CARICOM SIDS IT Training and Capacity-Building Priorities

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Abstract
Based on a 2003 consultancy report to the OAS on CARICOM Small Island Developing States-SIDS' Information Management-IM needs, the paper generally identifies priority training needs for the region in the generation and use of information for sustainable development. In particular, the paper promotes the use of 'new' Information Technology-IT tools for information management, highlights methodological approaches for the development of training materials & the design of training courses, and concludes with recommendations and strategies for addressing identified gaps.

The paper is split into two sections, the first assesses the existing regional IT management infrastructure and the second presents regional IT training & capacity-building priorities:
1. REGIONAL IT MANAGEMENT INFRASTRUCTURE ASSESSMENT
1.1. Information Management Review
1.2. Information Infrastructure Review
1.3. Global Sustainable Development Information Management Review
1.4. Regional Sustainable Development Information Management Review
1.5. The Use of Information for Regional Sustainable Development Decision-Making
2. REGIONAL IT TRAINING & CAPACITY BUILDING PRIORITIES
2.1 IM/IT Training & Capacity-Building Conceptual Review
2.2 Caribbean Sustainable Development IT Training & Capacity-Building Needs & Recommended Actions
• Sustainable Caribbean IT Training & Infrastructure Capacity-Building Requirements
• Stakeholder Principles for Sustainable IT Training & Capacity Building Policies
• Proposed Action Strategy

CONCEPTUAL REVIEW

This paper on determining regional IT Training & Capacity-Building priorities begins by turning to a `source book' (Mansell & When, 1997) for a review of the conceptual base for both a `lifelong learning & institutional change' approach to and specific recommendations for IT skills requirements; two relevant sections are quoted below:

Education, Lifelong Learning and Institutional Change

"Major transformations are occurring in the formal education sector and other organisations that play a key role in enabling people to develop new capabilities…increasing use of ICTs as enabling technologies for education and learning. The possibility of continuous informal education and lifelong learning is growing with the increased availability of IT applications … to address development problems. In developing countries, the potential of the application of IT to these areas is only beginning to be realized. However, this potential can only be exploited if the formal and informal educational processes in developing countries allow people to acquire the skills that are necessary to use new technologies creatively and productively. Major changes in formal education systems and institutions as well as the organisations that contribute to informal learning are needed to build new capabilities. The introduction of lifelong learning strategies requires that the foundations of learning be

strengthened and changed…"

Enhancing the Skills Base for Participation, Facilitation and Control

"The use of IT to support development goals does not need to be considered only in terms of the extension of telephony networks to every household. Alternate modes of access may be preferable in some circumstances and the choice of radio, television or telephony as a means of connection of citizens to networks of information is dependent on each country's circumstances. The skills base that is built up must be compatible with the mix of ICTs available and provide a basis for continuing learning. Three specific skills are particularly important:

1. Participatory Skills…
2. Facilitating Skills...
3. Control Skills…"

CARIBBEAN SUSTAINABLE DEVELOPMENT IT TRAINING & CAPACITY-BUILDING NEEDS

Jamaica & Belize Missions and St. Lucia Survey Findings

As a critical part of the OAS consultancy on which the paper is based, in May 2003 brief missions were mounted to Jamaica and Belize and St. Lucia in order to determine Priority IT Training & Capacity-Building Needs in the region. The findings were examined to establish priority categories by tabulating the number of times the replies received from discussions and the survey, generally fit into common groups within the three issues of needs, constraints or New IT Tools (See Charts 1 & 2).

Table 1: *Jamaica and Belize Mission Findings Summary*

Needs	Constraints	New IT Tools
• IT Education & Training (13) • National/Regional Linkages & Collaboration (7) • Web & Software Development (5) • IT Infrastructure Capacity (5) • Finance/Funding (2) • Public/Community Awareness (2) • Staffing/Human Resources Capacity (2) • Other (1)	National/Regional Linkages & Collaboration (4) Access/Connectivity (4) IT Education & Training (3) Finance/Funding (3) Web & Software Development (2) National Decision-Making (2) Staffing/Human Resources Capacity (1) IT Infrastructure Capacity (1) Other (1)	Web & Software Development (9) IT Education & Training (2) IT Infrastructure Capacity (2) National/Regional Linkages & Collaboration (1)

