H.E.A.R.T. TRUST/N.T.A.

Technical High School Development Project

Technical High School Programme Evaluation

A Technical Proposal

Presented by:
C.A.T.C. Ltd.
13 Caledonia Avenue,
Kingston 5
Jamaica
22 March, 1995

In this section we give a brief overview of the how we perceive the client's need for the project, with relevant background and issues to be addressed in the study at hand.

1.1 Introduction

H.E.A.R.T./N.T.A., in collaboration with the Ministry of Education, Youth and Culture is embarking on a major programme for the development of the Technical High School system, so that it is able to meet the human resource development challenges of the twenty-first century. In order for this to programme to proceed, certain information about Technical High Schools must be gathered and analysed to provide a clearer understanding of the Technical High School resource base, and any deficiencies therein. Overseas funding for certain Technical High School developmental and pilot projects is contingent on the provision of baseline data on the system. The needs for an up-to-date statement of the Technical High School *status quo* for both internal planning reasons and to meet international funding requirements therefore are the basic rationale for the current request for proposal.

1.2 Background

The twelve Technical High Schools in Jamaica have been in operation for a variable number of years starting with the first, Kingston Technical High School, which has been in operation as a technical high school for over 30 years. Seven of the current 12 Technical High Schools can be termed traditional in that they were purpose built as technical institutions from their inception. The remainder have been converted either from New Secondary Schools, in the case of three (Frome, Stokes Hall and Marcus Garvey in 1987), a Secondary High School, in the case of one and a Comprehensive High School (Herbert Morrison, 1987) in one case. Upgraded schools, especially those upgraded from New Secondary status often face severe difficulties both in terms of lack of facilities, and because they invariably take a large percentage of their intake as direct flow from the local all age and primary feeder schools. Because of this, some institutions are split in their functions, operating as New Secondary Schools for part of the student population, and as technical high schools for the group of students that have passed the 11+ and the 13+ Common Entrance Examinations. Despite the apparent "dilution" in .

the quality of both student intake and outflow, THS's remain prestigious institutions. This prestige is evidenced by two factors:

1. growing total enrolment in THS's, which, as a result of their credibility as sources of quality education and the reclassifications above, grew from about 8,000 students (3.6% of all secondary enrolments) in 1986, to over 14,000 (6.5% of all secondary students) in 1993, and;
2. the generally high calibre of the mix of certification exams (of general and technical proficiency) which their students sit, reported for 1993 as follows-

CXC	1,698 students
SSC	306 students from 4 schools
GCE	477 students
City & Guilds	420 students

Following on initiatives to up-grade schools, the Reform of Secondary Education (ROSE) Project is also in the early stages of making dynamic structural changes to the broad system of secondary education, with pilot junior high schools implementing a three year programme which will be followed by two-to-three years of senior high school leading to certification primarily via the Caribbean Examinations Council. A particularly innovative feature of the junior high school pilot programme is a well-integrated course on Resource and Technology. This course, by design, has strong links into the community resource base, including employers. How the course will evolve and be integrated into the senior high school system, and whether to certify the course at the CXC level are current topics of great interest within both MOEYC and HEART/NTA.

1.3 Issues to be Addressed

Issues to be addressed in the current proposal are as follows:

- What is the status of each school in terms of physical facilities, equipment and educational supplies?
- What are the staffing levels - how are staff performing in the provision of a technically oriented education?
- Are the programmes offered by each of the schools sufficient for the students to acquire suitable employment skills?
- How are the schools coping with the different entry capabilities of "non-selected" students?
- Is the training/education being received at a THS appropriate to the real needs of the employers of graduates from these institutions? If not, how do these programmes need to be changed to make them more appropriate?
- What are employers' levels of satisfaction with the job performances of technical high school graduates? What would employers like to see

included in these programmes? To what extent do they offer work study opportunities?

- Are the programmes at THS's sufficient to meet entry requirements of tertiary institutions such as CAST? If not, what is needed to ensure that the programmes equip their students with sufficient content and knowledge to allow entry?
- How will the Technical High School system interface with the junior high school system being developed under the Reform of Secondary Education, particularly in relation to the Resource and Technology curriculum?

In addressing these issues through primary and secondary research, this study will provide critical baseline data on the Technical High School system and assist in the development of a planning framework for future rationalisations and improvements to that system.

2.0 Approach

This section examines the work programme and methodologies proposed by the consultants, the outputs which may be expected as a result of the work done on behalf of the client, and a schedule of activities and outputs. Key features of the work programme are its reliance on primary research at each school and its surrounding work environment, and the scheduling of rural schools first. The latter is in the event that many jobs suited to THS graduates are concentrated in urban areas, which we suspect will be true: if a technical education is a factor in promoting urban drift, it bears exploration as a side issue of work readiness and student/employer expectations.

2.1 Work Programme

The work programme will be completed in four phases covering:

1. Rural schools and their environments;
2. Urban schools and their environments;
3. Certification, qualitative issues, technical teacher training and in-service;
4. Analyses, interpretation, syntheses, conceptual and planning work leading to summative report with recommendations and follow-up actions steps.

A graphical summary appears overleaf.

Phase	Target Groups	Key Issues	Data Collection Instruments	⇒	Outputs
1. Rural Schools Survey	Students Teachers Employers	School environment; Programmes and programme development; Work readiness and work study; Quality of training; Employability; Preparation for tertiary and further OTJ training	School status Student survey Graduate survey Employer survey	⇒	-School status reports Programmes Materials Equipment Problems Teachers, their training and teaching -Student expectations and programme evaluation -Graduate experience, work readiness - Work study opportunities -Employer evaluation of graduate work readiness and trainability
			Modify as ⇓ necessary ⇓		
2. Urban School Survey	As above	As above	As above, with possible modifications	⇒	As above
					⇓
3. Certification and Qualitative Issues	CXC, GCE, C&G administrators; Technical teacher training centres; MOEYC administrators; tertiary institutes	Mobility and quality of graduates; Mobility and quality of teachers; In-service programmes	Interviews on: Certification processes and pass rates; Technical teacher training programme reviews; Entrance rates to tertiary level and success rates	⇒	Report on status of certification of THS students, their trainability and mobility; Problems related to the quality of student outputs; Technical teacher training status quo, problems and opportunities.
					⇓
4. Conceptual development Summation; Recommendations; Action Steps	n/a. This phase is totally geared toward final output.	Development of baseline and constructive overview of THS system. ROSE junior high school linkages	Concepts and recommendation be will be reviewed and discussed at teacher, MOEYC and HEART/NTA levels	⇒	Summative report with recommendations and action steps.

2.1.1. Phases One and Two- Schools and Employers

These phases encompass the large majority of the intensive and extensive fieldwork component of this investigation.

Inputs- Primary research and evaluation in the schools and their surrounding employment bases, including the sub-topics listed below; secondary research into broad workplace trends and issues.

