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VIRTUAL RESEARCH AND DEVELOPMENT NETWORKS AND LABORATORIES

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CONTENT

I. INTRODUCTION

The facility with which information may be exchanged over the Internet, and through other modern means of communications, has rendered wide-ranging research cooperation more feasible than ever before. Virtual research networks and laboratories involving developing and developed countries are being promoted in a wide variety of fields. With urgent issues facing sustainable development in the former, as well as reduced growth and competitiveness in the latter, research networking could offer institutions in both groups of countries immense benefits.

While members of a virtual network or laboratory could be geographically dispersed, their cooperation may only be productive if they share their objectives and possess common tools.

In order to generate initial interest and guarantee sustainability, areas of interest for virtual research networking will have to closely conform to a set of criteria and priority issues. During its present biennial planning cycle, 2004-2005, and the next, the Economic and Social Commission for Western Asia (ESCWA) will seek to establish a number of research networks and laboratories. These will be set up under the

managed by a consortium of organizations.

Implementation of specific VRNIs will be guided by experiences from around the world, targeting a range of priority issues that confront sustainable development in the region. Needless to say, VRNI will seek to complement and cooperate with other schemes concerned with harnessing technology for sustainable development, whether through bricks-and-mortar or virtual facilities.

This document outlines concepts involved in virtual research networks and laboratories, addresses essential aspects of their creation and briefly discusses their potential benefits.

Implementation of virtual research networks and laboratories in ESCWA countries will, naturally, require further in depth analysis targeting needs, cooperation modalities, the design of substantive activities as well as financial and information resources and specific technology needs.

II. VIRTUAL VS. BRICKS-AND-MORTAR RESEARCH

In principle, geographically dispersed researchers targeting shared objectives, common tools and evaluation criteria may benefit from modalities that help them establish more effective communications. An

at results that are relevant to all participants. Virtual research networks will be particularly effective whenever the research targeted is either independent of geographical location (while research results are relevant to all participants) or requires access to resources persons, facilities and data from dispersed locations.

A virtual research network is in effect a tool designed to help conduct research activity in science and technology in a more efficient manner especially when such activities benefit from cooperative activities carried out over a widely dispersed geographical domain. A virtual research network is often made up of a collection of bricks-and-mortar research laboratories, but could also be considered as an adjunct to a virtual research laboratory.

In a bricks-and-mortar research establishment physical laboratories and field facilities constitute the principal work location; where scientists and technicians collect, analyze and interpret results before sharing them with their peers and, sometimes the public. A virtual research network, on the other hand, is in effect a dispersed community of researchers, supported by their own physical resources and equipped with

communication, information, administrative and other support services. For virtual research networks the electronic backbone that keeps the group connected is of crucial importance.

A Meeting on Virtual Laboratories, held in the late nineties,[2]
electronic workspace for distance collaboration and experimentation in research or other creative activity, to

www.iitap.iastate.edu/reprts/vl). Thus while a virtual laboratory is the entity behind actual scientific or technological work is being done, a virtual network is an entity through which research output is made available and resources are shared.

Virtual research centers are analogous to their physical counterparts in that participation is restricted to those contributing to an agreed set of activities; experiments, data analysis, authorship of research notes, etc.

III. VIRTUAL LABORATORIES

A virtual laboratory has much better defined goals than a virtual research network. However, it may have a more limited life span. Clearly, only selected members of a virtual network would participate in a given virtual laboratory. Additionally, it may be possible to ensure collaboration with scientists who do not belong to the core of the virtual network. Centralized data management is of the utmost importance for any co-lab, as are a support system for teamwork, networking for continuous thinking and planning together, and software tools for developing the methods and organizational structures of the co-lab itself. Interconnecting with other co-labs and research teams affords a means of tackling even the most difficult problems through the sharing of ideas, experiments and discoveries. By working together regularly and on an international scale, researchers can use their combined forces to take on problems that would otherwise be unmanageably complex and difficult. Thanks to co-labs, work can now be completed more quickly, efficiently and comprehensively than ever before.

