordinating the science and technology agenda.

Faced with falling commodity prices and increased competition by the late 1980s, the political directorate began to be interested in the idea of a regional policy for science and technology, mindful of their own limited national resource and influence. The 1981 document was revived and, this time it was brought to governments for discussion, consideration and eventually adopted in 1987 by the Heads of Government of CARICOM. The policy outlined the various areas in which research programmes and projects were to be undertaken. However, it was fundamentally flawed since it did not try to establish the bases for these proposed actions from sound, scientific and systematic data, nor did it begin by promoting systematic studies in the sector. These studies would have pointed to the need for data and indicators to be collected for proper analysis and evaluation. Justification for the policy, rather, was based more on "gut-feeling" or instinctive propositions. Another fundamental problem, too, remained the responsibility for carrying out these activities especially in a situation of limited national institutions and the absence of a regional funding mechanism. The document, as justification for

the policy, in its introduction did mention and tried to compare the Caribbean with such countries as Singapore, pointing out that in the 1960s Singapore and Jamaica were about level in economic activity. However, by the 1980s, Singapore made a quantum leap forward while Jamaica experienced a period of economic decline. The document, however, failed to analyze how Singapore attained its level of economic development and what steps or programmes are in place for maintaining that momentum.

### **Systems of data and statistics**

This is not to say that data and statistics were not collected or available. As noted by Best, Caribbean countries have been collecting data on trade, demography and finance, commonly termed “economic data” for a long time primarily through the statistical divisions of their ministries of trade<sup>2</sup>. Given their limited resources the data may not be timely or sufficiently uniform to facilitate comparison. However, in recognition of these problems a number of seminars and workshops have been held in the region, especially through the work of the ECLAC Subregional Headquarters for the Caribbean, based in Port of Spain, to help strengthen the statistical databases and human resource development in this area. One such meeting was held in 1989 on Statistics and the New Technologies. The main stated objective of the meeting was *“to develop a system of shared databases to increase the usefulness of statistics to the planning apparatus and the streamlining of statistical activity within national boundaries to contribute to a national data set of greater reliability”*.

However, on a limited budget, the seminar focused more on training for the use of the new technology rather than on the analysis of data and its effectiveness in the planning process utilizing the new technologies.

### **The present scenario**

The 1990s approached the Caribbean with increasing liberalisation of trade, increased competition but there was no realistic mechanism established to deal with the science and technology agenda for development. When, therefore, scientific and technological requirements with respect to product testing, quality control, labeling and packaging were instituted by the various international bodies of which these States are members, and “innovation” and “competitiveness” became buzz-words on the world scene, the Caribbean States became helpless to deal with the increasing pressures of a globalized market. Not much had changed since the 1960s. With the exception of Trinidad and Tobago with its oil-based industries and Jamaica with bauxite and agro-processing, manufacturing and industrial output are at very low levels. Activities in garment manufacture, rum, beer and furniture-making are some of the major undertakings in the subregion. The tourism industry is fast becoming the major foreign exchange earner in the subregion over agriculture and manufacturing, especially in the very small States.

The small size and limited resource base of these States do not allow them many options for development, so that once a product does well and generates income, as bananas have done for the small islands for the past 25-30 years, there is a level of complacency and satisfaction that prevents risk taking. Yet, it is precisely because of the limited options that very small States must

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<sup>2</sup> ANNEX 1

properly develop their economies, in order to be sustainable. To use bananas as an example, no effort was made to diversify within the industry, to promote agro-industrial development using bananas as raw material as is done in Costa Rica and the Philippines. As a first response it might be fair to say that the development of new products for export would require substantive investments in plant and equipment, which small producers would not be too inclined to undertake. However, possibly the more likely problem is the lack of information to access market conditions, make predictions, and to forecast. In short, the indicators on which these studies would be based are unavailable.

In 1994 the United Nations adopted a Programme of Action for Small Island Developing States (SIDS POA) in Barbados and called for international assistance to help these States overcome their development problems. The programme addressed all the major sectoral issues from trade to the environment, and agreed on the steps that had to be taken at the national, regional and international levels to promote sustainable development in these States. However, much of the work leading to the Programme of Action was descriptive rather than analytical and the document is woefully silent on the need for data and indicators for policy choices, measurement and evaluation. The implementation of the SIDS POA remains below expectation because of limited financing and the lack of proper implementation strategies based on sound analysis of capacity. The availability of indicators that can make the case for assistance to these States and that can be used in the formulation of policy and the design of implementation methods should go a long way in improving the implementation of this very worthwhile project.

