Global Spatial Data Infrastructure
February 2-6, 2004 Bangalore, India
7th Conference

A Framework for Technological and Organisational Capacity Building for Local Level Planning in India

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Abstract

The planning process of the Indian government has undergone many changes since its launch in 1951. Decentralised local level planning is currently accepted as the national planning strat egy. Towards this end, the Constitution (73rd and 74th Amendments, 1992 & 1993) has been amended to empower the State Governments to form the Institutions of Local self-Governance (ILG). The mandates of such local level bodies are to draw up and implemen t integrated development schemes. These schemes require the collation and collection of data relating to local resources as well as the appropriate tools for processing the data to generate relevant information for local level planning.

To address this need, the Department of Science & Technology (DST), Government of India, launched the Natural Resources Data Management System (NRDMS) programme with the purpose of developing and providing geo-Information and Communication Technologies (geo-ICT) and tools to potential users. NRDMS started in 1982 as an R&D programme and has consumed about US$2 million to date. Many tools and techniques have been developed and demonstrated to potential users, including some ILGs. However, a recent NRDMS programme assessment revealed that utilization of geo-ICT tools and techniques has not been institutionalized in ILGs. The most prominent reasons include: (i) lack of technological capacity at ILGs (ii) poor linkage of geo-ICT with the organizational work flows at ILGs, (iii) unavailable standardised and up-to-date spatial data at all levels and (iv) lack of data sharing.

Currently, joint federal efforts between DST and the Indian Space Research Organisation (ISRO) to implement the Indian National Spatial Data Infrastru cture (NSDI) are expected to address the data availability and sharing problem at a federal level. Hence, building the requisite technological and organizational capacity at ILGs deserves special attention. In this paper, we (i) highlight the *evolution* of the NRDMS programme over the past 20 years, (ii) propose a *framework for the assessment & development of technical and organizational capacity of ILGs*, (iii) develop a *local Spatial Data Infrastructure strategy* for the generation and sharing of data pert inent to local level planning and (iv) outline a *validation* methodology of the proposed framework at the Bankura District of West Bengal in India.

Introduction

With the constitution of Indian Planning Commission in March, 1950, planning experiment in In dia started in 1951 with the objectives of 1) Removal of poverty, 2) Building of a modern society making maximum possible use of Science and Technology and 3) Attainment of self-reliance (Planning Commission,). Key to national prosperity was identified i n effective combination of three factors, technology, raw materials and

capital (Scientific Policy Resolution, 1958). The initial approach of planning based on macro level assessment of resources did not yield the desired results. The inequities amongst pe ople and disparities between regions persisted. Also, there was evidence of general environmental degradation and mounting stress on land and water resources. In order to overcome the situation, conceptual changes in the practice of planning was brought in, around late 70s, by adopting the decentralised or local level planning to ensure that the development is sustainable, area-specific and take into account the felt needs of the local people. The objectives of decentralised planning are ;1) Increase in Pr oductivity of land, 2) Employment generation. Keeping in mind assets development, 3) Poverty alleviation and 4) Provisions of minimum amenities and infrastructure facilities (Reference:). Towards this end, the Constitution (73 rd and 74th Amendments, 1992 & 1993) was amended to empower the State Governments to form the institutions of local self - governance i.e. rural local bodies (panchayats) and municipalties (nagarpalikas) in rural and urban areas respectively.

At the core of this concept lies an integr ated approach to planning in contrast to the sectoral method. This requires a detailed knowledge of the interrelations and interdependencies between various sectors to resolve often-conflicting demands. This leads to a requirement for appropriate data management and analyzing tools and techniques and a large matrix of sectoral data, in digital format, on natural resources, demography, socio - economy etc. and integrating them to generate appropriate information/applications required for plan preparation.

India has a long tradition of systematic collection of spatial and non -spatial data at National level. Some of the national organizations involved data collection in different sectors is given in the table -1.