Co-labs lead to global projects involving creative interaction across disciplinary, cultural and international boundaries. There are many examples of virtual laboratories. Thus, the Project to Inter-compare Regional Climate Simulations (PIRCS) is a geographically dispersed team of researchers, with participants from the United States, Europe and a number of developing countries. The project is designed to help gain better understanding of current, and predict future, droughts and floods, through modeling and analysis of relevant regional climate simulations. Partners in this project are able to access data kept in a shared repository and to apply the model using data from their own locations. Model runs are then shared so that all

model refinements.[3]

In summary, virtual research networks and laboratories allow their members to access and use knowledge from a geographically dispersed membership in order to implement well-defined research agenda. They also help their members effectively communicate with each other and with stakeholders. Through networking it is possible for professionals involved to collectively contribute to problem solving methodologies and take par in training exercises.

[2] Expert Meeting on Virtual Laboratories, 1012 May 1999, Ames, Iowa, the United States.
[3] See for example material posted on www.pircs.iastate.edu.

IV. THE INTERNET IN VIRTUAL RESEARCH NETWORKS AND LABORATORIES

The ability to share information and resources and reach management decisions using Internet-based communication tools is by now self-evident. However, virtual networks must be viewed as contributing something more than mere connectivity. For, in essence, they ought to contribute to the creation of research communities spanning geographical, political and institutional boundaries as well as disciplines.

Many of the advantages of virtual research networks are shared with other fields of activity making transaction costs of communication, procurement and other modalities of doing business among members of a dispersed group of co-workers. If well planned and managed, a virtual research networks would allow all members almost instantaneous and unfettered access to relevant information.

With reduced costs of communication and time required to post and share information opportunities arise for enhanced benefits mainly due to improved efficiency of interactions. Additionally, the fact that information may be exchanged using multimedia formats may ensure quality of interactions. With adequate protocols in place, virtual research networks could become vital means for knowledge as well as information sharing.

The Internet will facilitate access to material produced by virtual research networks and laboratories with three categories of users in mind:

- rned professionals interested in the research being undertaken and possibly in applying its results but would not necessarily contribute to the network in any meaningful way. These include research and development professionals from international and national research and development organizations, extension workers, non-governmental organizations (NGOs), policy makers and media professionals.
- Members of the virtual research network and laboratories, both those directly involved in conducting its day-to-day research activities as well as and administrators, managers, and supervisors of individual projects and component activities.
- Donors and other organizations providing support wishing to follow up on funding and related issues.

It is essential that protocols are developed to allow all three categories of users access that is commensurate with their needs.

V. IMPLEMENTING VIRTUAL RESEARCH NETWORKS AND LABORATORIES

In implementing virtual research networks and laboratories three important and related considerations will stand out: sustainability, ownership of results and other knowledge assets and prospects for future expansion. Looking at examples set by established regional networks, there is need for clear strategies with regard to all three aspects. It may be useful for such strategies to start from the premise until the entity in question evolves into an independent, self-sustaining body. Once this is decided, it becomes essential for the network to generate revenues, for example, by providing information and technical services against payments, sale of publications, developing programmes and projects with a view for collaborative implementation with funding by donors and development agencies.

It goes without saying that independence and self-sustainability should go hand in hand with moves to forge partnerships with other institutions to collaborate on issues of common interests. Therefore, ensuring sustainability will require that the confidence of stakeholders is gained and this in turn will necessitate that programmes and projects address priority issues as seen by governments and the donor community with which the network is involved. Needs and priorities of both central and local authorities would have to be

addressed. It is often useful to have priorities integrated into work programmes and action plans adopted by

VI. ORGANIZATIONAL ISSUES, MANAGEMENT AND ADMINISTRATION

Virtual research networks and laboratories would need to have a clear internal structures, which while allowing maximum interactivity, maintain clear responsibility and safeguard the interests of all parties. Examples of a variety of networks point to the need for a governing body, an advisory board, as well as a group of coordinators whose task would be to ensure that policy guidelines are observed and the interests of collaborators and stakeholders safeguarded.