### **Issues of innovation and competitiveness**

What then have been the efforts to correct these problems given that the countries have now accepted that they have to be innovative to compete and to develop policies that are sound and sustainable? Early efforts at dealing with competitiveness have been through incentives such as tax-free concessions and other fiscal policies. While these have their place they must be complemented with innovations at the plant or industry levels in order to be successful. Education and training must also be tailored to meet the skills and manpower needs of an innovation and competitiveness programme. This holistic approach to an innovation and competitiveness programme remains elusive. A survey conducted in Jamaica in 1990 concluded that *“critical shortages of specially trained personnel, equipment and funds; need for coordination: organizational and institutional defects; lack of adequate engineering resources, consultancy and money; no effective and coordinated mechanisms to stimulate, encourage and support creativity and innovativeness have led to the continued dependence on imported technology and low local innovative capacity”*. In the list of recommendations proposed by the writers to correct these problems, no mention was made of the need for indicators or proper analysis and use of existing indicators, however limited, for policy analysis. A similar paper was written in 1997 at the University of the West Indies, Trinidad and Tobago, in a report to the Campus Council. The focus, there too, was on research, without emphasis on proper analytical procedures for the determination of the research agenda. The arguments put forward were based more on perceptions than on analytical results. It would seem therefore that the need for indicators to strengthen these arguments and proposals and to convince policy makers and the decision makers in the private sector seems not to be appreciated even by the elite of the society.



The first effort at the design of a more comprehensive innovation programme was taken by CARICOM in 1996 in the development of a two-year project entitled Regional Enterprise Competitiveness Programme funded under the Lomé Financial Protocol. Like the first science and technology policy document, the project was not analytical in approach but descriptive and lacked targets and evaluation methods as well as an integrated funding mechanism. In addition, as a regional initiative, its success depends on national institutions and efforts that are still relatively weak.

The threatened demise of the banana industry and decreasing demand for traditional primary products prompted the Caribbean governments to re-examine a position and proposal put forward by the CCST with respect to the promotion of ancillary industries around the banana crop. This position was presented at a meeting of Heads of Government of the Organization of Eastern Caribbean States (OECS) in Dominica in 1997. The proposal called for the establishment of incubators at the national levels to train young entrepreneurs in all aspects of industrial development and to set up an industrial extension service, similar to the agricultural extension service, to promote small- and medium-sized enterprises, especially in the rural areas where bananas are grown.

In researching for the development of the project the absence of reliable data on production technologies, types and levels of industries operating in the States, and the information bases of these industries were seen as major hurdles in providing assistance to the small and medium-sized enterprises.

### **Introduction to the regional science and technology indicators programme**

The formulation of science and technology policy and the development of science and technology plans and programmes for the promotion of sustainable development and innovation require up-to-date, reliable and comprehensive data on a country's scientific and technological potential as well as its resource base.

The work and publications of the Red Iberoamericana de Ciencia y Tecnología (RICYT) in Latin America showed gaps in the information base for the Caribbean and exploratory talks were held to find out how the Caribbean could be incorporated into the programme. This led to a first meeting in 1997 in Trinidad and Tobago where the programme was introduced to members of the CCST national focal points in each country. By that time both Trinidad and Tobago and Jamaica, the larger economies of the subregion, had embarked on a small programme to collect indicators so as to inform their efforts at writing national science and technology policy papers.

At that first meeting with presentations from Adam Holbrook of Simon Frazer University, Canada, and Edson Kondo of the Contrato de Gestão – Conselho Nacional de Desenvolvimento Científico y Tecnológico (CNPq/MCT), Brazil, as resource persons, and hearing of the work of Jamaica and Trinidad and Tobago, member States expressed a willingness to undertake the collection of indicators but recognized the need for additional assistance in the development, use and evaluation of these indicators. With the help of RICYT again, a second meeting was held in Jamaica at which some crude indicators were developed in an attempt to identify those considered as most relevant to small states. The various manuals, Frascati, Oslo,

and Canberra were examined and discussed. It was agreed that these manuals were of limited assistance given the scope of activities that they measured. These activities were well beyond those of the very small Caribbean States and economies. Some of these crude indicators proposed were:

- Numbers and distribution of enterprises
- Government spending on science and technology
- Amount of small technology based enterprises
- Numbers of persons trained in various disciplines
- Employment levels
- Quality of life

However, in order to ensure uniformity of the data for comparison with other States, a small working group was established to develop a systematic set of indicators that would be useful to any small State while, at the same time, be uniform enough for comparison.

Over the past few years there has been a growing need in Caribbean countries for an information system and database on science and technology statistics, popularly known as “science statistics”. Policy makers, particularly those concerned with planning, implementation and management of technology issues, felt the need for comprehensive information, not only on the use of input resources which comprises mainly the financial and human resources deployed and infrastructure available for science and technology, but also the output of such activities measured in terms of increased productivity and increased economic growth and the use of new technologies and their impact on society. Such information is considered useful for undertaking cost benefit analysis and other economic studies as well as for efficient programming, planning and budgeting. It will also help in comparing the national science and technology efforts with other developing/developed countries.

Science and technology indicators fulfil several functions:

- Signaling or monitoring: Giving insight and calling attention to developments and trends in the science and technology system and its environment;
- Accountability, evaluation and allocation: Setting and justifying science and technology budgets and giving insight into the performance of the science and technology system against the goals established by policy makers and planners;
- Legitimization: Support for existing policies; and
- Awareness: Providing information to set aside prejudices and incorrect perceptions of the performance of the science and technology system.