Table 2: *St. Lucia Meeting Resource Persons Survey Findings Summary*

Needs	Constraints	New IT Tools
• IT Education & Training (26) • IT Infrastructure Capacity (3) • Web & Software Development (2) • Finance/Funding (1) • Access/Connectivity (1) • Other (6)	Staffing/Human Resources Capacity (13) Finance/Funding (7) IT Infrastructure Capacity (3) National/Regional Linkages & Collaboration (2) IT Education & Training (2) National Decision-Making (2) Other (4)	Web & Software Development (12) It Education & Training (1) IT Infrastructure Capacity (1) Other (1)

ANALYSIS OF NEEDS, CONSTRAINTS & NEW TOOLS

Needs

I. Education & Training (39)

According to both findings, the most important need identified is Education & Training (including certification) in the following key areas with examples:

Databases, including

- Creation, development, distribution & management (especially for administrative staff);
- Regional database development & maintenance training ('train the trainers' programme);
- Review of administrative forms & systems to facilitate data gathering & recording;
- Metadata development & management.

Networks, including

- Satellite networking;
- Management & design.

Web/Internet, including

- Development;
- Management.

Computer Operations & Maintenance, including

- Basic computer hardware concepts (e.g. RAM, ROM, etc.);
- Essential office software (e.g. spreadsheets, word processing & database programmes);
- PC File Management, Data formatting and Presentation programmes such as PowerPoint.

Remote Sensing and Geographic Information Systems (GIS), including

- GIS technology for CSOs or clearinghouses;
- GIS for Environmental and Coastal Zone Management.

Software Development and Use, especially

- Open-source (Linux) for “e”-Commerce.

Management of Changing and Evolving IT Systems & Infrastructure, including

- Security/vulnerability issues;
- Training for negotiators;
- Technical analysis training;
- CTO MIST system operations (esp. in manipulation of 'back-end' data for national demands).

Statistics & Indicators, including

- Energy Balance & Energy Statistics;
- Statistical coding methodologies, e.g. Costa Rica University Development Observatory;
- Development of impact indicators.

II. Infrastructure Capacity (8)

The next most important need cited by the two groups, IT Infrastructure Capacity, emphasised:

Management of Changing and Evolving IT Systems & Infrastructure, including

- Provision of greater data storage & conversion services to relevant SD/SIDS-POA data nodes;
- Long-term capacity-building projects for National partners;
- Formal on-going capacity-building programmes.

Web/Internet, including

- Increased emphasis on Internet and Web management capacity-building.

Statistics/Indicators, including

- Strengthening national environmental statistics capacity of CSOs or clearinghouses.

III. Web & Software Development (7)

The development of software for Internet and Web-based applications could be considered the third category of need most observed overall; the area, with examples is:

Web/Internet, including

- Development of Caribbean SD-related /SIDS-POA Website & Content Software and Linkages;
- Internet and Web management capacity-building;
- Continuous updating of regional SD websites' content, including IDSD Project thematic areas;
- Streamlining & Continuous updating of regional SD websites;
- Website Development & Maintenance capacity-building and training.

IV. National/Regional Linkages & Collaboration (7)

The establishment or enhancing of functional (collaborative and integrated) national and/or regional IT organisational linkages was noted a relatively large number of times by the Jamaica & Belize mission interviewees, although it was not mentioned as a need by any of the survey respondents at the St. Lucia meeting. This reflects an acknowledged need to strengthen collaboration between stakeholders that are principally responsible for SIDS-POA thematic areas in the Caribbean, on four levels:

1. The National level (esp. Intra-national Policy Harmonisation by local & regional representatives);
2. The Regional level;
3. The Hemispheric level;
4. The United Nations & Global level.

V. Other (Finance, Staffing, Public Awareness & Access/Connectivity) Important Needs

Several other important areas mentioned were:

- Increased financial resources and revenue generation for programme sustainability;
- Definition & Institutionalisation of specific IT Knowledge, Skill Levels & Requirements;

- Provision of greater public access to and more community reporting activities about relevant SD/SIDS-POA data;
- Improved computer connectivity & Internet access for selected audiences or groups.

Constraints

I. Staffing/Human Resources Capacity (14)

The main perceived stumbling block for improved regional IT training & capacity, particularly by the St. Lucia meeting respondents, seems to lie in the area of national authorities and their respective capacities to adequately deploy, maintain & improve local human resources; in particular:

Insufficient Time for Substantive Workloads and IT-Related Tasks, including

- Time to dedicate to research & training;
- Time of both providers & receivers of training;
- Timely data collection;
- Work loads & priorities of coordinating agencies.

Supply of Trained and/or Specialist IT and Related Staff, including

- Lack of competent National CSO/sectoral agency staff to receive training;
- Lack specialist staff for collection, processing sharing of relevant SD/ SIDS-POA information;
- Staff turnover once trained;
- Absorptive capacity of institutions to apply training.