Comparison of programmes of the 12 Technical High schools

- Staffing and vacancies
- Use of volunteers/contract teachers in technical subjects
- Technical teacher attrition rates
- Brief history of programmes offered: how the mix of skills offered by the schools has responded to employer/student/community needs and technological change
- Enrolment trends by technical subject.
- Technical subjects - to find out which ones are taught and where.
- Core academic subjects - period loadings and linkages between academic and technical subjects.
- Support subjects - subjects such as technical drawing and physics which support the development of technical competence and broader understanding of technical issues.
- Content of the main core subject packages and the linkages between these and the more peripheral subjects.
- Work/study arrangements - formal and informal contacts with the world of work. How are these designed? Are levels of local co-operation and innovation in the provision of work study opportunities similar for each school?
- Support equipment in both technological and scientific subject areas.
- Support materials - supply and demand - main problem areas?
- Facilities and utilisation thereof, including their usage by out of school students.
- After hours use of facilities - in other words how well utilised are the technical and scientific facilities used over a 24 hour period.
- What is the general demand (in terms of anecdotal evidence) for extra-mural services in the general population?
- Job placements vs. training and skills developed: how they match, the students' views
- Employer evaluation of suitability of THS graduates
    1. For position for which graduate was hired;
    2. Trainability and promotional potential;

3. THS graduates compared to other sources of skilled/trainable labour
4. Work ethic and attitudes.

- Review of secondary sources:
  5. PSOJ/USAID Business Behaviour Surveys re: employer perceptions;
  6. Labour statistics re: employment in technical/technician positions - trends;
  7. Job advertising indicators of employer needs;
  8. Work permit statistics as an indicator of technical skills shortfalls

- International factors: ISO 9000 (as applied to products and teaching services)

Outputs- The summaries for these phases will:

1. Highlight both differences and commonalities in the programmes offered by the schools;
2. Point the way to potential specialisation of function by region, by school or by equipment resource base;
3. Provide definitive baseline data on all technical schools in the areas of staffing, equipment, materials and work study opportunities, thereby allowing indicative upgrade budgets to be generated.
4. Highlight broad Jamaican job market trends in technical employment;
5. Pinpoint specific trainee and employer difficulties related to technical and associated abilities developed in THS's.

2.1.2 Certification and Teaching: a qualitative review

This phase of the study will consider the qualitative issues related to technical education, in terms of teacher preparedness, certification, mobility, and output quality; and student certification mechanism and how they are received in the worlds of further training/education and work.

Inputs- Primary research and evaluation at schools and tertiary institutes; a review of statistical indicators related to employment patterns.

- **Staff**

1. Staff performance indicators, and, if approved by schools, some in-class evaluation of teaching processes.

2. Evaluation mechanisms
3. Certification and promotion mechanisms
4. Training mechanisms for technical teachers- initial and on-going

- **Students**

1. Certification mechanisms and exam processes
2. Potential for entry to further studies

Outputs- The summary for this phase will:

1. Evaluate general staffing problems and performance
2. Recommend teacher career path development guidelines
3. Review INSET procedures at the different schools and recommend common procedures and mechanisms.
4. Review examination processes, results and transferability, especially in dual stream schools.
5. Review potential for further study for graduates from THS

2.1.3 Interpretation and Final Report Preparation

This phase will be largely conceptual, and synthesise research findings into an overview of the Technical High School system. The emphasis will be on clarity of demarcation of strengths and weaknesses of the current system of Technical High Schools, problems and solutions, potential for centralising activities according to the resource base, practical action steps and timeframes for follow-up activities.

Inputs- Statistical and conceptual analysis of information gathered in phases one to three; comparison of schools to generate summaries on both an individual school basis and on a comparative basis; estimation of potential to rationalise training on a regional or central school basis; planning aspects will look at options and time frames for implementing changes to the current system.

Outputs- The output for this phase is the final report. Please see Section 3 for the proposed organisation of the final report.

In summary:

The proposed study will provide HEART/NTA with considerable baseline data and a series of recommendations concerning the future direction of the Technical High School Development Project, and how an organisation such as HEART/NTA could best coordinate and facilitate this development.

2.2 Methodologies

The proposed study is multi-faceted and so demands a mix of methodologies to suit each different aspect of the study. One of the major outputs of the project will be a description of the individual schools, including their operating environment and the types of industry located in the schools catchment area. The main fieldwork component, therefore will be centred around each of these schools, with an average of 4 days to be spent in the field per school. Where the schools are in clusters, such as in the Kingston/St. Andrew area, the intensity of the catchment area fieldwork will be reduced, allowing more time to be spent in the investigation of the special needs of some of the rural area catchment areas. Therefore out of a project deadline period of 66 working days, it is estimated that at least 48 will be spent in the field.
The different methodologies are outlined below, but a brief summary follows.

Decide with HEART/NTA on broad and specific information needs
↓
Design appropriate data collection instruments
↓
Pre-test and finalise DCI's
↓
Meet with THS Principals or Vice-Principals
↓
Conduct primary research, rural schools and employers
↓
Data entry and analysis
↓
Interpretation and summary
↓
Modify DCI's as required
↓
Conduct primary research, urban schools and employers
↓
Data entry and analysis
↓
Interpretation and summary
↓
Use findings to direct subsequent primary and secondary research
↓
Primary and secondary research on training and certification
↓
Analysis, interpretation, conceptualisation, summation

2.2.1 Phases One and Two

The purpose of these phases of the field work is to provide HEART/NTA with a fulsome description of the state of each school as outlined in Section 1.3 above, Issues to be Addressed.

The prime methods to be used are directed interviews with THS teachers, administrators and students; inspection/observation checklists related to materials, equipment and, if approved, teacher performance; directed face-to-face and telephone interviews with employers in the near-school and broader national environments;

2.2.1 a. School Conditions

One questionnaire will be used to ascertain the following information from the school's principal and senior staff:

- Staffing levels, subject positions qualifications and vacancies.
- Use of contract, volunteer and part time teachers for shortage technical area instructors.
- Technical and shortage subject teacher attrition rates.
- What are the methods used to select students to various technical schools programmes?
- Where does the THS draw its students from in terms of catchment area and feeder school type. It is hoped that an analysis of the individual school student records will be sufficient to collect this information.
- A brief history of the development of programmes at the school.

A second questionnaire/checklist will be constructed to gain the following information:

- Subjects taught at the school - period loadings per grade/subject
- Technical and scientific teaching facilities - workshops and laboratories.
- Equipment levels in these facilities
- Materials used in these facilities - including ideal material levels and mixes and material accessing problems.
- Utilisation of facilities
- Enrolment trends by technical subject.

2.2.1b Student Evaluations and Expectations

A questionnaire will be developed for students in Grade 11, to explore their impressions of:

- their training,
- work/study experiences, if any;
- level of preparedness for certification and
- expectations in terms of future employment or education.

It is proposed that the above three questionnaires will be delivered to the principals in a briefing meeting which will outline the purpose and scope of the investigations. They will be asked to complete the questionnaires and administer the student questionnaires as completely as possible. Dates of interview will then be allocated, with the consultant visiting the school and conducting face to face "top-up" interviews with the principals, relevant staff members and grade 11 students over a period of at least two days.

2.2.1c Employer and Graduate Experiences and Expectations

A third critical area calls for the examination of the employment environment in the milieu of each of the schools. This will be done by questionnaire-directed face-to-face and telephone interviews with employers and THS graduate employees while the consultant is in the school catchment/employment area.