In the public sector, statistics on science and technology inputs and outputs, and the consequent budget, should support the following activities:

- Formulation of science and technology policy, in support of economic and social objectives including analysis of the national system of innovation;
- Provision of advice to ministers and other senior officials;

- Support for and justification of science and technology programme expenditures; and
- Information on scientific activities for elected officials, journalists and other stakeholders.

In practice this means looking at changes in the levels of human and financial resources devoted to science and technology, as inputs and the change in the level of national development, as the desired output. Human resources for science and technology are the common denominator among all nations – science and technology programmes, are, by definition, carried out by skilled science and technology professionals. In the Caribbean context, the allocation of human resources is more indicative of the distribution of science and technology assets than actual expenditures. Thus, it is possible to define what is, and is not, a science and technology programme by asking whether or not science and technology professionals are a component of the programme.

There are two universes which intersect - that of all people trained in science and technology fields of study and that of all people who are working as science and technology professionals, regardless of their formal training. The sum of both universes is the area that is of interest to policy makers, although the policies may differ for the two. Indeed, it is important to know the magnitude of the two universes and the degree of overlap between them.

### **National science and technology performance data and their place in an indicators programme**

National science and technology performance data is keyed to the identification of science and technology activities, as defined by science and technology-related occupations and their activities, whether science and technology or not, of individuals trained in science and technology-related fields of study. In addition, national responses should include both a science and technology policy statement, as well as specific quantitative measures of performance.

As a first step these basic indicators would inform on the state of science and technology in the State and in the subregion as a whole. Given the relatively weak resource base, it was agreed also that emphasis be placed, at least in the initial stage of the programme, on human resource indicators. This means, in practice, looking at changes in the levels of human and financial resources devoted to science and technology (as inputs) and the change in the level of national development (as the desired output). It would appear from the above also that in the Caribbean context the allocation of human resource is more indicative of the distribution of science and technology assets than actual expenditures. Thus, it is possible to define what is, and is not, a science and technology programme by asking whether or not science and technology professionals are a component of the programme.

Annex

**THE MANUAL**

## **Acknowledgement**

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## THE MANUAL

The proposed common Caribbean science and technology indicators programme is based on the collection of data from all projects, institutions and establishments which employ science and technology professionals. If a programme has science and technology professionals employed, as defined in the Canberra manual, then it must be included in the survey.

Human Resources in Science and Technology (HRST), as defined by the Canberra manual includes individuals trained in both the natural and social sciences and individuals working in occupations that are contained within the definitions of natural and social sciences. The test as to what should be included and what should be excluded is whether the field of study or occupation falls within the mandate of a nation's science and technology policy or programme. If there is any doubt, then the test is whether the field of study or occupation would contribute to the development of a new product or process within the establishment in question.

### Questionnaire and data base sets

#### *Economic and social data relevant to science and technology activities to be collected are:*

1. Population
2. Labour force
3. Percentage of population with post-secondary education
4. Gross Domestic Product (GDP) - US\$
5. GDP/capita - US\$, ppp)
6. Exports as a percentage of GDP
7. Imports as a percentage of GDP
8. Foreign Direct Investment
9. Kilowatt hours (KwH) per capita
10. Telephone lines per 1000 population
11. Internet hosts/1000 population
12. Computers/1000population

An excellent source for national economic and social data is the figures published by the United Nations Development Programme (UNDP) in the annual Human Development Report.

### Specific Caribbean science and technology indicators to be collected at the national level

13. Public sector personnel performing science and technology (including research and development) as a percent of total public sector employment – *Public sector as defined in the Frascati Manual: use either full-time equivalents or total employed for both HRST and all employees.*
14. Public sector science and technology expenditures including research and development, as a percent of government budgetary allocations – *Government budgetary allocations forecast current and capital expenditures, including funds from international agencies, but excluding debt repayments.*

15. HRST workers as a percent of employed labour force – *Employed labour force is all individuals active in the formal economy.*
16. HRST-trained workers as a percent of total labour force – *Total labour force is employed labour force plus all individuals 15 years and older available for work.*
17. Percent of total labour force with post-secondary education
18. GERD as a percent of GDP

### 19. Distribution of HRST by sector

Sector	HRST (number)	% females	% < 35 yrs old	HRST % employed labour force	Expatriate HRST % of total	Expatriate HRST % CARICOM
Non-renewable resources, plus associated primary mfg.						
Renewable resources plus associated primary mfg.						
Secondary manufacturing						
Private sector services (except tourism)						
Tourism						
Public sector services (except tourism-related)						

### 20. Distribution of science and technology spending by Sector (National Currency)

Sector	S&T Expend.	R&D Expend.	S&T % Extramural	S&T % Capital	S&T % Salaries
Non-renewable resources, plus associated primary mfg.					
Renewable resources plus associated primary mfg.					
Secondary manufacturing					
Private sector services (except tourism)					
Tourism					
Public sector services (except tourism-related)					

1. HRST is defined as all individuals who have post-secondary education in at least one of the fields of study as defined in the Canberra Manual, Annex 3, Table 6, sections 1, 2, 3, 4, 5.1, 5.2, 5.3 and 6.1, or are employed in an HRST occupation as defined in Annex 4 of the Canberra manual.
2. An expatriate is an individual who is working in the nation who is normally resident elsewhere regardless of citizenship or place of birth.
3. Primary manufacturing is any sector of industry where the major inputs are raw, natural resources, whether renewable or non-renewable.
4. Tourism activities are those defined by the local tourist board.

