

# WITHER SCIENTIFIC AND TECHNOLOGICAL INFORMATION NETWORK IN TANZANIA: STATUS AND PROSPECTS OF TANISSAT

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## ABSTRACT

Networking among libraries and information centres is inevitable in modern world, as it is not possible to be self-sufficient in every thing. This article sets out to make an analysis of Tanzania's efforts at establishing a network for scientific and technological information. The paper discusses the Tanzania National System for Science and Technology (TANISSAT) under the Tanzania Commission for Science and Technology (COSTECH). TANISSAT which began as an ambitious project has since its inception been dodged by a number of problems and constraints that have affected its full operationalization. The Paper moots proposals for the way forward in ensuring creation of a viable, effective, efficient and sustainable network.

## INTRODUCTION

The twenty first-century has been designated as the Science and Technology century in Tanzania as in well as other countries. Science and technology has expanded the frontiers of knowledge and capabilities of humankind in tackling what were considered in the past as insurmountable problems. Moreover science and technology and Scientific and Technical Information (STI) are among the crucial factors in human development. Information technology has turned the world into a global village. Indeed information technology is increasingly playing a vital role now than ever before in the management and provision of information services.

No library or information service and especially in a developing country like Tanzania can be self-sufficient. Therefore, libraries and information centres must share resources through

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networking in order to meet the needs of their diverse users effectively. This article examines Tanzania's attempts at creating the Tanzania National Information System for Science and Technology (NISSAT) under the auspices of the Tanzania Commission for Science and Technology (COSTECH). The purpose was to link different institutions involved in generation and dissemination of STI in the country. Core institutions involved in the first phase of NISSAT were 19 institutions include the University of Dar Es Salaam (COSTECH, 1990:1). However, since its launching, this ambitious project has experienced a number of problems and has failed to realise most of its programmes. From the onset implementation has been behind schedule (COSTECH, 1992:27).

## **THE IMPORTANCE OF NETWORKING**

It is imperative to dwell, albeit briefly, on the definitions and importance of networking before delving in the main subject of the paper. There is no single agreed upon definition of network as applied to library and information services. Most definitions tend to be functional rather than conceptual, with emphasis on describing the objectives of networking. Information networks have been described as sets of interconnected information systems that operate through formal or informal agreements between participating institutions (Thiagarajan, 1984). UNISIST defines information networking as:

A set of interrelated information systems associated with communication facilities, which are operating through more or less formal agreements and institutional arrangements, in order to jointly implement information handling operation, with a view to pooling their resources and to offer better services to users. They generally follow identical or compatible procedures (UNESCO, 1991:5).

The main purpose of networks is to facilitate access and utilisation of data and information resources of participating institutions (Gayas-ud-din, 1993). Furthermore, they provide access to other databases within and outside a country, which are used for interactive or on-line searching (ibid. p.120). Creating an information network is a formidable task, especially for developing

countries. This is because they presuppose an existence of appropriate information communications, technology infrastructure for information transfer, and well-equipped information centres that have compatible interconnecting links (Sharma, 1990). Expounding on the benefits of establishing data networks in developing countries, Gayas-ud-din (op cit. pp.133-134) argues that:

In the library world, institution form networks primarily to achieve better sharing of resources (bibliographic information and collections) and to provide better services to users. The focus in the present context is on on-line networks, those using computers and linking member libraries to computer resources by means of telecommunications connections. Networks have significant future implications for expanding and sharing the resources in all libraries to the extent that demands are fully met by local libraries. ... Data networking becomes increasingly significant as the need for co-operation and exchange increases. The on-line networks would ultimately make this feasible and would permit instant access to union catalogues, instant transmission of interlibrary loan requests, interactive message transfer, and instant telefaxing of documents including graphics. When on-line networking is finally available for bibliographic information transfer, it will offer many existing possibilities for libraries and information work.