- What employment environment that can students expect after they graduate from the institution?
- What are employer expectations of and experience with THS graduates?
- What are recent THS graduate expectations and perceptions of both employment and further training /education opportunities?
- What evidence is there that students are mobile - e.g. if they are trained at STETHS are they likely to be employable in the area or are they more likely to be employed further afield?
- The exploration of sectoral employment trends (growth, stagnation, decline) in the milieux will also explore the potential for and history of employment of THS graduates.

Indicative questions to employers will concern the nature and sector of their business; the status of their current workforce, their general complaints and comments concerning the quality of their current workforce and suggestions concerning the improvement of the training and education of graduates that they employ. These will not be limited to the

employees perceptions of THS students, although the questions will be slanted towards this end.

Data collected from all interviews will be entered and analysed on an Excel 5.0 for Windows database, which in turn may be used by the client for further analyses in other database formats.

Analyses of the data will direct secondary research into broader macro statistics on employment patterns, levels of training expenditure, employer assessments of work needs and shortcomings.

2.2.2 Phase Three- Certification and Qualitative Issues

It is envisaged that research into these areas will include:

- A statistical review of five years of THS student results in the common certification examinations;
- Approaches to CAST, UWI and community colleges as to the numbers and proportions of THS graduates entering their programmes either directly or from the world of work; their successes, problems and accomplishments in course work;
- A review of the technical teacher training and in-service mechanisms;
- A review of career options and career development mechanisms for technical teachers.

2.2.3 Phase Four

The main methodologies used to develop the final report from all information gathered in the previous phases will be statistical analyses, formation of summaries, discussion of problems with HEART/NTA and current MOEYC technical training personnel. All recommendations will be discussed with an informal panel of experienced educators before final presentation.

2.3 Project Outputs

In brief, the proposed study will provide HEART/NTA with considerable baseline data and a series of recommendations concerning the future direction of the Technical High School Development Project.

It is intended that the final report will be built on two deliverable documents:

1. A report on findings from the rural schools and their environs, with indicators as to how those findings will direct investigations in the urban areas.

2. A report on findings from urban area schools and their environs and how the sum of findings will direct research into qualitative and certification issues.

For impact and clarity of communication, it is envisaged that much of the above information will be encapsulated in demographic maps for each Technical High school area, including an analysis of transportation systems, especially for the rural schools. This latter will be included as transportation and logistics are often the limiting factors in promoting work study or greater utilisation of school assets.

The final report will be structured in the following manner:

Executive Summary

Section One: School Analyses
1. Highlight both differences and commonalities in the programmes offered by the schools;
2. Point the way to potential specialisation of function by region, by school or by equipment resource base;
3. Provide definitive baseline data on all technical schools in the areas of staffing, equipment, materials and work study opportunities, thereby allowing indicative upgrade budgets to be generated.

Section Two: Staffing
1. Evaluate general staffing problems and performance
2. Recommend teacher career path development guidelines
3. Review INSET procedures at the different schools and recommend common procedures and mechanisms.
4. Review examination processes, results and transferability, especially in dual stream schools.
5. Review potential for further study for graduates from THS.

Section Three Employment and Job Market Trends
1. Student work study experiences
2. Student employment and educational expectations.
3. Employer expectations and experience with THS graduates.
4. Past THS graduates experience with employers and evaluation of suitability of training.
5. Job market and OTJ training trends.

6. Summary of work related problems.

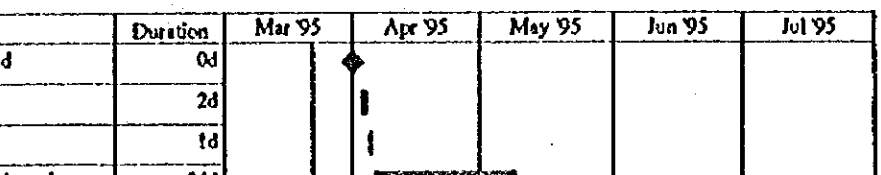
Section Four Certification and Qualitative Issues
THS results and trends in certification exams.
Indicators of readiness for further education/training.
Technical teacher/instructor training.

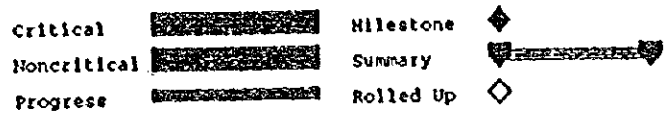
Summary and Recommendations
1. Major findings (and perhaps, anomalies).
2. Critical concerns and priorities.
3. Recommendations/models for dealing with concerns.
4. Next action steps.

2.4 Schedule of Activities

The project is intended and designed to be completed in 13 weeks between April 1 and June 30, 1995, so that its findings may direct activities in the school year starting September, 1995.

ID	Name	Duration
1	Contract signed/mobilisation paid	0d
2	DCI preparation (all)	2d
3	Meeting with Principals or VPs	1d
4	Rural THS and environment field work	24d
5	Analysis, write summary of rural findings	5d
6	Present summary and urban workplan	0d
7	Kingston area field work	24d
8	Secondary source review	2d
9	Analysis, write summary of urban findings	5d
10	Submit draft for discussion/revision	0d
11	Write final report with recommendations	3d
12	Submit final report	0d





3.0 Project Resources

This section outlines the relevant experiences of CATC and its personnel and indicates the organisation's ability to undertake the research and analyses required by the project.

3.1 CATC's Relevant Experience

Registered in 1984, CATC is a known force in management consultancy and social, market and economic research and analysis. A detailed company profile appears in the Appendices, highlighting a broad range of clients, sectoral involvement and research undertakings. The most relevant to the project at hand appear below. Note the extensive and intensive interaction with major technical employers in Jamaica.

ORGANIZATION DEVELOPMENT AND INSTITUTION BUILDING

- Operations/Management audit and institutional strengthening of the Ministry of Education's Projects, Construction and Maintenance Division. Funded by UNDP.
- Worked closely with Alcan over an extended period in assisting management with the establishment of a Technical Planning Division.
- Design and implementation of a restructuring plan for The Jamaica Maritime Institute (J.M.I.) on behalf of the Norwegian Aid Agency, Norad.
- Development of decentralization and re-structuring plan for Jamaica's Ministry of Education, Ministry of Utilities and Transport and the National Water Commission.

STRATEGIC PLANNING

- Strategic planning programmes for an extensive and varied list of corporations including British Caribbean Insurance Company, Alcan Jamaica Company, Helitours, American Chamber of Commerce, Corporate Group of Companies, Workers Bank, Manufacturers Merchant Bank, Montego Bay Marine Park, Jamaica Employers' Federation and Freight Handlers Limited.
- Strategic planning for Total Quality Management (TQM) for market leading firms including Shell, Plastic Containers Limited and the Jamaica Public Service.

PROJECT MANAGEMENT

- Staffing and management of a multi-million dollar project to provide the United States Agency for International Development with a General Services Office for its Jamaican operation over an extended period.