Management, administrative and other support functions are tasks that need to be adequately shouldered in setting up a virtual research network. In analogy to the bricks-and-mortar research establishment, data produced by virtual research networks have to be interpreted and information shared with other colleagues through published reports. Additionally, funds will need to be planned, managed and accounting functions performed. Supervisory responsibilities will have to be agreed and monitoring implemented in order to maintain quality, integrity and sustained focus on priority issues.

It will often be that geographical and administrative considerations, coupled to thematic diversity and multiple constituencies, will lead to the adoption of decentralized forms of management. However, a group of professionals will have to possess overall responsibility on general policy regarding resource and knowledge management. Day-to-day management of Internet resources will be assigned to a coordinator who will be responsible for what information is may be released to network members and the public and what protocols are used by both categories of users in accessing as well as updating files and databases. Project and activity coordinators may have to be allocated the responsibility of verifying updates and deciding when it might go alive, thereby creating new content.

Other issues that require attention in setting up virtual networks and laboratories include access by partners to sufficient bandwidth tools and the need to take into account Intellectual Property Rights issues.

VII. FUNDING

Care should be taken to formulate clear criteria at the policy and strategy levels with regard to establishing linkages to, and networking with, institutions and funding sources outside the incubator. The mic surroundings and financing sources should be vigorously pursued. In fact, Real costs are involved in setting up and running a virtual laboratory. These are mainly incurred on account of the need to:

- organize face-to-face meetings, initially to establish trust among the researchers and discuss progress during later phases;
- have researchers use uniform equipment and sampling methods;
- use relevant information and communications technologies for training purposes.

In certain cases it may be essential to have an information technology specialist dedicated, at least for part of her/his working day, to each component of a virtual research network. This is often essential in order to ensure that optimal benefits may be delivered using available information technology infrastructures.

Experience in virtual research centres show that the network concept can work if a suitable environment is created and favourable circumstances are developed. In particular, commitment on the part of a funding agency is necessary, as is the careful selection of individuals on the basis of their expertise and

enthusiasm for interdisciplinary investigation. Constant attention to the complexities of carrying out collaborative work across institutional and disciplinary boundaries is also a necessary condition for success.

VIII. CONCLUDING REMARKS

Key issues in deciding whether to set up a virtual network or laboratory are whether:

(a) functions, to be undertaken by the virtual entity are indeed required and feasible, as performed by a brick-and-mortar facility;
(b) the virtual nature of the intended network or laboratory will indeed provide added value in terms of improved performance in targeted research and development activities.

Interdisciplinarity and access to unavailable expertise and human resources are often major benefits. Several models may be advanced in efforts towards implementing research networks and laboratories. Some have been tested while others remain nascent or at their embryonic stages of development. The European experience points to the need for a judicious amalgam of virtual and face-to-face contacts, retaining the latter mode of interaction within periodic workshops. Evaluation exercises are seen as an essential element in success.

Efforts by ESCWA to set up research and laboratory networking schemes fall within the scope of current and future programmatic activities designed for implementation in collaboration with partners in the region and outside. These activities will be undertaken under the umbrella of a regional initiative: the

guided by experiences from a wide range of cases and will seek to complement, rather than compete with, other schemes being developed, or implemented, by other national and regional concerned with harnessing technology for sustainable development. Additionally, ESCWA efforts in this direction will also highlight programme planning, monitoring and evaluation. Priority areas targeted at early stages of the programme will

ESCWA supports research in various areas with emphasis on specific priority issues for the region. One of the most important topics common to the manufacturing and industrial fields listed below is the adaptation and development of Environmentally Sound Technologies (ESTs). Meanwhile, Information and Communication Technologies (ICTs) have also been playing key roles in increased economic growth and productivity in the region. The following focus areas are proposed as basis for establishing R and D networks:

- Pro-Poor Technology;
- Water Resources, Treatment and Desalination;
- Sustainable Agriculture;
- Biotechnology;
- Information & Communication Technology;
- Food Processing;
- New Materials Technology;
- Petrochemicals & Plastics;
- Energy Resources;
- Science, Technology and Innovation (STI) Indicators;
- Social Sciences and the Humanities;