

CONSULTING ACTIVITIES AT ITC

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The strength of ITC consulting comes largely from the breadth of the ITC network and the interreaction between the education, research and consulting components in the ITC mandate.

Consulting activities at ITC are defined to include all activities funded from other sources than the regular Dutch government subsidy and are integral and necessary in fulfilling the ITC mission:

- (i) to provide a comprehensive service through education, research and consulting to strengthen the productive, innovative and management capabilities of organizations, particularly in developing countries, engaged in the capture, updating, storage, processing, analysis, presentation and use of geo information derived from a variety of sources particularly aerospace survey;
- (ii) to contribute to meeting the development cooperation goals of The Netherlands' Government in the management and development of natural and human resources.

OBJECTIVES OF ITC CONSULTING

The main purpose of our consulting is to help our former students. We have some 8000 alumni living all over the world, and we provide advice and services to them and their organizations in their own countries. We help them also to test concepts, methods and techniques to make sure that they are relevant for their proposed applications. Thus one of our tasks is to help develop appropriate technology, whether it is high, medium or low level technology.

Consulting also enables our staff to keep their expertise up-to-date and relevant to the problems of the developing countries, so that their courses can stay as popular as they are. Not only has the staff of ITC built up a reputation over 36 years; their courses also have a reputation of being good in theory, and, of course, very practical and hands-on oriented. Another objective of ITC's consulting activities is to strengthen and sharpen our research capability by means of contract research projects. Consulting also creates greater financial flexibility for ITC, with the consulting income generated being used to invest in new facilities or for other activities of concern to the Institute.

ACCEPTANCE OF PROJECTS

ITC is in a very fortunate position in that we receive more requests for our consulting services than we can cope with. Thus we have a set of criteria on which we accept projects in the developing countries. A project should fall within the sphere of interest of one or more of the ITC departments. ITC accepts requests for consulting for technical assistance projects (such as follow up services to alumni and their organizations), institutional support projects (designed to strengthen infrastructure), cooperative projects in the field of education as well as projects related to our own educational programme (contract education) and projects with an important research and development component.

ITC's consulting activities include:

- designing and developing systems and production processes
- planning of survey organizations and facilities
- setting up educational projects abroad
- contract research in developing countries
- executing pilot projects
- supervising and evaluating projects
- preparing project specifications
- hiring of ITC aircraft, equipment and facilities for research projects
- designing tailor-made training courses
- image processing.

and operate in the fields of:

- * surveying, mapping and cartography
- * aerospace surveys
including aerial photography and all aspects of remote sensing and its application for development.
- * rural development and natural resource management including rural land use planning, resource assessment and evaluation, development programmes, survey design and project management.
- * urban surveys and human settlement analysis.
- * earth sciences and earth resource surveys
including geological, geomorphological and geophysical surveys.

Our consulting services cover the whole range of ITC disciplines and courses and benefit from the latest educational as well as research and development thinking.

CONSULTING GROWTH AT ITC

The following illustrates the growth of ITC's consulting services.

1981	-	120 man-months
1982	-	163 man-months
1983	-	219 man-months
1984	-	202 man-months
1985	-	277 man-months
1986	-	383 man-months
1987	-	500 man-months
1988	-	550 man-month (forecast)

This growth has been rather rapid, almost doubling between 1981 and 1984 and doubling again in the last few years, and has led to some growing pains in

terms of the administrative support for our projects and staff working in the field.

Recently improved organizational measures have been agreed and with a new project administrative unit we are confident in being able to cope with further future growth.

Of course, without the enormous drive, enthusiasm and professionalism of our project supervisors, team leaders and team members, this rapid growth would not have been possible.

Both the requests and financial support for our projects come from a variety of sources. Until quite recently, 90 percent of the projects were funded by Dutch development aid, ie, DGIS (the Dutch government's Directorate General for International Development Cooperation). They are still the major sponsor of our projects, but the rapid growth that has taken place over the last few years can be attributed mainly to the fact that other sponsors are now recognizing the services that ITC can provide. So now we find that the EEC, the World Bank, the various regional development banks, FAO, etc., are coming to ITC to provide the scientific staff or project teams to help them carry out projects in the developing countries. We are also providing our services to Dutch consulting companies, European remote sensing organizations and other ministries of the Dutch government.