- Contracting of personnel, funds management and general coordinating activities for Jamaica's AIDS/HIV programme on behalf of Family Health International on a long term basis.

- Local Executing Agency (LEA) for the Canadian Cooperation Office and including staffing, funds management, project monitoring. This is a major multi-million dollar contract with overall oversight responsibility for CIDA's Jamaica program.

- Logistics management for five power companies working on reconstruction projects in Jamaica in the aftermath of Hurricane Gilbert.

INVESTMENT, TECHNOLOGY AND RESOURCE PLANNING

- Technology transfer programmes from NASA to small entrepreneurs under NASA's Technology Utilization Programme; also channelled through the EDC.

- Analysis of divestment options for Nutrition Products Limited; GOJ's school feeding production enterprise.

EDUCATIONAL ADMINISTRATION

- Worked on development of the curriculum and instruction manual for the School Community Outreach Programme for Education (SCOPE) funded by U.S.A.I.D. Coordinated the selection of course presenters and all instructional logistics for presentation of programme to over eighteen hundred principals and community leaders from nine hundred and fifty primary schools across Jamaica.

- Revised the programme of courses for the Jamaica Maritime Institute to re-position the programme of training to be more relevant to regional economic development.

- Worked with a team to develop the B.Sc. Administrative Management Degree programme at the College of Arts, Science and Technology.

HUMAN RESOURCE DEVELOPMENT AND PERSONNEL ADMINISTRATION SERVICES

- Senior and middle management training programmes in Strategic Planning, Time Management, Team Building, Total Quality Management, Interviewing Methods, Management by Objectives etc. for a range of organizations including the Bank of Jamaica, Grace Kennedy Limited, Life Insurance Company Association of Jamaica, the Eagle Group of Companies, Life of Jamaica, National Commercial Bank, Caribbean Cement Company, Jamaica Packaging Industries Limited, Speed-O-Graphic Limited, Mutual Life.

- Development and successful marketing of outplacement services for companies implementing restructuring and staff cut-back programmes eg. Alcoa, Alcan, Guiness Jamaica Limited and Jamaica Public Service.

- Development of personnel procedure and policy manuals, safety manuals, performance appraisal systems etc. for clients including National Development Foundation, Workers' Bank, Alcan Jamaica Company.

RESEARCH, FIELD SURVEYS AND STUDIES

- Surveys to determine employee attitudes towards work-place issues for clients including R.S. Gamble Limited, Alcan Jamaica Company and the Workers Bank.
- Participation in a comprehensive study of the Jamaican small business sector funded by U.S.A.I.D.
- Shared the management of a major study to establish the status of Science and Technology Education in Jamaica and to derive recommendations for its future development. Funded by PIOJ.

3.2 Project Team: Summary of Qualifications

This section gives a very brief overview of the team, its members' roles in this project, qualifications and relevant experience. Detailed *curriculum vitaes* appear in the Appendices.

Roland D Allbrook (Project manager designate; research designer and field research; analysis and writing)

- BA, History and Politics, Dip. Ed.
- Senior administrative experience in schools and provincial education system; broad experience in curriculum and evaluation design.
- Extensive field work design and implementation experience in Jamaica on educational, management and market research projects.
- Project Manager, Reform of Secondary Education, Upper Secondary Study
- Senior Researcher, Science and Technology Education in Jamaica - an Action Plan to the Year 2000
- Programme evaluations: Caribbean Agriculture Middle Management Training Programme; Canada/Jamaica Training Programme (Mid-Term); Secondary School Text Book Project

Mark Van Dusen (Research, database management, analysis and writing)

B.A. (Economics); B.Ed. 1979

- Tertiary level tech/voc trainer, Zambia, 1974-76
- Science curriculum development, Papua New Guinea, 1979-81
- Junior high school vocational training Papua New Guinea 1982-85 (programme design, project management)
- Research and data analysis, Reform of Secondary Education, Upper Secondary Study

- Database administration Science and Technology Education in Jamaica - an Action Plan to the Year 2000
- Programme evaluations, statistical/data analysis, Canada/ Jamaica Training Programme (Mid-Term); Secondary School Text Book Project

Dr Henley Morgan (Major/technical employer and tertiary institution liaison; analysis)

- Ph.D. Educational and Public Admin; MA Business; B.Sc. Chemistry
- Extensive work with major employers such as D&G, Alcan, NWC.
- Programme development and evaluation SCOPE, Jamaica Maritime Institute
- Co-manager, Science and Technology Education Project
- Moderator, ROSE Upper Secondary Study Public Forum

HEART Trust/NTA

NEEDS SURVEY

Re:

DEVELOPMENT OF ELECTRONICS COURSE

(Draft)

Presented By:
Loveda Jones
Project Manager
Technical High School Development Project

14

BACKGROUND

The attached is a draft list of Competency Areas and Related Skills re the Development of the Electronics programme which will be implemented at the Jose Marti Technical High School. It is intented that the programme will serve as the pilot and eventual model in the present effort to revise the focus and programmes in the technical high schools.

The content of the current programmes in the Jamaican technical high schools is guided by the requirements of examination syllabi; mainly the Caribbean Examination Council (CXC). The skills and competencies students acquire in their preparation for the various examinations fall short of what is required by employees. There is a need to convert from a supplier-driven approach to a market-driven approach. This is the approach being followed in the development of the above-mentioned Electronics course.

Methodology

A needs survey is being conducted with a sample of employers whose firms are active in the Electronics sector to determine the entry level skills/competencies that they require graduates of an Electronics programme to possess in order to perform competently at the workplace. The sample comprises twenty (20) firms that are involved in different types of Electronics activities: domestic and industrial electronics and communication. Effort was made to ensure that the representative from each firm who was providing the required information was the "technical expert".

Round I

The "technical expert" in eight (8) firms was asked to list the skills that they feel should be in the curriculum. (The entry-level skills they require graduates to possess in order to perform competently).

Round II

The eight (8) lists of opinions were compiled and sent to another sample of 'technical experts' in twelve (12) other firms. They were asked to rate each item in terms of importance to their employment needs.

Round III

The consensus ratings of items were compiled. Eight of the representatives who participated in

Rounds I and II were invited to a consultation session. They were asked to revise, if necessary, their opinions based on the results.

Also participating in the session were two Germans consultants with expertise in the field of Electronics, who are currently contracted to the Heart Trust/NTA.

Inputs have also been sought from a teacher of Electronics in one of the technical high schools and the Head of the Electronics Department at the College of Arts Science and Technology (CAST).

Round IV

The updated consensus ratings have been reviewed and revisions have been made. The attached list of competency areas and related skills reflects the information gattered to date.

Final revisions will be made after the inputs being sought from the College of Arts Science and Technology and another major production firm have been obtained. The development of curriculum material will then follow.