Inadequate Human Resources Management, including

- Lack of 'trickle-down' of skills and knowledge to appropriate end-users;
- Appropriate personnel selection.

Insufficient Number of Permanent IT and Related Staff, including

- Lack of human resources or personnel;
- Lack of designated or permanent IT staff.

II. Finance/Funding (10)

Finance and funding can be considered as the second major inhibiting factor, as defined by remarks that fall into two areas:

Inadequate Financial Resources, including

- Sustainability of programme services;

- Lack of financial resources;
- General lack of resources/funding;
- Lack of funding for travel.

High Costs of Goods & Services, including

- High cost of appropriate certified `high-end' IM/IT training;
- High cost of proprietary technology;
- Internet access costs.

III. National/Regional Linkages & Collaboration (6)

The third area perceived to hamper regional IT training & capacity-building is that of functional cooperation & links, both at home and abroad locally and in the following areas:

Not enough High Level IM/IT Policy & Management Coordination, including

- Lack of national/regional policy collaboration & coordination;
- Lack of common Regional & National approach to IM;
- Balkanised' approaches among agencies;
- Lack of voluntary agreement by sectoral agencies to share or release data;
- Lack of inter-sectoral collaboration.

Not enough High Level MEAs Policy & Management Coordination, including

- Lack of information and coordination at national (Government/NGO) level regarding hemispheric and regional Multi-lateral Environmental Agreements (MEAs).

IV. Education & Training (5)

In addition to being seen as an important need, the lack or inefficient use of IT skills is also seen as another important restraining element in these areas:

Computer Operations & Maintenance, including

- Low levels of IT or “e” Literacy;
- Staff underutilisation of the full range of software applications.

Remote Sensing and Geographic Information Systems (GIS) , including

- Lack of Cartography skills in GIS section.

Supply of Trained and/or Specialist IT and Related Staff, including

- Lack of flexibility by trainers in meeting specific needs of users.

Web/Internet, including

- Limited availability of training materials, on-line or otherwise.

V. Infrastructure Capacity (4)

Inadequate IT Infrastructure Capacity was cited as negatively affecting the following areas & cases:

Management of Changing and Evolving IT Systems & Infrastructure, including

- Lack of National Government Standards in software and related hardware functionality (e.g. expensive Oracle vs. cheaper MSSQL for Database operations
- Digitising older reports
- Disaggregating of data & distribution over many departments, agencies or ministries
- Lack of computers at national level offices

VI. Web & Software Development (2)

The lack of an adequate web presence constrains IT training & capacity-building; two examples are:

Web/Internet, including

- Low quality and technical level of SIDSNET Website
- Ineffective Website design

VII. Other (National Decision-Making, Access/Connectivity) Significant Constraints

There are two other significant constraint areas:

National Decision-Making, which includes

- Inadequate decision-making processes by national Governments in terms of attitudes and aptitudes regarding IM/IT information development & use;
- Lack of integrated national planning framework;
- Need for increased awareness among policy-makers;
- Lack of informed decision-making by political directorate.

Access/Connectivity, including

- Lack of `Connectivity' and High-speed Internet Access.

New Tools

I. Web & Software Development (21)

In the arena of new technologies for IT training & capacity-building, the development of Internet and Web-based software applications is clearly considered to be of utmost importance; being overwhelmingly mentioned by almost all mission interviewees and survey respondents. The web is almost omnipresent in its scope, seemingly related in one way or another to most of the feedback received on new IT tools. Some exemplary observations, by area, are:

Web/Internet, including

- Web conferencing;
- Web-based distribution of information, including spatial information;
- Web-based Internet Video-conferencing software & technology;
- On-line newsletter;
- Webpage design;
- CEPNET, SPAW, CAMPaM List-servs;
- SIDSNET Energy Issues List-serv.

Software Development and Use, especially

- Open source software, e.g. Linux, Kykr, DMP & MySql;
- Website “e”-Commerce software development & use;
- Scenario modelling software (e.g. Polestar);
- Development of web-based databases using open source software & open standards for data storage;
- IDSS Disaster management software (available through US Southern Command);
- Open source software for database & content management;
- SQL server & Access software tools, esp. reporting systems such as Crystal Reports and SPSS.

Databases, including

- Visual Basic software for MS Access Databases;
- Simplified database software;

Flexible National & sectoral databases that allow linkages at national, regional & international levels.

Networks, including

- Virtual Private Network (VPN) software & technology.

Remote Sensing and Geographic Information Systems (GIS), including

- Web-based GIS database software development & use.