TYPES OF CONSULTING PROJECT

The needs of the developing countries in which we tend to be able to help them best, can be grouped into four main categories: technical assistance, institutional support, training and research and development. While projects often combine elements from two or more categories, described below are the characteristics of the categories and a number of projects illustrating the main categories.

- 1) **Technical Assistance Projects** can be complex and contain many components. Here two components are discussed:
 - a) **Advice on "appropriate technology"**: technology is changing so rapidly that we are quite often asked to assist in identifying organizations' real requirements in terms of throughput, and then to assess how and what type of technology they need to meet these requirements. We are requested to give advice on staff (number, level, training requirements), and equipment and facilities. We provide assistance with the tender specifications, the subsequent evaluation of the tenders (to ensure they are obtaining value for money from the equipment manufacturers) and also with acceptance testing of equipment after the systems have been installed.
 - b) **Assistance with project execution**: we are often asked to help with project execution, including the formulation stage to help define the project, and to present a proper survey design - a document to present to funding agencies to obtain the necessary support to carry out the project. We also give advice on project monitoring, management, and evaluation to assess the results; we thus learn from the project to ensure that subsequent projects are carried out even more successfully.

One project which particularly well illustrates technical assistance characteristics is ITC's consulting services to the Aerial Survey Department (ASD), Ministry of Petroleum and Mineral Resources, Saudi

Arabia. This project first began back in 1962 and over the years ITC has been involved with:

- . assisting in the design and development of ASD: including initial need analysis, advice at early policy and planning stages, undertaking cost benefit studies and giving advice on strategical aspects of development.
- . direct staffing: including many short term assignments and some longer term missions with experts posted to ASD.
- . staff development and training: undertaken both at ITC, Enschede and at ASD either as formal lectures or on-the-job training.
- . designing and developing systems and production processes: mainly in the fields of aerial photography, photogrammetry and cartography but also in field survey, remote sensing and land information systems. More recently advice has been given on automation and digital mapping techniques. The development of ASD production capacity was a prime objective and ITC gave advice on the selection and testing of equipment, preparation of production manuals and production supervision.
- . assistance on the contract mapping programme: specific tasks where ITC has been involved include
 - preparing specifications
 - preparing tender lists, technical evaluation of proposals and advice of the award stage.
 - contract amplification discussions with the contractor, contract supervision, visiting contractors laboratories, problem solving, quality control and acceptance of mapping at all stages including finally printed maps (1:50,000, 1:100,000 and 1:250,000 scales).
- . organizing and executing pilot projects, particularly with respect to APR and orthophoto mapping techniques.

A second example of technical assistance is a project recently undertaken entitled "Environmental Profile for Western Province, Zambia." This project also illustrates ITC's contribution to meeting the development cooperation goals of the Netherlands' government in the management and development of natural resources.

Part of the Netherlands Government's commitment to international nature conservation is the production of so-called Environmental Profiles of areas where Dutch development cooperation is concentrated. Being involved in the preparation of a Land Resources Survey Programme for Western Province in Zambia, in 1986 ITC was invited to make an Environmental Profile for this region. This would be the first Environmental Profile made under the auspices of the Netherlands Government.

The preparation of the Environmental Profile coincides with the call for a National Conservation Strategy (NCS) for the whole country, which requires a Teak Forest Inventory and Carrying Capacity studies of rangeland. The NCS aims at decentralizing the coordination of conservation oriented development at Provincial and District level, so that surveys for the Environmental Profile are limited to the Western Province only.

The objective of the project was to assess the risks of over-exploitation and recommend preventive measures. The Profile was aimed at a number of target groups, the first being the Dutch and Zambian officials and politicians who would make decisions regarding Netherlands-financed

conservation programmes dealing with the sustained use of renewable resources.