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1.2 Background

The twelve Technical High Schools in Jamaica have been in operation for a variable number of years starting with the first, Kingston Technical High School, which has been in operation as a technical high school for over 30 years. Seven of the current 12 Technical High Schools can be termed traditional in that they were purpose built as technical institutions from their inception. The remainder have been converted either from New Secondary Schools, in the case of three (Frome, Stokes Hall and Marcus Garvey in 1987), a Secondary High School, in the case of one and a Comprehensive High School (Herbert Morrison, 1987) in one case. Upgraded schools, especially those upgraded from New Secondary status often face severe difficulties both in terms of lack of facilities, and because they invariably take a large percentage of their intake as direct flow from the local all age and primary feeder schools. Because of this, some institutions are split in their functions, operating as New Secondary Schools for part of the student population, and as technical high schools for the group of students that have passed the 11+ and the 13+ Common Entrance Examinations. Despite the apparent "dilution" in

the quality of both student intake and outflow, THS's remain prestigious institutions. This prestige is evidenced by two factors:

1. growing total enrolment in THS's, which, as a result of their credibility as sources of quality education and the reclassifications above, grew from about 8,000 students (3.6% of all secondary enrolments) in 1986, to over 14,000 (6.5% of all secondary students) in 1993, and;
2. the generally high calibre of the mix of certification exams (of general and technical proficiency) which their students sit, reported for 1993 as follows-

CXC	1,698 students
SSC	306 students from 4 schools
GCE	477 students
City & Guilds	420 students

Following on initiatives to up-grade schools, the Reform of Secondary Education (ROSE) Project is also in the early stages of making dynamic structural changes to the broad system of secondary education, with pilot junior high schools implementing a three year programme which will be followed by two-to-three years of senior high school leading to certification primarily via the Caribbean Examinations Council. A particularly innovative feature of the junior high school pilot programme is a well-integrated course on Resource and Technology. This course, by design, has strong links into the community resource base, including employers. How the course will evolve and be integrated into the senior high school system, and whether to certify the course at the CXC level are current topics of great interest within both MOEYC and HEART/NTA.

1.3 Issues to be Addressed

Issues to be addressed in the current proposal are as follows:

- What is the status of each school in terms of physical facilities, equipment and educational supplies?
- What are the staffing levels - how are staff performing in the provision of a technically oriented education?
- Are the programmes offered by each of the schools sufficient for the students to acquire suitable employment skills?
- How are the schools coping with the different entry capabilities of "non-selected" students?
- Is the training/education being received at a THS appropriate to the real needs of the employers of graduates from these institutions? If not, how do these programmes need to be changed to make them more appropriate?
- What are employers' levels of satisfaction with the job performances of technical high school graduates? What would employers like to see

included in these programmes? To what extent do they offer work study opportunities?

- Are the programmes at THS's sufficient to meet entry requirements of tertiary institutions such as CAST? If not, what is needed to ensure that the programmes equip their students with sufficient content and knowledge to allow entry?
- How will the Technical High School system interface with the junior high school system being developed under the Reform of Secondary Education, particularly in relation to the Resource and Technology curriculum?

In addressing these issues through primary and secondary research, this study will provide critical baseline data on the Technical High School system and assist in the development of a planning framework for future rationalisations and improvements to that system.

2.0 Approach

This section examines the work programme and methodologies proposed by the consultants, the outputs which may be expected as a result of the work done on behalf of the client, and a schedule of activities and outputs. Key features of the work programme are its reliance on primary research at each school and its surrounding work environment, and the scheduling of rural schools first. The latter is in the event that many jobs suited to THS graduates are concentrated in urban areas, which we suspect will be true: if a technical education is a factor in promoting urban drift, it bears exploration as a side issue of work readiness and student/employer expectations.

2.1 Work Programme

The work programme will be completed in four phases covering:
1. Rural schools and their environments;
2. Urban schools and their environments;
3. Certification, qualitative issues, technical teacher training and in-service;
4. Analyses, interpretation, syntheses, conceptual and planning work leading to summative report with recommendations and follow-up actions steps.

A graphical summary appears overleaf.

Phase	Target Groups	Key Issues	Data Collection Instruments	⇒	Outputs
1. Rural Schools Survey	Students Teachers Employers	School environment; Programmes and programme development; Work readiness and work study; Quality of training; Employability; Preparation for tertiary and further OTJ training	School status Student survey Graduate survey Employer survey	⇒ ⇒	-School status reports Programmes Materials Equipment Problems Teachers, their training and teaching -Student expectations and programme evaluation -Graduate experience, work readiness - Work study opportunities -Employer evaluation of graduate work readiness and trainability
			Modify as ⇓ necessary ⇓		
2. Urban School Survey	As above	As above	As above, with possible modifications	⇒	As above
3. Certification and Qualitative Issues	CXC, GCE, C&G administrators; Technical teacher training centres; MOEYC administrators; tertiary institutes	Mobility and quality of graduates; Mobility and quality of teachers; In-service programmes	Interviews on: Certification processes and pass rates; Technical teacher training programme reviews; Entrance rates to tertiary level and success rates	⇒	Report on status of certification of THS students, their trainability and mobility; Problems related to the quality of student outputs; Technical teacher training status quo, problems and opportunities.
4. Conceptual development Summation; Recommendations; Action Steps	n/a. This phase is totally geared toward final output.	Development of baseline and constructive overview of THS system. ROSE junior high school linkages	Concepts and recommendation be will be reviewed and discussed at teacher, MOEYC and HEART/NTA levels	⇒	Summative report with recommendations and action steps.

2.1.1. Phases One and Two- Schools and Employers

These phases encompass the large majority of the intensive and extensive fieldwork component of this investigation.

Inputs- Primary research and evaluation in the schools and their surrounding employment bases, including the sub-topics listed below; secondary research into broad workplace trends and issues.

Comparison of programmes of the 12 Technical High schools

- Staffing and vacancies
- Use of volunteers/contract teachers in technical subjects
- Technical teacher attrition rates
- Brief history of programmes offered: how the mix of skills offered by the schools has responded to employer/student/community needs and technological change
- Enrolment trends by technical subject.
- Technical subjects - to find out which ones are taught and where.
- Core academic subjects - period loadings and linkages between academic and technical subjects.
- Support subjects - subjects such as technical drawing and physics which support the development of technical competence and broader understanding of technical issues.
- Content of the main core subject packages and the linkages between these and the more peripheral subjects.
- Work/study arrangements - formal and informal contacts with the world of work. How are these designed? Are levels of local co-operation and innovation in the provision of work study opportunities similar for each school?
- Support equipment in both technological and scientific subject areas.
- Support materials - supply and demand - main problem areas?
- Facilities and utilisation thereof, including their usage by out of school students.
- After hours use of facilities - in other words how well utilised are the technical and scientific facilities used over a 24 hour period.
- What is the general demand (in terms of anecdotal evidence) for extra-mural services in the general population?
- Job placements vs. training and skills developed: how they match, the students' views
- Employer evaluation of suitability of THS graduates
    1. For position for which graduate was hired;
    2. Trainability and promotional potential;

3. THS graduates compared to other sources of skilled/trainable labour
4. Work ethic and attitudes.

- Review of secondary sources:
  5. PSOJ/USAID Business Behaviour Surveys re: employer perceptions;
  6. Labour statistics re: employment in technical/technician positions - trends;
  7. Job advertising indicators of employer needs;
  8. Work permit statistics as an indicator of technical skills shortfalls

- International factors: ISO 9000 (as applied to products and teaching services)

Outputs- The summaries for these phases will:

1. Highlight both differences and commonalities in the programmes offered by the schools;
2. Point the way to potential specialisation of function by region, by school or by equipment resource base;
3. Provide definitive baseline data on all technical schools in the areas of staffing, equipment, materials and work study opportunities, thereby allowing indicative upgrade budgets to be generated.
4. Highlight broad Jamaican job market trends in technical employment;
5. Pinpoint specific trainee and employer difficulties related to technical and associated abilities developed in THS's.