Science and Technology expenditures are those expenditures resulting from the activities of all Science and Technology individuals in HRST occupations. Each national contribution would also include and science and technology policy statement, as outlined above.

**Questionnaire on Indicators - Survey frame (establishment level):**

- All government S&T agencies
- All government-supported institutions (hospitals, libraries, etc.), excluding education
- All post-secondary educational institutions (UWI faculties will fill out separate questionnaires)
- All S&T non-government organizations (NGOs) and private non-profit institutions
- All S&T professional associations – doctors, engineers, etc. (private practice members only)
- All business enterprises with any S&T employees as defined as HRST in Annex 4 of the Canberra Manual
- The agency collecting the data will send questionnaires to international S&T organisations operating in the Caribbean

1. <b>HRST</b>	# Males	# Females	% Expats	% Expats from CARICOM	% < 35 yrs. old
STA professionals (level 6&7)					
STA technicians (level 5)					
STA support staff					
R&D professionals (level 6&7)					
R&D technicians (level 5)					
R&D support staff					
Other employees with level 6&7					
Other employees with level 5					
Total all employees, all levels of education					

2. <b>Expenditures</b> (National Currency)	Salaries	Operating	Capital	Total
STA expenditures				
R&D expenditures				
Total				
	Internal	External Public sector	External Private sector	Total
STA expenditures				
R&D expenditures				
Total				



**Concordance with RICYT indicators (1999 edition, pp 13 – 18):**

RICYT Ind. #	Description	Caribbean region Indicator #
1	Population	1
2	Labour force	2
3	GDP	4
4	Total S&T expenditures	Available from questionnaire
5	Total S&T expenditures/GDP	Data available from questionnaire
6	Total S&T expenditures/capita	Data available from questionnaire
7	R&D expenditures/researcher	Data available from questionnaire
8	S&T expenditures by funder	Data available from questionnaire
9	S&T expenditures by performer	Data available from questionnaire
10	S&T expend. by socio-ec. Objective	Data available from questionnaire
11	S&T personnel	Data available from questionnaire
12	S&T personnel/1000 labour force	Data available from questionnaire
13	S&T personnel by gender	Data available from questionnaire
14	R&D personnel by sector	Data available from questionnaire
15 – 17	University graduates by level	Approx. data may be available from Min. of Education
16 – 20	Patent data	Numbers may be too small and variable for valid comparisons
23-28	Bibliometric data	Numbers may be too small and variable for valid comparisons

**QUESTIONNAIRE FOR COLLECTING DATA**

**CONFIDENTIAL**

**(NAME OF AGENCY CONDUCTING SURVEY)  
SURVEY OF RESOURCES DEVOTED TO SCIENTIFIC AND TECHNOLOGICAL  
ACTIVITIES**

Due date for submission: \_\_\_\_\_

Name of Establishment: \_\_\_\_\_

Address: \_\_\_\_\_

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Name of Contact Person: \_\_\_\_\_

Telephone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Email: \_\_\_\_\_

Web Page Address: \_\_\_\_\_

Major Activity of Establishment/Institution: \_\_\_\_\_

Year in which established: \_\_\_\_\_

Signature of person completing

Date

## Questionnaire

**Q. 1** Does your Establishment/Institution allocate any resources (finance/personnel) to *Scientific and Technological Activities (STA)*? **(Before filling, see definition below).**  Yes  No

**If yes, please complete this questionnaire**

**Definition**

**Scientific and Technological Activities (STA)**

Systematic activities which are closely concerned with the generation, advancement, dissemination and application of scientific and technical knowledge in all fields of science and technology. These include such activities as *Research and development (R&D)* (defined below), *Scientific and Technical Education and Training (STET)* (defined below) and the *Scientific and Technological Services (STS)* (defined below.)

**Q2. HUMAN RESOURCES**

Give the number of persons in your establishment engaged in *Science and Technology Activities* as of **(Before, read definitions given below).**

Category of Persons	Number of Persons			
	YEAR		YEAR	
	Male	Female	Male	Female
a) Researchers				
b) Post-graduate students				
c) Technicians and Equivalent staff				
d) Scientific (STS) personnel				

## **Definitions**

### **Researchers**

*Researchers* are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned.

### **Post-graduate Students**

*Post-graduate students* engaged in R&D should be considered as researchers and should be reported separately.

### **Technicians and equivalent Staff**

*Technicians and equivalent staff* are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences, or social sciences and humanities. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers.

*Equivalent staff* perform the corresponding R&D tasks under the supervision of researchers in the social sciences and humanities. Their main tasks include carrying out bibliographic searches and selecting relevant material from archives and libraries; preparing computer programmes; carrying out experiments, tests and analyses; preparing materials and equipment for experiments, tests and analyses; recording measurements, making calculations; preparing charts and graphs as well as carrying out statistical surveys and interviews.