The Environmental Profile is envisaged to be a general framework for preliminary assessment of potential negative impacts of development activities on the environment in the Province. In this context it is a description and analysis of the main ecosystems of a given area, assessing the potentials and limitations of exploitation of the renewable resources by development activities, and recommending measures to avoid environmental degradation and to promote conservation. In this respect integrated land resources data collection is very important and can be achieved with digital satellite imagery processing and interpretation linked to a LIS/GIS data-base.

The project started with a preparatory period at ITC for data compilation and analysis using data obtained from aerial photography and satellite imagery. After that, a two months field-work with Zambian counterparts took place in May and June 1987.

The surveys in Western Province were primarily concerned with forestry, wildlife, agriculture (including soil and grasslands), water and fisheries, and human health hazards associated with rice cultivation. Currently there are no major mining, industrial, infrastructural or reclamation developments, and the state of the natural environment is generally good.

Results were published in a final report issued in 1988.

- 2) **Institutional support projects:** institutional support is a somewhat new trend. ITC has been doing it for many years on an ad hoc and individual basis, in that former students frequently asked their former professors to come and help with problems in their countries. Now, however, the trend is to send rather large teams and provide longer-term support to help institutes in the developing countries. The main objectives of the institutional support projects are to provide follow-up services to our alumni, to help build and support local infrastructures and to develop production processes to help the countries produce the maps and information needed for development, to help set up local education centres and to assist with local staff development.

A project reflecting this new trend but which also contains technical assistance and training elements is the Trans V IBRD project in Indonesia which ITC is undertaking as leading consultant in association with Forschungsinstitut für Luftbildtechnik (FLT) Stuttgart, BRD and the Technical University Bandung (ITB), Indonesia.

The Trans V IBRD Project is ITC's first major World Bank project and forms part of the massive Indonesian transmigration programme in which large groups from overcrowded Java and Bali are resettled on some of the less populated islands in the archipelago.

Under the fourth five year plan, the Government of Indonesia received World Bank (IBRD) assistance for the physical planning of the transmigration programme, in a project known as Trans V. Within the scope of this programme in late 1985, ITC was invited to submit a proposal for the provision of a Technical Advisory Team (TAT) to furnish technical assistance to the National Coordination Agency for Surveys and Mapping (BAKOSURTANAL). The mapping programme of BAKOSURTANAL has been scheduled for seven years of which ITC should assist in the first four years of the programme.

The TAT will provide consulting services to BAKOSURTANAL with the aim of strengthening its institutional capacity, so that national base map production, particularly in support of the transmigration programme, is accelerated. Briefly the short and medium-term technical objectives of BAKOSURTANAL under the Trans V IBRD project are:

- to collect basic data for the national mapping programme (with dual camera aerial photography over 517.500 sq.kms and digital radar mapping in areas with permanent cloud cover).
- to produce base maps (line and photomaps; 1245 sheets).
- to establish homogeneous levelling networks of second order (9350 line kms on the outer islands).

In addition to supporting these objectives directly, the TAT also assists in manpower development with on-the-job and more formal training activities.

The TAT consists in total of 20 experts covering the full range of modern surveying and mapping sciences with missions varying from three months to one year (except for the team leader who is resident throughout the four year project).

Key elements in the institutional support programme include:

- . advising and supervising production activities (supervising supervisors) and undertaking production oriented training.
- . manpower development and technology transfer appropriate to an organization in the transition from conventional to digital mapping.
- . advising and assisting in the preparation and execution of a major contract surveying and mapping programme.

- 3) **Training projects:** the training for which we are most commonly asked to help is, of course, the practical, "hands-on" type. There is an enormous need for people actually to be able to do things in their own countries not just be able to talk about them or understand the theory, but actually be able to do things, to implement projects, to carry them out to help regional development in their own countries. So we do a significant amount of on-the-job training in the countries themselves. We have several projects where we help to teach teachers, who in turn will teach more people in their own countries. We have developed a number of "mobile" courses at ITC, which we take to different countries, adapting them in each instance to the local conditions. We are often asked to give tailor-made courses to groups of specialists in a certain discipline. These are usually of rather short duration, ranging typically from four to six months; they tend to supplement the traditional one-year courses at ITC. We are often asked to help in transferring our courses to other institutes overseas, and of course we have a number of requests to assist developing countries with teaching materials and to help them develop their own courses.