2.1.2 Certification and Teaching: a qualitative review

This phase of the study will consider the qualitative issues related to technical education, in terms of teacher preparedness, certification, mobility, and output quality; and student certification mechanism and how they are received in the worlds of further training/education and work.

Inputs- Primary research and evaluation at schools and tertiary institutes; a review of statistical indicators related to employment patterns.

- **Staff**

1. Staff performance indicators, and, if approved by schools, some in-class evaluation of teaching processes.

2. Evaluation mechanisms
3. Certification and promotion mechanisms
4. Training mechanisms for technical teachers- initial and on-going

- **Students**

1. Certification mechanisms and exam processes
2. Potential for entry to further studies

Outputs- The summary for this phase will:

1. Evaluate general staffing problems and performance
2. Recommend teacher career path development guidelines
3. Review INSET procedures at the different schools and recommend common procedures and mechanisms.
4. Review examination processes, results and transferability, especially in dual stream schools.
5. Review potential for further study for graduates from THS

2.1.3 Interpretation and Final Report Preparation

This phase will be largely conceptual, and synthesise research findings into an overview of the Technical High School system. The emphasis will be on clarity of demarcation of strengths and weaknesses of the current system of Technical High Schools, problems and solutions, potential for centralising activities according to the resource base, practical action steps and timeframes for follow-up activities.

Inputs- Statistical and conceptual analysis of information gathered in phases one to three; comparison of schools to generate summaries on both an individual school basis and on a comparative basis; estimation of potential to rationalise training on a regional or central school basis; planning aspects will look at options and time frames for implementing changes to the current system.

Outputs- The output for this phase is the final report. Please see Section 3 for the proposed organisation of the final report.

In summary:

The proposed study will provide HEART/NTA with considerable baseline data and a series of recommendations concerning the future direction of the Technical High School Development Project, and how an organisation such as HEART/NTA could best coordinate and facilitate this development.

2.2 Methodologies

The proposed study is multi-faceted and so demands a mix of methodologies to suit each different aspect of the study. One of the major outputs of the project will be a description of the individual schools, including their operating environment and the types of industry located in the schools catchment area. The main fieldwork component, therefore will be centred around each of these schools, with an average of 4 days to be spent in the field per school. Where the schools are in clusters, such as in the Kingston/St. Andrew area, the intensity of the catchment area fieldwork will be reduced, allowing more time to be spent in the investigation of the special needs of some of the rural area catchment areas. Therefore out of a project deadline period of 66 working days, it is estimated that at least 48 will be spent in the field.
The different methodologies are outlined below, but a brief summary follows.

Decide with HEART/NTA on broad and specific information needs
↓
Design appropriate data collection instruments
↓
Pre-test and finalise DCI's
↓
Meet with THS Principals or Vice-Principals
↓
Conduct primary research, rural schools and employers
↓
Data entry and analysis
↓
Interpretation and summary
↓
Modify DCI's as required
↓
Conduct primary research, urban schools and employers
↓
Data entry and analysis
↓
Interpretation and summary
↓
Use findings to direct subsequent primary and secondary research
↓
Primary and secondary research on training and certification
↓
Analysis, interpretation, conceptualisation, summation

2.2.1 Phases One and Two

The purpose of these phases of the field work is to provide HEART/NTA with a fulsome description of the state of each school as outlined in Section 1.3 above, Issues to be Addressed.

The prime methods to be used are directed interviews with THS teachers, administrators and students; inspection/observation checklists related to materials, equipment and, if approved, teacher performance; directed face-to-face and telephone interviews with employers in the near-school and broader national environments;

2.2.1 a. School Conditions

One questionnaire will be used to ascertain the following information from the school's principal and senior staff:

- Staffing levels, subject positions qualifications and vacancies.
- Use of contract, volunteer and part time teachers for shortage technical area instructors.
- Technical and shortage subject teacher attrition rates.
- What are the methods used to select students to various technical schools programmes?
- Where does the THS draw its students from in terms of catchment area and feeder school type. It is hoped that an analysis of the individual school student records will be sufficient to collect this information.
- A brief history of the development of programmes at the school.

A second questionnaire/checklist will be constructed to gain the following information:

- Subjects taught at the school - period loadings per grade/subject
- Technical and scientific teaching facilities - workshops and laboratories.
- Equipment levels in these facilities
- Materials used in these facilities - including ideal material levels and mixes and material accessing problems.
- Utilisation of facilities
- Enrolment trends by technical subject.

2.2.1b Student Evaluations and Expectations

A questionnaire will be developed for students in Grade 11, to explore their impressions of:

- their training,
- work/study experiences, if any;
- level of preparedness for certification and
- expectations in terms of future employment or education.

It is proposed that the above three questionnaires will be delivered to the principals in a briefing meeting which will outline the purpose and scope of the investigations. They will be asked to complete the questionnaires and administer the student questionnaires as completely as possible. Dates of interview will then be allocated, with the consultant visiting the school and conducting face to face "top-up" interviews with the principals, relevant staff members and grade 11 students over a period of at least two days.

2.2.1c Employer and Graduate Experiences and Expectations

A third critical area calls for the examination of the employment environment in the milieu of each of the schools. This will be done by questionnaire-directed face-to-face and telephone interviews with employers and THS graduate employees while the consultant is in the school catchment/employment area.

- What employment environment that can students expect after they graduate from the institution?
- What are employer expectations of and experience with THS graduates?
- What are recent THS graduate expectations and perceptions of both employment and further training /education opportunities?
- What evidence is there that students are mobile - e.g. if they are trained at STETHS are they likely to be employable in the area or are they more likely to be employed further afield?
- The exploration of sectoral employment trends (growth, stagnation, decline) in the milieux will also explore the potential for and history of employment of THS graduates.

Indicative questions to employers will concern the nature and sector of their business; the status of their current workforce, their general complaints and comments concerning the quality of their current work-force and suggestions concerning the improvement of the training and education of graduates that they employ. These will not be limited to the

employees perceptions of THS students, although the questions will be slanted towards this end.

Data collected from all interviews will be entered and analysed on an Excel 5.0 for Windows database, which in turn may be used by the client for further analyses in other database formats.

Analyses of the data will direct secondary research into broader macro statistics on employment patterns, levels of training expenditure, employer assessments of work needs and shortcomings.

2.2.2 Phase Three- Certification and Qualitative Issues

It is envisaged that research into these areas will include:

- A statistical review of five years of THS student results in the common certification examinations;
- Approaches to CAST, UWI and community colleges as to the numbers and proportions of THS graduates entering their programmes either directly or from the world of work; their successes, problems and accomplishments in course work;
- A review of the technical teacher training and in-service mechanisms;
- A review of career options and career development mechanisms for technical teachers.