### **Types and Characteristics of Networking**

There are different types of networking which are determined largely by the mode and medium of application. It is not the intention of this section to dwell in detail of the types and characteristics of networks but to mention them in appreciation of the complexity of networking. Satyarana and Rajan (1985) have identified three types of networks, namely communication networks, computer networks and library and information networks. Communication networks are made-up of transmission lines, concentrators, switching mechanisms and non-data processing (ibid.). Computer networking are made up of an interconnection of assemblies of computer systems, terminals and communication facilities (Thiagarajan, op. cit. p.154). . Library and information networks are defined in terms of different levels of co-operation among libraries (Satyanaryana and Rajan, 1985: 158).

## **Requirements of a Network**

In order for a scientific network or system to operate efficiently and effectively it requires an infrastructure but also other elements. According to Ocholla (op. cit. p. 49) elements which are essential for a scientific information system are human, financial and technical resources. For example, what is needed at the human level is active, motivated producers and consumers of information, personnel trained in information handling and transfer as well as a literate and enlightened community with the desire to be self-reliant and self-sufficient in the areas of science and technology (ibid., p.45-50). At the institutional level, manpower training, especially at higher levels, capable of transforming quantity into quality is crucial.

An effective scientific network also requires well established and productive research and academic institutions, information resource management capabilities, scientific and technical information centres including libraries and other information centres, capable of storing, transferring and disseminating information, an accurate record of scientific information holding as well as their adequate publicity and promotion. It also needs a national co-ordinating body in the form of a management body, such as a Ministry or department in charge of research, science and technology (including related information activities). Good public relations, consultancy services including bilateral and multilateral information exchange and transfer agreements are also important. Furthermore, it also requires professional associations and institutions capable of generating and enhancing scientific and technological information and of developing the profession (ibid. p.50). In addition, at the technical level, an efficient network requires an adequate and open communication system, including transport, telecommunications and computer networks.

At the political level there is a need to formulate and implement appropriate information policies, guidelines, legislation and other regulatory and control mechanisms. A viable framework for the organisation and management of intellectual property is also crucial in order to co-ordinate industrial information such as patents and standards, and a conducive political will and social

climate (ibid.). Underscoring the political element in making a network function, Kigongo-Bukenya (1990:106) concludes that:

At the end of the day, the real effective growth of scientific and technical information will depend on the government attitude which should influence the adoption of a national policy, setting up legal basis and providing the necessary resources (Birungi, 1990).

Indeed, the benefits of networking are numerous, and especially when they are established they also benefit the traditional areas of library operations such as acquisition, cataloguing, exchange of materials, inter-loan and staff development.

## **PLANNING AND IMPLEMENTATION OF TANISSAT**

The development of Tanzania National Information System for Science and Technology (TANISSAT) project was aimed at creating databases which would provide information on science, ongoing Research and Development projects, R&D institutions and specialised research equipment in Tanzania (COSTECH, 1992). Implementation of the first phase began in July 1990 and was financed by International Development Research Centre (IDRC) Canada (COSTECH, 1991). The assistance from IDRC was in the year 1990/91 used to train two members of staff for six weeks in India, buying one IBM Micro-Computer equipped with facilities for undertaking desk-top publishing and one Xerox photocopy machine (ibid.).

COSTECH was the co-ordinating institution and also the overseer of the project. URT, 1993: 76). Two members of COSTECH staff received six-week training in India on the technique of establishing and running the National Information System. Despite this, implementation was behind schedule. According to plans it was supposed to have been completed by end of June 1992 (COSTECH, 1992). The whole network project was to a large extent funded by IDRC. The establishment of TANISSAT is one of the three main projects which Tanzania has embarked upon in order to strengthen the development of information technology in Tanzania. The other two projects are the Endogenous Capacity Building and the Capacity Building in

Science and Technology through Microelectronics project (Sheya, 1992).