Current education projects abroad include:

- . supporting the Survey Training Institute of the Survey of India in integrated digital mapping training and updating STI courses.
- . supporting the Centre for Forest Training, Bogor, Indonesia in environmental conservation and watershed management training.
- . supporting IGAG/CIAF, Columbia in training in remote sensing, its applications and related fields such as geographic information systems, photogrammetry, cartography, etc.
- . supporting PUSPICS, Gadjah Mada University, Yogyakarta, Indonesia in remote sensing and land information systems.

- . supporting the Indian Institute of Remote Sensing and the Wuhan Technical University, China in developing urban survey and human settlement analysis courses.

ITC is also involved in giving shorter courses in Thailand, Ghana, Tanzania, Columbia and Indonesia. Furthermore, self teaching technician packages and/or mobile courses have been or are in the process of being prepared in (basic digital) photogrammetry, cartography, soil surveying and most recently in training for photogrammetric instrument maintenance and project management.

The demand for contract education in digital mapping at ITC and abroad has been a clear pointer to the need to redesign our approach to photogrammetric and related education, resulting in new courses integrating digital photogrammetry, image processing, G.I.S., automated cartography, etc.

There is a clear trend for more education overseas particularly at the technician and technologist level with more multi-disciplinary integrated courses linking the fields of aerospace survey and earth sciences taking place at ITC.

The idea of "geoinformatics" (a new word that we frequently hear at ITC these days) is currently used to describe this link.

- 4) **Contract research projects:** in 1987 the results of our largest research project were published. The project was named "ILWIS" (Integrated Land and Water management geo Information System) also known as the "Sumatra project", which started in 1985. This computer-assisted system for agricultural planning in watershed areas is now in operation. It has been installed at the ITC-supported training institute (PUSPICS) of the Gadjah Mada University, Yogyakarta and at the Ministry of Forestry in Jakarta; there are plans to install ILWIS more widely in Indonesia, in Colombia and in several other places.

The high level of performance, the choice of the relational data base and the low costs are the major factors influencing the success achieved so far. Publications include three manuals, 10 MSc theses and six scientific papers.

Future developments will link ILWIS with ARTEMIS, an operational remote sensing system, to create a reliable crop monitoring system so desperately needed in the East and Southern Africa region.

THE NEEDS OF DEVELOPING COUNTRIES.

Looking at the application areas for which we receive most requests, we see that they cover all existing scientific departments of ITC. Over the past 18 months, we have received numerous requests for projects involving water resources of various types - irrigation, subsurface water, water supply, etc. There is still an enormous need for water supply projects in the developing countries.

Many countries still have problems with the speed at which they can produce maps or update existing ones, without which development projects cannot progress efficiently. Budget limitations restrict activities in some countries, elsewhere security is a major factor.

In certain countries, specifically Indonesia, there has been an enormous demand for ITC to assist them in developing the techniques of low-cost, small-format aerial photography, especially applied to urban monitoring. In forestry, the demand for our services has exceeded our capacity; we have not been able to respond for some time to this enormous demand for forest management expertise. ITC has trained many foresters in the developing countries, and they very regularly ask for more advice and more projects in this field, especially in the tropical areas.

We are collaborating with the FAO and other institutes, as indicated earlier, in crop monitoring. There is a great need in many countries for reliable crop monitoring techniques, and also information in the field of urban analysis. ITC has built up an excellent reputation in this work and we have many requests and numerous projects for assistance.

Surveys of both natural hazards - such as volcanos and earthquakes - and man-made ones are also important in the developing countries. ITC expertise can assist in carrying them out and in training local personnel in hazard surveying and monitoring.