Table-1 Some old national organizations for spat ial and non-spatial data generation

Organisations	**Years of Operation**
Survey of India	235 years
Geological survey of India	151 years
Marine survey of India	138 years
Census of India	130 years
India meteorological Department	126 years

At the district level, history of non-spatial data collection date backs to the eighteenth century, when a District Gazetteer used to be there for each district. There is a strong tradition of non -spatial data collection at the local level (district) by different depa rtments. The development of database technologies, e ntry of computers in India in the late 70s and first Indian Remote sensing Experiment in 1977, triggered the possibility of introduction and integration of geo spatial information in the planning.

Considering the emphasis on technological self-reliance and development and adaptation of suitable technologies for local needs to make an impact on the lives of ordinary citizens (Technology Policy statement, 1983), the Government of India initiated a number o f technology-based programmes to support the Local level planning in1980s viz. Natural Resources Data Management System (NRDMS) of the Department of Science & Technology, National Natural Resources Management System (NNRMS) of the Department of Space (DOS) and Geographical Information System (GISNIC) and District Information System (DISNIC) of the National Informatics Center (Ministry of Communication and Information Technology).

2. NRDMS: The Programme

The Department of Science and Technology (DST) as a multi-disciplinary and multi-institutional R&D programme initiated natural Resources Data Management System (NRDMS) programme in 1982. The evolution of the programme has been discussed below in details by dividing it into three decades viz. 1st decade from 1982-92, 2nd decade from 1992-2002 and 3rd decade 2002 onwards.

2.1 First decade (1982-92)

During this period , national planning exercise was in transition from national to local, while the planning philosophy was sectoral . The Planning commission in troduced concept of spatial planning to smaller area levels. Pertinently, vision of the NRDMS programme during its inception was to provide S&T inputs for operationalisation of the concept of Decentralized Planning of the country. Goal of the programme was to develop computer compatible methodology for developing spatial databases on natural resources, socio and agro -economic parameters to further the concept of area specific decentralized planning. In order to achieve this goal, the objectives of the progr amme were:

- To promote R&D in spatial data management.
- To develop pilot scale integrated databases on natural resources and socio -economic parameters to cater to micro level planning.
- To demonstrate the efficacy of database approach for management and cons ervation of natural resources with emphasis on location specific problems.
- To build spatial resource profiles at different hierarchical units of planning i.e. district, block and panchayat .
- To provide software support for data management, modeling and ope rations research.
- Training of potential users.
- Documentation and dissemination of NRDMS methodology.

Data collated and collected from different sources like topo -sheets, aerial survey, satellite imageries, census reports, data from district line departme nts and from limited surveys were used to convert into computer compatible formats in a common database which was not developed as per database design. Those data were processed to generate outputs like statistical table, thematic maps, charts, diagrams etc. and were considered to be inputs or support to decision -making (Fig.1). The system was not focus to the information requirement of users.

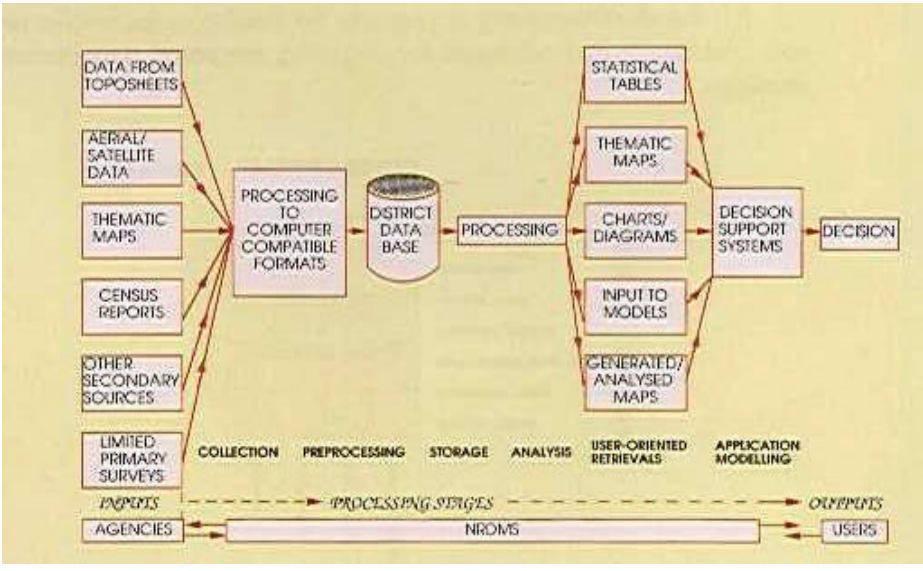

Figure1. NRDMS Methodology during First Decade (1982-1992)