The establishment of TANISSAT is to a large extent a result of the endeavours of the United Nations Centre on Science and Technology for Development (UNCSTD) attempt to promote science and technology for development ((COSTECH, 1992: 1). Tanzania was among the ten developing countries selected by UNCSTD in 1989 for assistance in strengthening endogenous capacities in science and technology for socio-economic development. In implementing the project in Tanzania, the UNCSTD commissioned three studies co-ordinated by COSTECH. These studies were carried out by the Institute of Development Studies (IDS) of the University of Dar Es Salaam, the Small –scale Industries Development Organisation (SIDO) and COSTECH. Between 1990 and 1991 special Policy Dialogue meetings on Endogenous Capacity Building in Science and Technology in Tanzania I and II respectively, were convened with the support of UNCSTD to discuss the reports together with the comments by UNCSTD experts. During these meetings the following observations and recommendations were made:

1. Institutions responsible for small entrepreneurs were not well co-ordinated to provide end-users with information on required technology;
2. A need to establish databases to facilitate technology assessment; and
3. A need to institute efficient science and technology information systems.

The studies conducted by IDS, SIDO and COSTECH indicate that, despite the efforts made by individual institutions in providing services in the field of STI, its impact had not been felt at the national level due to various reasons. These include lack of co-ordination at the national level, lack of adequate funding, and lack of efficient and reliable telecommunication systems and services. It was recommended that different science and technology information projects must be unified in order to produce one project proposal for the creation of a scientific and technological information network in Tanzania (*ibid.*, p. 2).

In Tanzania scientific and technical information services are scattered, poorly organised, and uncoordinated at the national level. For example, since its establishment in 1979, the Tanzania Industrial Research and Development Organisation (TIRDO) has been providing industrial information extension services, SDI services, current awareness list and publishes a newsletter. TIRDO has also established a co-operative link with the Industrial and Technical Information Bank (INTIB) operating under the United Nations Industrial Development Organisation (UNIDO). As a result TIRDO is the reference and focal point of INTIB in Tanzania Utafiti, 1983: 3). The Tanzania Industrial Studies and Consulting Organisation (TISCO) has also been offering scientific and technical information services and has compiled and produced directories on manufacturing industries. Unfortunately TIRDO has failed to update them due to lack of financial support (COSTECH, 1992: 3).

Co-ordination of STI services in Tanzania is necessary, especially since new STI systems are still being established in the country even after the establishment of TANISSAT. For example, in 1995 the government of Tanzania established the Tanzania Mineral Information Centre (TMIC) which is based at the Department of Mineral Resources in Dodoma. The Guardian, Oct.26<sup>th</sup> 1995). The Centre was financed through a \$ 100 million loan from the World Bank. The main purpose of the Department of Minerals is to provide information and data concerning the geological and mineral resources in Tanzania. The Centre has already computerised most of its geological data collected in the Tanzania in the last 100 years including geological, mineral titles, mineral statistics and mining environmental databases. This data has made it possible to explain and forecast mineral demand and supply, prices, deciphering international trade patterns and effects, modelling mineral market behaviours, mineral appraisal and evaluating projects. The Centre also issues the investment guide for prospectors entitled "Opportunities for Mineral Resource Development in Tanzania". Exhibitions on Tanzania's mineral endowment have been displayed in Canada, Australia, the United States, the United Kingdom and China. A majority of the items and information displayed are produced by the TMIC. The Centre has benefited from the information resources of the Geology Library

and the Mineral Resources Division at Dodoma established in 1923 (Kennington, 1966).

The establishment of the network received no objection from different interested parties, including the Tanzania Library Services (TLS) which in the past had strongly objected to the establishment of such a service outside its jurisdictions. Justification given on the establishment of the network were, inter alia, that it will enable Tanzania to keep abreast of modern techniques of information storage and retrieval and also the proper co-ordination of STI in the country. This would also enhance contacts with international databases through satellite ((COSTECH, 1992). In its proposal COSTECH convincingly argued that:

The project starts from the realization that uncoordinated information activities undertaken at individual institutions are not likely to bring about effective and efficient access to scientific and technological information in the country (Tanzania) as a whole. A network approach to, information handling is expected to unify not only techniques in information storage and retrieval but also bring along greater awareness in organizing information in science and technology (ibid.).