There are many other endeavours in the developing countries for which we are asked to assist and the projects outlined above serve to illustrate the way ITC can respond to meet the needs of the developing countries.

THE ITC NETWORK

Membership of the ITC family is rather special and our relationship with the Technical University Bandung (ITB) serves to illustrate this rather well. ITC first started training ITB students in the mid 1970s and to date some 20 students have attended ITC following mostly post-graduate and MSc courses in photogrammetry, cartography and more recently urban surveys and human settlement analysis. A number of students have returned to complete MSc. studies and we expect the first PhD students in 1989.

The School of Photogrammetry and Cartography (PPFK) was established during the period 1975-80 with the assistance of Dutch government funding. A project executed by ITC provided much of the initial staffing and equipment to develop the School. From 1980 PPFK has functioned basically independent of Dutch assistance with the possible exception of short aftercare missions concerning instrument maintenance.

In 1986 we entered a new stage in our relationship when ITC bid jointly with ITB as consultants for the Trans V IBRD project. We also jointly undertake low cost small format aerial photography missions in Indonesia.

In a project which is still on the drawing board we expect to cement the relationship even further and assist in upgrading PPFK facilities to better meet the training challenge in the transition from analogue to digital technology in Indonesia.

FUTURE NEEDS FOR CONSULTING

Looking a little bit into the future, we think the need for consulting will become even greater, especially because of rapidly changing technology. Many developing countries are rather uncertain about upgrading or modernizing their facilities, or waiting a little longer until the technology has settled down or become cheaper. We have a great role to play here, including advising our former students and their organizations on how to cope and adapt, and training their people to implement and utilize the new or existing technology.

This is also important for ITC because it applies to several of our existing courses. We have to ensure that our courses stay up-to-date and respond quickly to these changing technologies.

Furthermore, we are now facing increased competition. After 36 years, ITC's success formula is gradually catching on, and several other institutes in North America, Australia and Europe are now trying to provide services similar to our own. The need is so great that there is room for everyone, but consulting keeps us at the forefront of what is required by our students and enables us to maintain an edge over our competitors.

Unfortunately, another reason for remaining involved with consulting is that during times of government budgetary restraints, the extra income we generate from consulting allows us to invest continuously in the best and most modern facilities and equipment for our students. It also allows our staff to attend conferences and professional meetings to stay up-to-date so that we can continuously and rapidly respond to the needs of the developing countries.

Thus if ITC accepts the challenge to remain involved in consulting, and on the understanding that we are so organized and structured that the projects run smoothly and we deliver good products and services (as we have always done in the past), then there are many benefits to both ITC and the developing countries. It gives us continuous staff development. Our staff benefit from the experience of involvement in projects and observing first-hand the needs of our clients. This enables us to continuously update our own courses. For example, the recent STI project in India allows us now to provide a very advanced integrated digital mapping course at ITC. It also enables us to bring in certain expertise that we may not have in-house. Being involved in consulting, we are able to respond much more rapidly to users' needs in the developing countries because we know their requirements and can be prepared when they ask us for advice or expertise. We are able to respond rapidly because we know what those requirements are. The revenues allow us to invest in staff and modern equipment. Our facilities are still the envy of most other universities or training centres anywhere in the world.

In relation to the research and development potential, the funds that were provided to develop the ILWIS project mean that the R&D invested in terms of GIS now put ITC in a very strong position in this field.

Of course, another benefit of consulting is the job satisfaction; it is very rewarding for the staff to work in the developing countries to achieve a result or solve a particular problem for which they have been asked to assist. Thus by being and staying involved and staying at the leading edge of both the newest and most appropriate technologies, ITC can strengthen its unique position in the fields of earth resources, aerospace techniques and "geoinformatics". Departmental boundaries are becoming weaker and the departments are becoming more integrated as ITC's multidisciplinary consulting and contract research projects involve many scientific departments in the same project. Partly because of the benefits resulting from its consulting activities, ITC is well-placed to accept the challenge of accepting and adapting new technologies to the betterment of itself, its alumni and their organizations in the developing countries.

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