### **STS Personnel**

The STS Personnel includes persons engaged in scientific and technical services included in the concept of STA.

**Definition*****Scientific and Technological Services (STS)***

*Scientific and Technological Services (STS)* are defined as activities contributing to the generation, dissemination and application of scientific and technical knowledge. These include:

- (i) S&T services provided by libraries, archives, information and documentation centres, reference departments, data banks and information-processing departments;
- (ii) S&T services provided by museums of science and/or technology, botanical and zoological gardens and other S&T collections;
- (iii) Systematic works on the translation and editing of S&T books and periodicals;
- (iv) Topographical, geological and hydrological surveying; routine astronomical, meteorological and seismological observations; surveying of soils and of plants, fish and wildlife resources; routine soil, atmosphere and water testing; the routine checking and monitoring of radioactivity levels;
- (v) Prospecting and related activities designed to locate and identify oil and mineral resources;
- (vi) The gathering of information on human, social, economic and cultural phenomena, usually for the purpose of compiling routine statistics, e.g. population census, production, distribution and consumption statistics, social and cultural statistics;
- (vii) Testing, standardisation, metrology and quality control; regular routine work on analysis, checking and testing, by recognised methods, of materials, products, devices and processes, together with the setting up and maintenance of standards of measurement;
- (viii) Regular routine work on the training of clients and other sections of an organisation of independent users which is designed to help make them to make use of scientific, technological and management information; and
- (ix) Activities relating to patents and licenses; systematic work of a scientific, legal and administrative nature on patents and licenses carried out by public bodies.

### Q.3 EXPENDITURE

#### 3.1 Expenditure on *Research and development (R&D)* (Before filling out read the definition given below)

Type of Expenditure	Expenditure (\$)	
	1998	1999
a) <u>Current</u> Labour Cost Other current cost		
b) <u>Capital</u> Land and building Major instruments and equipment		
Total (a + b)		

#### **Definition**

##### ***Research and Experimental Development (R&D)***

*Research and development (R&D)* comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge of man, culture and society and the use of this stock of knowledge to devise new applications.

#### **Definition**

##### ***Current Expenditure***

***Includes labour costs and other current costs***

##### ***Labour Costs***

These comprise annual wages and salaries and all associated costs or fringe benefits such as bonus payments, holiday pay, contributions to pension funds, NIS and health surcharge contributions, payroll taxes, etc. The labour costs of persons providing indirect services and which are not included in the personnel data (such as security and maintenance or the staff of central libraries, computer departments or head offices) should be included under other current costs.

##### ***Other Current Costs***

These comprise non-capital purchases of material supplies and equipment to support R&D performed by the statistical unit in a given year. All expenditures on indirect services should be included here, whether carried out within the organization concerned or hired or purchased from external suppliers.

**Definition*****Capital Expenditure***

*includes land and buildings and major instruments and equipment.*

***Land and buildings***

This comprises land acquired for Science and Technology or Research and Development (e.g. testing grounds, sites for laboratories and pilot plants) and buildings constructed or purchased, including major improvements, modifications and repairs.

***Major instruments and equipment***

The boundary between “minor” and “major” instruments and equipment varies slightly among countries according to accounting practices and among different firms and organisations in the same country according to accounting practices. Thus, national conventions will govern allocations to current or capital expenditures.

3.2 Expenditure on *Scientific and Technological Services (STS)*.

**(Before filling out read the definition given below).**

Type of Expenditure	Expenditure (\$)	
	YEAR	YEAR
c) <u>Current</u> Labour Cost Other current cost		
d) <u>Capital</u> Land and building Major instruments and equipment		
Total (a + b)		

Note: For definitions of current and capital costs see page 4.

3.3 Expenditure on *scientific and technological education and training (STET)*

**(Before filling out read the definitions given below)**

Type of Expenditure	Expenditure (\$)	
	YEAR	YEAR
e) <u>Current</u> Labour Cost Other current cost		
f) <u>Capital</u> Land and building Major instruments and equipment		
Total (a + b)		

Note: For definitions of current and capital costs see page 4.

**Definition*****Scientific and Technological Education and Training (STET)***

Any activity comprising specialised non-university higher education and training, higher education and training leading to a university degree, post-graduate and further training or organised lifelong training for scientists and engineers.

**Q.4 MISCELLANEOUS**

4.1 What fraction of employees have access to the Internet at the workplace?

75-100%    50-74%    25-49%    <25%

4.2 Has your establishment registered any patents?    **Yes**    **No**

Number \_\_\_\_\_

4.3 Has your establishment produced any papers for publication?    **Yes**    **No**

Number \_\_\_\_\_

**COMMENTS**

**Do you have comments on how Science and Technology may be used to improve your establishment?**

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Thank you for taking the time to complete this questionnaire. Please return to the:

Name and Address of Executing Agency

If you have any questions, please contact (Institute) at (telephone number). All data collected through this survey will be treated as strictly confidential. No establishment or individual will be in any way identified in any reports or publications based on this survey.