According to COSTECH, the network approach to information handling in Tanzania is not only restricted in unifying techniques in information storage and retrieval but also creating greater awareness in organising information, science and technology.

### **Main Objectives and Outputs of TANISSAT**

The main objective of TANISSAT is to create databases that will facilitate access to precise and reliable scientific information for users at the time it is required. The specific objectives are given as:

- (1) To strengthen scientific and technological (S&T) information centres within participating institutions;
- (2) To establish and maintain a co-ordinated information network in science and technology within participating institutions;
- (3) To organise locally generated science and technology information;



- (4) To set up a computer-based network infrastructure for exchanging information among participating institutions;
- (5) To set up satellite-based infrastructure for accessing international databases provided through such information vendors as MEDLINE, DIALOG and Information Retrieval System (IRS) of the European Space Agency;
- (6) To provide information services;
- (7) To establish standards for data collection, compilation and dissemination;
- (8) To provide gateways for accessing international databases;
- (9) To train personnel for network operations;
- (10) To facilitate procurement of international databases available in CD-ROM; and
- (11) To create critical reports on various sectors of science and technology.

The project started by training of staff and acquisition of equipment. Thereafter, survey instruments for research and development institutions in Dar Es Salaam, Morogoro and Tanga regions were designed and tested (COSTECH, 1992). Institutions involved in the survey were the Faculty of Science, University of Dar Es Salaam, National Institute for Medical Research, Tanzania Food and Nutrition Centre, Ministry of Water, Energy and Minerals, Sokoine University of Agriculture and the Tsetse and Trypanosomiasis Research Institute. In each of these institutions a liaison officer was identified to act as a link-person between that institution and COSTECH.

A lot of what had been planned was shelved except the component relating to creation of database on ongoing research and development. TANISSAT succeeded in establishing three databases namely:

1. Scientists and Technical Personnel Database;
2. Scientific Institutions Database; and
3. Ongoing Research and Development Database.

Other outputs included a directory on "Survey of Information Technology in Tanzania " which was conducted by Samm Baker in 1992/939 ((COSTECH, 1994).

According to the Project Implementation Proposal it was envisaged that after the network is fully operational, it would produce computerised inventories of active scientists and technologists, ongoing research projects, science and technology bibliographic information and research facilities in Tanzania. This information would be useful for researchers and in planning research and development activities in Tanzania, both at the national and institutional levels.

Since the output from the network, was expected to be scientific and technological information from various databases, including bibliographic information, it was necessary that uniform procedures for outputting information be put in place to avoid chaos (*ibid.* p. 16). Basically the network was required to adopt common standards for data collection, compilation and dissemination which would be used by all network members. The network also acquired desktop publishing facilities to be able to deliver some of the science and technological information in the form of printed documents, e.g., directories, newsletters, operational manuals, and other materials (*ibid.*).

### **Envisaged Participating Institutions in TANISSAT**

The network was supposed to involve 19 local institutions, representing a cross-section of institutions from five sectors, namely agriculture, industry, health, construction and transport which are located in different parts of Tanzania. This was deliberately planned in order to extend network nodes to remote and normally neglected parts of Tanzania (*ibid.*, p. 8). COSTECH, the hub of the network was responsible for co-ordinating the network, including providing secretarial services to various committees of the network. It also acts as the main link of the network with external based scientific and technological organisations.

University libraries in Tanzania, that is the University of Dar Es Salaam with its constituent college, the Muhimbili University College of Health Sciences, and the Sokoine University of Agriculture feature prominently in the network as crucial and core institutions in the production, collection, compilation and dissemination of STI. The Open University of Tanzania which was established after the project had started, was not included in the

network. Phase I of the implementation began with eleven institutions namely the Sokoine University of Agriculture Library which is also the National Agricultural Library of Tanzania and the main source of agricultural information for the network.