2.2.3 Phase Four

The main methodologies used to develop the final report from all information gathered in the previous phases will be statistical analyses, formation of summaries, discussion of problems with HEART/NTA and current MOEYC technical training personnel. All recommendations will be discussed with an informal panel of experienced educators before final presentation.

2.3 Project Outputs

In brief, the proposed study will provide HEART/NTA with considerable baseline data and a series of recommendations concerning the future direction of the Technical High School Development Project.

It is intended that the final report will be built on two deliverable documents:

1. A report on findings from the rural schools and their environs, with indicators as to how those findings will direct investigations in the urban areas.

2. A report on findings from urban area schools and their environs and how the sum of findings will direct research into qualitative and certification issues.

For impact and clarity of communication, it is envisaged that much of the above information will be encapsulated in demographic maps for each Technical High school area, including an analysis of transportation systems, especially for the rural schools. This latter will be included as transportation and logistics are often the limiting factors in promoting work study or greater utilisation of school assets.

The final report will be structured in the following manner:

Executive Summary

Section One: School Analyses
1. Highlight both differences and commonalities in the programmes offered by the schools;
2. Point the way to potential specialisation of function by region, by school or by equipment resource base;
3. Provide definitive baseline data on all technical schools in the areas of staffing, equipment, materials and work study opportunities, thereby allowing indicative upgrade budgets to be generated.

Section Two: Staffing
1. Evaluate general staffing problems and performance
2. Recommend teacher career path development guidelines
3. Review INSET procedures at the different schools and recommend common procedures and mechanisms.
4. Review examination processes, results and transferability, especially in dual stream schools.
5. Review potential for further study for graduates from THS.

Section Three Employment and Job Market Trends
1. Student work study experiences
2. Student employment and educational expectations.
3. Employer expectations and experience with THS graduates.
4. Past THS graduates experience with employers and evaluation of suitability of training.
5. Job market and OTJ training trends.

6. Summary of work related problems.

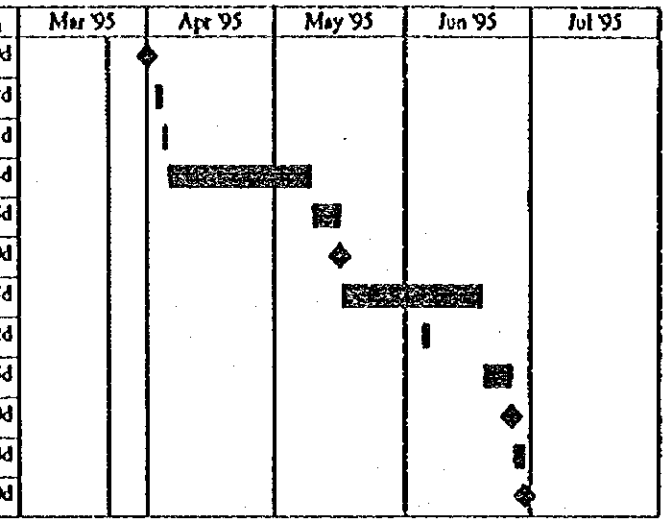
Section Four Certification and Qualitative Issues
THS results and trends in certification exams.
Indicators of readiness for further education/training.
Technical teacher/instructor training.

Summary and Recommendations
1. Major findings (and perhaps, anomalies).
2. Critical concerns and priorities.
3. Recommendations/models for dealing with concerns.
4. Next action steps.

2.4 Schedule of Activities

The project is intended and designed to be completed in 13 weeks between April 1 and June 30, 1995, so that its findings may direct activities in the school year starting September, 1995.

ID	Name	Duration
1	Contract signed/mobilisation paid	0d
2	DCI preparation (all)	2d
3	Meeting with Principals or VPs	1d
4	Rural THS and environment field work	24d
5	Analysis, write summary of rural findings	5d
6	Present summary and urban workplan	0d
7	Kingston area field work	24d
8	Secondary source review	2d
9	Analysis, write summary of urban findings	5d
10	Submit draft for discussion/revision	0d
11	Write final report with recommendations	3d
12	Submit final report	0d



3.0 Project Resources

This section outlines the relevant experiences of CATC and its personnel and indicates the organisation's ability to undertake the research and analyses required by the project.

3.1 CATC's Relevant Experience

Registered in 1984, CATC is a known force in management consultancy and social, market and economic research and analysis. A detailed company profile appears in the Appendices, highlighting a broad range of clients, sectoral involvement and research undertakings. The most relevant to the project at hand appear below. Note the extensive and intensive interaction with major technical employers in Jamaica.

ORGANIZATION DEVELOPMENT AND INSTITUTION BUILDING

- Operations/Management audit and institutional strengthening of the Ministry of Education's Projects, Construction and Maintenance Division. Funded by UNDP.
- Worked closely with Alcan over an extended period in assisting management with the establishment of a Technical Planning Division.
- Design and implementation of a restructuring plan for The Jamaica Maritime Institute (J.M.I.) on behalf of the Norwegian Aid Agency, Norad.
- Development of decentralization and re-structuring plan for Jamaica's Ministry of Education, Ministry of Utilities and Transport and the National Water Commission.

STRATEGIC PLANNING

- Strategic planning programmes for an extensive and varied list of corporations including British Caribbean Insurance Company, Alcan Jamaica Company, Helitours, American Chamber of Commerce, Corporate Group of Companies, Workers Bank, Manufacturers Merchant Bank, Montego Bay Marine Park, Jamaica Employers' Federation and Freight Handlers Limited.
- Strategic planning for Total Quality Management (TQM) for market leading firms including Shell, Plastic Containers Limited and the Jamaica Public Service.

PROJECT MANAGEMENT

- Staffing and management of a multi-million dollar project to provide the United States Agency for International Development with a General Services Office for its Jamaican operation over an extended period.

- Contracting of personnel, funds management and general coordinating activities for Jamaica's AIDS/HIV programme on behalf of Family Health International on a long term basis.

- Local Executing Agency (LEA) for the Canadian Cooperation Office and including staffing, funds management, project monitoring. This is a major multi-million dollar contract with overall oversight responsibility for CIDA's Jamaica program.

- Logistics management for five power companies working on reconstruction projects in Jamaica in the aftermath of Hurricane Gilbert.

INVESTMENT, TECHNOLOGY AND RESOURCE PLANNING

- Technology transfer programmes from NASA to small entrepreneurs under NASA's Technology Utilization Programme; also channelled through the EDC.

- Analysis of divestment options for Nutrition Products Limited; GOJ's school feeding production enterprise.

EDUCATIONAL ADMINISTRATION

- Worked on development of the curriculum and instruction manual for the School Community Outreach Programme for Education (SCOPE) funded by U.S.A.I.D. Coordinated the selection of course presenters and all instructional logistics for presentation of programme to over eighteen hundred principals and community leaders from nine hundred and fifty primary schools across Jamaica.

- Revised the programme of courses for the Jamaica Maritime Institute to re-position the programme of training to be more relevant to regional economic development.