**A SAMPLE INDICATORS PROGRAMME  
TRINIDAD & TOBAGO**

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Science and Technology (NIHERST)**

## **1. SURVEY OF SCIENCE AND TECHNOLOGY INDICATORS**

### **Introduction**

Trinidad and Tobago is the southernmost island in the Caribbean Archipelago, only 10 km (seven miles) off the Venezuelan coast. It has a population of 1.3 million and an area of 1,980 square miles.

Research into Science and technology Indicators in Trinidad and Tobago is fairly new. Preliminary work is currently being conducted by the National Institute of Higher Education, Research, Science and Technology (NIHERST).

With the growing need for information on Science and Technology Indicators, Trinidad and Tobago, in March 1999, began the collection of macro level data in the field of S&T which included Research and Development (R&D) expenditure, S&T expenditure, R&D manpower, S&T manpower and an opinion check of organisations on the availability of resources to carry out R&D activities.

### **Questionnaire Design**

Before undertaking the survey, considerable thought was given to defining the objectives of the study and designing the survey tools. The information requested by RICYT and that required by NIHERST was taken into account. Bearing this in mind, a questionnaire was developed which would gather the necessary information. Due to the type of data which was being requested, the nature of the subject matter and the various methods of measuring indicators of expenditure and manpower, it was necessary to develop a list of concepts and definitions as an attachment to the questionnaire. The development of this list was guided by information in the Frascati Manual and took into account the country's relative ignorance of the subject matter.

The questionnaire mainly sought information on two important input parameters: - the number of personnel employed in S&T and R&D activities and relevant expenditure. Details were requested on two parameters, the break up of R&D and S&T expenditure into revenue and capital expenditure for the 1996 – 1997 period. The qualifications of R&D and S&T personnel were further broken down by gender. Apart from this, information on ongoing R&D projects was also requested. This included the title of the project, project description, objectives, duration, sponsor and budget. Organisations were requested to give their opinion on the extent of problems faced in carrying out R&D activities due to certain factors such as manpower, training, funding, encouragement, facilities, environment and bureaucracy.

## **Survey Methodology**

The present survey covers the Government, private and higher education sectors. The questionnaire was mailed to 93 organisations.

The method of contact employed was one in which the questionnaire and the list of concepts and definitions were mailed or hand delivered to organisations and a deadline given. A period of two weeks was allowed for the receipt of questionnaires after which appointments were made to meet with representatives of organisations in order to clarify concepts and definitions and to explain the method in which they should be applied to the various institutions based on their type of activity.

The completed questionnaires were checked for consistency and completeness of data and wherever necessary, queries were referred back to the respondents. The response rate is 60%.

## **Information and Analysis**

Data is being compiled and will be available shortly.

Following is a brief summary of the information which will be available.

- Total S&T expenditure by sectors
- Total S&T expenditure by revenue and capital expenditure
- Total expenditure as a percentage of Gross National Product
- Total R&D expenditure by various sectors
- Total R&D expenditure by revenue and capital expenditure
- R&D expenditure as a percentage of Gross National Product
- S&T personnel by sector
- R&D personnel by sector
- S&T and R&D personnel by qualifications
- Distribution of S&T and R&D personnel by gender
- Analysis of opinions on the factors affecting R&D

## **Secondary Sources**

- Macro Socio-economic indicators
- Expenditure on higher education
- Registration of students at under graduate and post graduate level
- Degrees awarded for graduate, post graduate and PhD level

- Registration of students in technical and vocational courses

## **LIMITATIONS**

- ⇒ As this is the first attempt by Trinidad and Tobago in collecting data on S&T Indicators, a situation has developed where much time and energy must be invested in the task of promoting the need for and use of such data and in translating the various concepts used in the study.
- ⇒ A major problem in the survey is the receipt of the questionnaire on time.
- ⇒ At present, no national laws/mandates/statutory provisions relating to the procurement of S&T statistics from S&T establishments exist.
- ⇒ Industries are not maintaining separate accounting systems for R&D or S&T expenditure.

## **RECOMMENDATIONS**

- ⇒ That an exercise be undertaken to focus on developing or adapting current concepts to the Caribbean context;
- ⇒ Sensitisation of the public to the use and need for information on S&T Indicators;
- ⇒ A policy decision is required to encourage industries to maintain separate accounts for S&T and R&D;
- ⇒ Statutory provisions need to be made in order to facilitate the procurement of S&T statistics from establishments; and
- ⇒ Use of experts in this field to educate respondents on the impact of such research on policy development.

## **2. SURVEY FOR THE IDENTIFICATION OF S&T INSTITUTIONS**

In January 2000, the NIHERST S&T Statistical Unit began a survey for the identification of S&T institutions.

The objectives of this study were:

- To identify organisations in Trinidad and Tobago which were involved in S&T activities;
- To create a database of institutes involved in S&T and R&D; and
- To gain some insight into innovation in companies in Trinidad and Tobago.

**Methodology**

All organisations in Government, higher education (UWI) and industry were contacted.