Other institutions in the first phase were from the industrial sector. For example, TIRDO was designated as the main source of industrial information in Tanzania and focal point of INTIB and industrial information from other countries. TIRDO has a relatively well-established Information and Documentation Department. TISCO that has a well-established information and documentation centre was included in the first phase. Its major task was to supply various consultancy reports on science and technology development projects useful to scientists, technologists and entrepreneurs to the network. Small-Scale Industry Development Organisation (SIDO) which was at that time in a process of establishing an information department was designated the link between the newly developed technologies and the entrepreneurs. Another institution dealing with industries and technology in the rural areas which was included in the first phase of the network operationalisation was CARMATEC located in Arusha, 500 km from Dar Es Salaam, as one of the distant nodes of the network (ibid. p. 10). Another institution from the industrial sector was the National Development Corporation (NDC) which had already established computer based data processing infrastructure at its headquarters in Dar Es Salaam and connected to all its seventeen subsidiary companies. The Patent Office based at the Ministry of Industries and Trade is part of the office of the Registrar of Companies. Its main function was to feed the network with information regarding patented technologies in Tanzania to give an indication of types of technologies used in Tanzania (ibid., p. 9).

The Sokoine University of Agriculture in Morogoro, 200 km from Dar Es Salaam, was also included in the first phase. The Sokoine University of Agriculture Library is not only a good source of agricultural information generated internationally, but also a training and research institution. Another major agricultural research and training centre included in the first phase was Uyole Agricultural Centre located 520 kilometres south-west of Dar Es Salaam.

The medical and health sciences together with the Muhimbili University College of Health Sciences were also represented by the NIMR which conducts medical research in the whole of Tanzania. NIMR has research centres and stations throughout Tanzania. All these centres and stations acted as third level of nodes in the network. NIMR was assigned to represent the medical sector in the provision and utilisation of health science information.

Had the second phase of implementing network operationalization taken place, it would have included seven participating TANISSAT institutions. These were the University of Dar Es Salaam Library and the Research and Publication Committee of the University of Dar Es Salaam, the Tanzania Forestry Research Institute (TAFORI) responsible for forestry research information, and the Tanzania Fisheries Research Institute (TAFIRI) responsible for fisheries research information. Both TAFORI and TAFIRI operated a host of research centres and stations in different parts of Tanzania. In addition, the Tanzania Engineering and Manufacturing Design Organisation (TEMDO) would have boosted the provision of more information needed by the industrial sector. TEMDO dealt with engineering and manufacturing design and therefore was a good source of science and technology information in that field. Tanzania Bureau of Statistics (TBS) was to be responsible for providing information on local and international standards to the network (ibid., p.20). Two government departments were scheduled to be included in the second phase of network operationalisation, namely the Planning Commission which is the overall co-ordinator of development plans in Tanzania, and the Treasury in the Ministry of Finance, which funds all development projects financed by the government in Tanzania.

The University of Dar Es Salaam Library and the University of Dar Es Salaam Research and Publication Committee were included in the second phase of implementation of the operationalisation of the network. Both the University of Dar Es Salaam and Publications Committee were supposed to provide the network with information on science and technology research and publication from the University including all Masters degree dissertations and doctoral thesis deposited in the East Africana

section of the University Library (ibid., p.41). It was envisaged that, the University of Dar Es Salaam Library with its rich collection on science and technology information would serve the network through its document delivery service (ibid., p. 10).

## **PROBLEMS AND CONSTRAINTS OF TANISSAT**

During its existence TANISSAT was plagued by several problems and constraints that affected its operations and led to its virtual demise. One of the main problems was inadequate financial resource to run the network. The network was heavily dependent on donor funding and its activities were seriously affected when such funding stopped. TANISSAT was established without taking into consideration of any financial sustainability strategy. TANISSAT was not only donor funded but also it lacked originality. The model used was copied from India without taking into account existing local conditions and needs.