- Worked with a team to develop the B.Sc. Administrative Management Degree programme at the College of Arts, Science and Technology.

HUMAN RESOURCE DEVELOPMENT AND PERSONNEL ADMINISTRATION SERVICES

- Senior and middle management training programmes in Strategic Planning, Time Management, Team Building, Total Quality Management, Interviewing Methods, Management by Objectives etc. for a range of organizations including the Bank of Jamaica, Grace Kennedy Limited, Life Insurance Company Association of Jamaica, the Eagle Group of Companies, Life of Jamaica, National Commercial Bank, Caribbean Cement Company, Jamaica Packaging Industries Limited, Speed-O-Graphic Limited, Mutual Life.

- Development and successful marketing of outplacement services for companies implementing restructuring and staff cut-back programmes eg. Alcoa, Alcan, Guiness Jamaica Limited and Jamaica Public Service.

- Development of personnel procedure and policy manuals, safety manuals, performance appraisal systems etc. for clients including National Development Foundation, Workers' Bank, Alcan Jamaica Company.

RESEARCH, FIELD SURVEYS AND STUDIES

- Surveys to determine employee attitudes towards work-place issues for clients including R.S. Gamble Limited, Alcan Jamaica Company and the Workers Bank.
- Participation in a comprehensive study of the Jamaican small business sector funded by U.S.A.I.D.
- Shared the management of a major study to establish the status of Science and Technology Education in Jamaica and to derive recommendations for its future development. Funded by PIOJ.

3.2 Project Team: Summary of Qualifications

This section gives a very brief overview of the team, its members' roles in this project, qualifications and relevant experience. Detailed *curriculum vitaes* appear in the Appendices.

Roland D Allbrook (Project manager designate; research designer and field research; analysis and writing)

- BA, History and Politics, Dip. Ed.
- Senior administrative experience in schools and provincial education system; broad experience in curriculum and evaluation design.
- Extensive field work design and implementation experience in Jamaica on educational, management and market research projects.
- Project Manager, Reform of Secondary Education, Upper Secondary Study
- Senior Researcher, Science and Technology Education in Jamaica - an Action Plan to the Year 2000
- Programme evaluations: Caribbean Agriculture Middle Management Training Programme; Canada/Jamaica Training Programme (Mid-Term); Secondary School Text Book Project

Mark Van Dusen (Research, database management, analysis and writing)

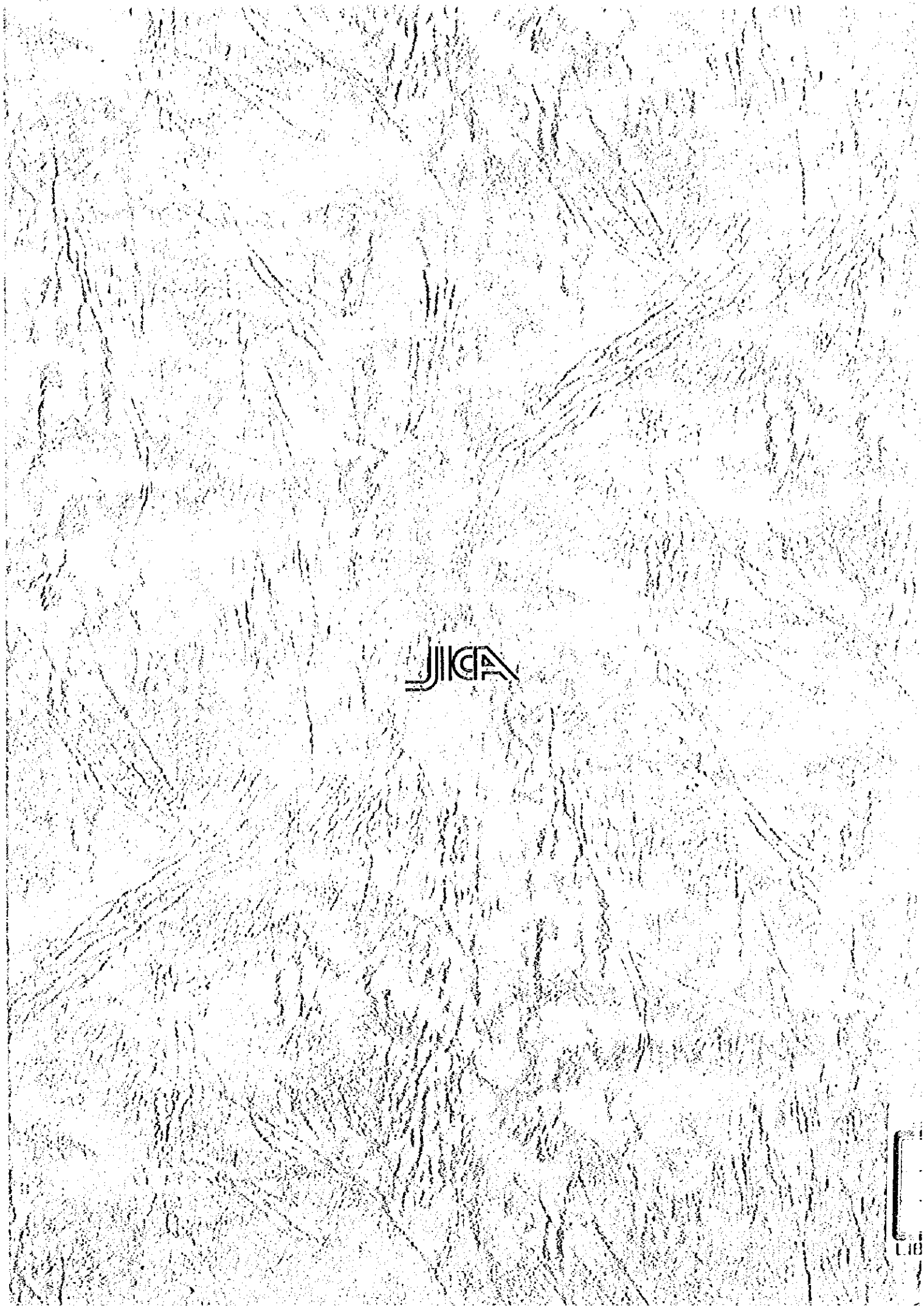
B.A. (Economics); B.Ed. 1979

- Tertiary level tech/voc trainer, Zambia, 1974-76
- Science curriculum development, Papua New Guinea, 1979-81
- Junior high school vocational training Papua New Guinea 1982-85 (programme design, project management)
- Research and data analysis, Reform of Secondary Education, Upper Secondary Study

- Database administration Science and Technology Education in Jamaica - an Action Plan to the Year 2000
- Programme evaluations, statistical/data analysis, Canada/ Jamaica Training Programme (Mid-Term); Secondary School Text Book Project

Dr Henley Morgan (Major/technical employer and tertiary institution liaison; analysis)

- Ph.D. Edúcational and Public Admin; MA Business; B.Sc. Chemistry
- Extensive work with major employers such as D&G, Alcan, NWC.
- Programme development and evaluation SCOPE, Jamaica Maritime Institute
- Co-manager, Science and Technology Education Project
- Moderator, ROSE Upper Secondary Study Public Forum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