**Government:** The Permanent Secretaries of all Ministries were contacted and asked to identify departments/divisions under their administration, involved in S&T/R&D and heads of divisions were sent the questionnaires.

**Higher Education:** Deans were sent the questionnaires

**Industry:** A complete list of organisations was sourced from the Central Statistical Office (CSO). A sample was selected based on the employment size and these companies were sent the questionnaires.

A total of 230 organisations received questionnaires and to date 75 have been completed and returned. Outstanding organisations are being contacted and follow up visits made to ensure completion of the exercise by August 2000. A copy of the questionnaire is attached for your information.

**CONFIDENTIAL**

**SURVEY OF SCIENCE AND TECHNOLOGY INDICATORS**

TO BE COMPLETED AND RETURNED TO NIHERST SCIENCE AND TECHNOLOGY  
DIVISION

**20 VICTORIA AVENUE, PORT OF SPAIN**

**I**

Questionnaire Number: \_\_\_\_\_

Due date for submission to NIHERST: \_\_\_\_\_

Name of Establishment: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Activity of Establishment: \_\_\_\_\_

## 1. MANPOWER

1.1 State the number of persons in your organization engaged in Science and Technology Activities. (See Concepts and definitions No. 1 to 10)

Category of Persons	<u>Number of Persons</u>			
	1996		1997	
	Male	Female	Male	Female
i) Researchers				
ii) Technicians and Equivalent Staff				
iii) Scientific (STS) Personnel				
iv) Postgraduate Students				
v) Other Support Staff				

1.2 For the year **1997** only, please complete the following table for the personnel in categories (i) Researchers (ii) Technicians and Equivalent Staff and (iii) STS Personnel as stated in Question 1.1 above.

NAME	QUALIFICATION <sup>3</sup>	FIELD <sup>4</sup>	Enter: <b>1.</b> for S&T Activity <b>2.</b> for R&D activity only <b>3.</b> for both

NOTE: Please attach additional sheets if necessary

<sup>3</sup> See Concepts & Definitions # 9

<sup>4</sup> See Concepts & Definitions # 10

## 2. EXPENDITURE

### 2.1 Total Expenditure on Science and Technology Activities (See Concepts and Definitions No. 1 & 11)

Type of Expenditure	Expenditure (TTS)	
	1996	1997
a) Current: Labour costs Other current costs		
b) Capital Land and building Major instrument and equipment		
TOTAL		

### 2.2 Total Expenditure on Research and Experimental Development (See Concepts & Definitions No. 2 & 11) (See Concepts and Definitions No. 1 & 11)

Type of Expenditure	Expenditure (TTS)	
	1996	1997
c) Current: Labour costs Other current costs		
d) Capital Land and building Major instrument and equipment		
TOTAL		

3. **RESEARCH & DEVELOPMENT PROJECTS IN 1998**

Please provide details of Research and development Projects undertaken by your establishment during 1998

Title of project	Description	Objectives	Duration	Sponsor	Budget (TTS)

**NOTE: Please attach additional sheets if necessary**



4. **PROBLEM AREAS IN RESEARCH & DEVELOPMENT**

- (a) Have you encountered any problems in carrying out the research mentioned in Question 3 above? (please tick the appropriate box)    Yes    [   ]                      No    [   ]

(If “no” to Q4 (a), omit Q 4(b))

- (b) To what extent were the following factors a problem in carrying out your research?  
Please tick the appropriate box)

	Not at all	To some extent	To a great extent
1. Manpower Deficiency	[   ]	[   ]	[   ]
2. Lack of Training	[   ]	[   ]	[   ]
3. Inadequate funding	[   ]	[   ]	[   ]
4. Lack of encouragement	[   ]	[   ]	[   ]
5. Inadequate facilities	[   ]	[   ]	[   ]
6. Unsuitable environment	[   ]	[   ]	[   ]
7. Bureaucracy	[   ]	[   ]	[   ]
8. Other	[   ]	[   ]	[   ]

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Please specify.

Date

Signature of person

Position held

Completing return

**CONFIDENTIAL**

**NATIONAL INSTITUTE OF HIGHER EDUCATION,  
RESEARCH, SCIENCE AND TECHNOLOGY (NIHERST)**

**SURVEY FOR IDENTIFICATION OF SCIENTIFIC AND TECHNOLOGICAL  
(S&T) INDUSTRIES**

Due date for submission to NIHERST: \_\_\_\_\_

Name of Establishment: \_\_\_\_\_

Address: \_\_\_\_\_

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Name of Contact person: \_\_\_\_\_

Telephone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Email: \_\_\_\_\_

Major Activity of Company: \_\_\_\_\_

Year in which established: \_\_\_\_\_

\_\_\_\_\_  
Signature of the person completing  
questionnaire

\_\_\_\_\_  
Date

**Note: Please tick [✓] the boxes in the following questions as applicable**

- Q1. Does your company allocate any company resources (finance, time and/or effort to Research and development (R&D)\*\*? Yes  No
- 1.1 Has this ever been done in the past? Yes  No
- 1.2 Do you plan to do so in the future? Yes  No