Operations of the network were also seriously hampered by the perception among participating institutions that the network was benefiting only the focal point of the network, that is COSTECH. Lack of true commitment to the idea of resource sharing and slow implementation of policy decisions also led to the slow growth and later collapse of TANISSAT. The situation was further compounded by individualistic and inward looking nature of most of the libraries of the participating institutions. Their preoccupation with their own users might also have impeded the progress and the continuation of TANISSAT. Another reason is that most of the libraries had limitations in resources and capacity building.

Another set of problems and constraints relate to the organisation of TANISSAT. As already explained earlier COSTECH was responsible for co-ordinating all TANISSAT activities. The experience of many networks was that true focal point became the core of its structure and therefore borne the main responsibility for the sustainability of the network activities. Even though a structure was put in place to manage the network, it seems the committees did not function properly and its participation in decision-making was not that effective. Members were not adequately involved in the design and development of the network, therefore, it lacked the sense of ownership by the participating

institutions and consequently it did not ensure collective approach to networking. Membership to the network also contributed to the problems of TANISSAT. They comprised of libraries working in different fields and of different orientation and specialization. These ranged from government departments and ministries to academic libraries as well research institutes libraries and documentation centres. With such a wide range of institutions there was bound to be differences in appreciation regarding the importance of information. What some saw as important to the core activities of the institution others saw it as periphery. Also, staffing pattern varied from the professional and non-professional. In a library where the majority were non-professional the orientation and appreciation of the level of co-operation in a network were affected.

Each organisation or institution involved in TANISSAT had projects that it was implementing other than the network which involved local, regional, and international initiatives. These other activities are time and resources consuming. Implementation and evaluation phase reports as well as other deliverables such as research studies are tedious and involving just as preparation of project proposals and feasibility studies.

Another problem was that most of the literature produced in the participating institutions was unpublished materials (grey literature) and remained confined within the institution concerned. It was cumbersome to disseminate and share such research especially where ICT had not been well established in the participating institutions.

## **POTENTIAL STRATEGIES: WAY FORWARD**

The importance of having the network is indisputable. It needs to be developed and sustained for the furtherance of scientific and technological advancement of Tanzania. The problems and constraints that have been outlined above should be taken as a challenge for seeking solutions and ways of creating an effective network based on the local conditions and context. The way forward needs to focus on three areas, namely resources, capacity building and sustainability.

1. There is need for mobilisation of local human and financial resources as well as other material resources to be the base for the development and operation of the network. Local resources once identified and a strategy developed for pooling them in the network, results will be positive and durable. Mobilisation needs to move from the tendency of concentrating on financial resource mobilisation and instead develop a general mobilisation drive.
2. There is need for capacity building for the operation and use of the network. Human capital is to a large extent the guarantor of survival of a venture. Capacity building should permeate the different levels of cadre. It should include also awareness and sensitisation programme for the users and potential users of the services to be offered by the network.
3. Sustainability must be nurtured and strategies developed for its actualisation. Sustainability should be viewed broadly to include programme, organisational, and financial sustainability. For this to be achieved there is need of developing partnerships involving both public and private sectors as well as donors and civil society at large.

## **CONCLUSION**

Resource sharing is essential for the development of a national information system; network members should be more outward looking and should view networking a part of their professional duties. In Tanzania networking among institutions and libraries involved in science and technology is essential and important. Despite the problems and other inhibiting factors that TANISSAT has faced networking in STI needs to be strengthened and sustained, and we must learn from past mistakes. An infrastructure for STI networking exists in Tanzania and can be the basis for establishing STI network in the country.

Member institutions, participating in the network, should be ready to share resources and to fund the network. Donor funding should not be the determinant factor. Efforts need to be directed towards generating local resources, accessing and sharing the available resources. The introduction and use of ICT in

participating libraries can help to reduce the cost of operating the network. The potential for re-establishing TANISSAT is there, but what is lacking is political will at the national level.

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