II. Education & Training (3)

Internet and Web-related education and training are a noteworthy new IT tools; the relevant areas are:

Web/Internet, including

- Virtual negotiations training.

Software Development and Use, especially

- WEB-CT and VIRTUAL-U Course Tools software development & use.

Remote Sensing and Geographic Information Systems (GIS), including

- GIS Skills training.

III. Infrastructure Capacity (3)

The building of new IT infrastructure capacities was also a noteworthy category suggested by:

Web/Internet, including

- Standardised IT platforms and databases.

Remote Sensing and Geographic Information Systems (GIS), including

- Satellite-based Remote Sensing IT tools for Fisheries Management.

Networks, including

- Wireless Fidelity (WIFI) Networking Technology.

IV. National/Regional Linkages & Collaboration (1)

Although it was only identified once, the need for indicators is an acute imperative; the applicable area and illustration is:

Statistics/Indicators, including

- Technical indicators for SIDS-POA, including IDSD Project, thematic areas, with delegation of responsibility for update/maintenance to relevant hemispheric & regional SD agencies.

Synopsis

In the determination of regional IT and capacity-building priorities, a synopsis of the categories from the findings indicate that Education and Training is perceived as the single most important need; Infrastructure Capacity, Web & Software Development and National/Regional Collaborative Linkages are also significant needs. Several constraints were identified; the most critical being the lack of Human Resources Capacity, followed by inadequate Financial Resources, weak National/Regional Collaborative Linkages and insufficient Infrastructure Capacity. Web and Software Development was overwhelmingly assessed as the most momentous in terms of New IT Tools, although some notable implements were recognised from the Education & Training and Infrastructure Capacity areas.

Table 3: *Synopsis of Key IT Training & Capacity Building Areas*

CATEGORY/FREQUENCY	NEED	CONSTRAINT	NEW IT TOOL
Education & Training/47	(39)	(05)	(03)
Web & Software Development/30	(07)	(02)	(21)
Infrastructure Capacity/15	(08)	(04)	(03)
National/Regional Linkages & Collaboration/14	(07)	(06)	(01)
Human Resources Capacity/14	(01)	(14)	(0)
Finance/Funding/10	(01)	(10)	(0)
Other: Access/Connectivity (02) Public Awareness (01) National Decision-Making (01)	 (01) (01)	 (01) (01)	

Clearly, the overall ranking demonstrates that both Education & Training and Web & Software Development would be crucial components of any effective regional IT Training and Capacity-Building initiative. And, along with Infrastructure Capacity, Human Capacity and National/Regional Collaborative Linkages; they can form the strategic elements of present and future IDSD Project activities. The securing of appropriate Financial Resources must not be overlooked either, as it is viewed as essential to the sustainability of any proposed programme.

Lessons from an Indian View on Human Resources Development to Meet IT Challenges

India is world known for the phenomenal advances made by its IT industry, especially in the field of software development and export. What can the Caribbean learn from India's experience? A useful paper in this respect was written by Narasimhan a National Fellow in IT at India's National Centre for Software Technology (NCST), in 2000. He debunks the "hype" and "mystique" that "software is peculiarly matched to the Indian genius" and analyses the HRD problem from a broader perspective while proposing a 4-level expertise generation framework based on what he calls "desired ideal" criteria:

Table 4: *Narasimhan's Four "Desired Ideal" Levels of IT Training*

LEVEL	DESCRIPTION	EMPLOYMENT
Level O: Universal Prerequisites	… to access the full potentials of an ICT-dominated world, every person should become ICT-literate. Minimally this means full familiarity with the use of a personal computer, and basic proficiency in the fundamental tools of personal computing such as email, word-processing, spreadsheets, databases, and of course, the use of the keyboard and the mouse. Students going through formal education should… be proficient in: • Communication: Oral communication, general and technical writing, and listening skills. • Quantitative & Qualitative Analysis: Including discrete mathematics, basic introduction to statistics and calculus. • Organisational Functions: Introduction to economics, accounting, finance, human resources, marketing, production, etc. Ideally every student passing out of 6 th Form must have acquired these prerequisite skills and foundational knowledge.	• Data-entry Operators • Information Systems (IS) Application Assistants
	• Thorough familiarity with Level O skills and foundational knowledge. • Familiarity with and competence in the use of	