Q2. Is your Company involved in the following activities:

- |   | Yes                      | No                       |
|---|--------------------------|--------------------------|
| ➤ Patent development?   | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ New process development?  | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ New product development?  | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Prototype development?  | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Technological changes in processes?   | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ New design development?   | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Import substitution development?  | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Publication of research papers/books  | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Undertake research projects?  | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Employment of researchers?  | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Research by postgraduate or Ph.D. students?   | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Retraining personnel in new techniques or use of new machinery?                     | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Modification of production machinery and tools?                                     | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Provide ** scientific and technological services to perform above given activities? | <input type="checkbox"/> | <input type="checkbox"/> |

**\*\* (See definitions on page 7 of this questionnaire before ticking)**

- Q. 3 Do you maintain a separate budget for R&D activities? Yes  No
- Q. 4 Do you have separate manpower for R&D projects? Yes  No

Q. 5 Do you have sufficient infrastructure facilities available for performing R&D activities? Yes  No

Q. 6 Nature of R&D carried out at present:

- Planned or systematic Yes  No
- Trouble shooting or ad hoc Yes  No
- Quality Control Yes  No
- Others (Please specify) Yes  No

Q. 7 Has your Company introduced any new products or processes in the past five years? Yes  No

Q. 8 Please indicate how often your Company, on the average, introduces new products or processes.

- More than three times a year
- Three times a year
- Twice a year
- Once a year
- Every second year
- Every third year
- More seldom than every third year

Q. 9 To what extent does your organisation:

- |   | Low                      | Medium                   | High                     |
|---|--------------------------|--------------------------|--------------------------|
| ➤ Have a stated and working strategy of product/process innovation?                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Treat employees as a vital resource for building competitive advantage in products/processes? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Hold creative product/process employees and their contributions in high esteem?               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Celebrate new product/process success?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- |   |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|
| ➤ Have product/process idea people?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Train employees to be creative for product/process development?                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Have effective suggestion programmes for products/processes?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Low                      | Medium                   | High                     |
| ➤ Manage organisational culture to make it more innovative for product/process development?             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Empower subordinates: delegate sufficient authority for employees to innovate new/products processes? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Invest heavily and appropriately in product/process R&D   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Q. 10 In general, how did this new product/process affect your Company's:

- |                        | Negatively               | No Effect                | Positively               |
|------------------------|--------------------------|--------------------------|--------------------------|
| ➤ Profitability        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Cash Flow            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Market Share         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Competitiveness      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Productivity         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Environmental Impact | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Quality of Service   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Labour Relations     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Other                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
- 

Q. 11 How valuable are the following in developing your new products and/or processes?

- |                   | Not Valuable             | Valuable                 | Crucial                  |
|-------------------|--------------------------|--------------------------|--------------------------|
| ➤ In-house R&D    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ➤ Out sourced R&D | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

➤ Sale and Marketing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Competitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Trade Shows	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Q. 12 How do the following factors influence innovation in your Company?

	Hinder	No Effect	Help
➤ Corporate culture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Management attitude	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Risk or Reward innovation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Development and/or production cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Clients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Competition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Supplies of raw material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Government policies or programmes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Availability of personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Availability of financing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
➤ Environmental concerns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q. 13 Has your company updated or replaced capital equipment in the past five years?

Yes  No

If yes, did the new equipment incorporate significant technological advances?

Yes  No

Q. 14 Is there one person at your Company responsible for managing innovation? Yes  No

Q. 15 Is your Company able to measure the quality and Effectiveness of its innovative practices? Yes  No

Q. 16 Does your company use the Internet? Yes  No

If yes, what percentage of your employees has access to the Internet from their desks?

- |                          |               |                          |               |
|--------------------------|---------------|--------------------------|---------------|
| <input type="checkbox"/> | All employees | <input type="checkbox"/> | 25% - 49%     |
| <input type="checkbox"/> | 75% -99%      | <input type="checkbox"/> | 10% - 24%     |
| <input type="checkbox"/> | 50% - 74%     | <input type="checkbox"/> | less than 10% |

Q. 17 If your organisation/institution uses Internet, do you use it

- |    |   |     |                          |    |                          |
|----|---|-----|--------------------------|----|--------------------------|
| a) | For e-mail?   | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| b) | For searches on the World Wide Web?                         | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| c) | For selling, not just advertising, your goods and services? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |

Q. 18 Does your Company have a home page on the World Wide Web? Yes  No

Q. 19 Does your Company have programmes, either formal or informal, for employee training and education? Yes  No

Q. 20 Please give your views/comments on how to boost R&D activities in the country?  
(Please do not exceed ten lines)

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Thank you for taking the time to complete this questionnaire. Please return it to the:

National Institute of Higher Education,  
Research, Science and technology (NIHERST)  
Science and technology Division  
20 Victoria Avenue  
PORT OF SPAIN

If you have any questions, please contact NIHERST at (868) 627-1732

All data collected through this survey will be treated as strictly confidential. No individual or institution will be in any way identified in any reports or publications based on this survey.