Level 1: Entry-level Skills & Knowledge in Information Systems (IS)	vendor-delivered products intended for general use. • Similar know-how and skills in the use of products incorporating knowledge in domains one is specialising in. • Capability to be trained to use customised products. • Familiarity with presentational graphics and their use in the generation of appropriate visual aids for popular or technical presentations. Ideally, all first degree holders from liberal arts, science and commerce colleges must have acquired Level 1 skills and knowledge of IS.	• Data-entry Operators • Information Systems (IS) Application Assistants
Level 2: Operating With Available Technologies	• Level 1 skills and knowledge are prerequisites • Knowledge of how IS work, rather than mere skills in using them. • Enough knowledge of programming, data-structures and mathematics to be able to design and implement applications packages in areas in which one has the requisite domain knowledge • Advanced technical writing skills to be able to write, and/or supervise the production of, “help” manuals at various levels of detail and complexity. • Articulating requirement specifications and/or translating requirement specifications into systems specifications and design. • Enough basic IS expertise to maintain (i.e. debug/rectify) application packages of various levels of complexity.	• Hardware/ software Maintenance • System Integration Assistants • Product Development Supervisors • Requirement/System Specifications Design
	• Full-fledged IS expertise.	

Level 3: Generating New Technologies	• Knowledge in cutting edge aspects of current technology. • Ability to add to technology or generate new technology in one's specialisations: e.g., graphics, networks, database techniques, operating systems, etc. • Enough technical and user understanding of the markets to judge what product innovations would sell. • Enough production know-how and grasp of marketing details to assess rationally the cost of product/process innovations.	• Application Development Managers • Project Leaders • Middle Level Managers

The path to appropriate and sustainable IT training for capacity-building lies along the Education sector highway, but, given the changes wrought by the emerging `global information order', existing educational infrastructures and philosophical dogmas must be revamped. This new `order' requires an `informatisation' of the educational establishment, with an emphasis on criteria that will enable life-long skills that enable peoples and societies to Participate in, Facilitate operation of & acquire Control over this new `order'. Narasimhan's view is important as we seek to find a Caribbean vehicle to carry us along a high-tech Education path: our IT training transport must not only be globally marketable and multi-disciplinary, but it must also be able to navigate our distinct socio-cultural roadways and allow us to both contribute as well as receive goods. In summary, IT training should become a part of all the region's many educational programmes. Beginning with `e-Literacy; IT training has to enable operational use and eventual mastery of the applications, sciences and technologies involved for the benefit of the whole Caribbean Society., Our ultimate success in this endeavour will be judged by our ability to generate new content, products and services that are globally marketable and locally beneficial.

REFERENCES

Mansell, R. & When, U.; (eds.) (1998), *Knowledge Societies: Information Technology for Sustainable Development* UN Commission on Science and Technology for Development, United Nations. Oxford University Press Inc. New York.

Narasimhan, R. (2000), *Human Resource Development to Meet the Challenges of Information and Communication Technologies (ICTs)* . National Centre for Software Technology, Ministry of Information Technology, Government of India

ENDNOTES

1 **June 2003 Draft IDSD Priority Training Needs Report, Appendix _; Page 4**

Specific references were made to agencies such as the CARICOM Secretariat, the OECS Secretariat, the Caribbean Meteorological Organisation (CMO), the Caribbean Environmental Health Institute (CEHI), the Caribbean Energy Information System (CEIS),

The Institute of Marine Affairs (IMA), the Caribbean Planning for Adaptation to Global Climate Change/ Adaptation to Climate Change in the Caribbean /Mainstreaming Adaptation to Climate Change in the Caribbean (CPACC/ACCC/MACC) Projects, the Caribbean Disaster Emergency Response Agency (CDERA), the Caribbean Development Bank (CDB), the Caribbean Regional Fisheries Mechanism (CRFM), the Caribbean Tourism Organisation (CTO) and the University of the West Indies (UWI).

“We must emphasise that we are here concerned only with the ICT-expertise that make-up the knowledge and skills at each level. We are not spelling out here the domain knowledge that relates to student specialisations such as Physics, Chemistry, Mathematics, Commerce, Business Administration, and so on...We are emphasizing the need for integrating training in ICT knowledge and skills with the education system in its entirety...” (Narasimhan, 2000)

“Information systems are engineered systems based on ICT with desired input-output specifications. To create such engineered systems (also called system integration usually) both hardware and software skills and knowledge may be needed.” (Narasimhan, 2000)

“Levels 2 and 3 relate primarily to students majoring in engineering. Level 2 roughly corresponds to students working for a first degree in engineering. Level 3 corresponds to students working for higher degrees (Masters, Doctorate) in engineering, and also those engaged in R&D activities in R&D organisations.” (Narasimhan, 2000)

Figures

Chart 1

Chart 2

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