At the end of the first decade, standardized formats and computer-based methodologies for collection, storage and retrieval of data on natural resources and socio-economic parameters were developed. An indigenous DOS based GIS package, Geo Reference Area Management (GRAM) was developed in modular form. On the recommendations of the working group on district planning set up by the Planning Commission and the multi-level planning unit of the Planning Commission, the developed packages were operationalised by establishing ten pilot district database centers at Vishakapatnam (Andhra Pradesh), Koraput (Orissa), Sultanpur (Uttar Pradesh), Gurgaon (Haryana), Kheda (Gujarat), Alwar (Rajasthan), Munger (Bihar), Pauri (Uttar Pradesh), Chandel (Manipur), Goa/Daman. The average cost for operationalising the centers was $13b,000 per annum. Few decision support modules for location of amenities, land and water management and investment planning were developed in research mode. The application of developed technology was demonstrated in drought management in the Gurgaon district of Haryana state.

On evaluation of the first decade of the NRDMS programme the following shortcomings were observed:

Data

The developed databases were mostly non-spatial and not much spatial data were there. Due to inefficient inter-sectoral data flow, developed databases were not integrated in nature and didn't serve the information need of local level planners. In spite of huge amount of data collected, little of it was available in computer compatible digital form.

Technology

Exorbitant cost of imported equipment and software packages on Relational Data Base Management (RDBMS) and Geographical Information System (GIS) and higher cost of conversion of spatial data to digital form were the main hindrances to the diffusion of spatial data technologies at the local level. The developed databases were not as per integrated design, thus, did not support multi-sectoral data integration. Need for development of technologies for spatial information generation was felt to fulfill the need of local level planning. The developed databases needed constant updating and developed software and GRAM needed updating and maintenance.

Technology Transfer

Lack of trained manpower in the R&D sector as well as handling of spatial databases at the local level was hindering the spatial data technologies potential application to local level planning. Need for demonstration of the technologies to users was felt during the end of this decade.

2.2 Second decade (1992-2002)

At the local level, necessary institutional changes were brought about during this period to ensure peoples participation in the planning process. As per the provisions of the 73rd and 74th constitutional amendments (1992-93), different State Governments constituted a three tier system of local bodies at district (Zilla Panchayat) , block (Panchayat Samiti) and village (Gram Sabha) levels at rural areas and municipalities (Nagarpalikas) at urban areas. Mandates of such local level bodies are to collect revenues,

draw up and implement integrated development schemes.

In order to maximise the economic and social returns from the developmental programmes of the Government and ensure optimal utilisation of the local resources, the need for integration of poverty alleviation and area development programmes with the sectoral schemes at the local level were being highlighted since the VIII 5 Year- Plan (1990-95) of Planning Commission. The plan also suggested that the developmental plans should be drawn u p at the local level (district and below) taking into account the physical and human endowments of the area, felt needs of the people and funds available.

Entry of GIS in India during late 80's , launching of Indian Remote Sensing Satellite during 198 7 and development of the Geo Information Science guided the evolution of the NRDMS programme during its second decade. The programme was considered as a major initiative for introduction of Geo spatial technologies and tools in the local level planning of the country with the focus on integration of multi -sectoral data and information.

In this context, vision of the programme remained the same as first decade, while the goals were focused towards 1. Development of spatial data management technologies for i ntegrated rural development planning and 2. Demonstration of utility of spatial data tools in local level decision making.

Objectives remained almost the same, adoption of GIS, as the core of NRDMS methodology for locale specific problem solving was made explicit. Forging linkages with users at different levels was introduced as one of the objectives for dissemination of NRDMS methodology.

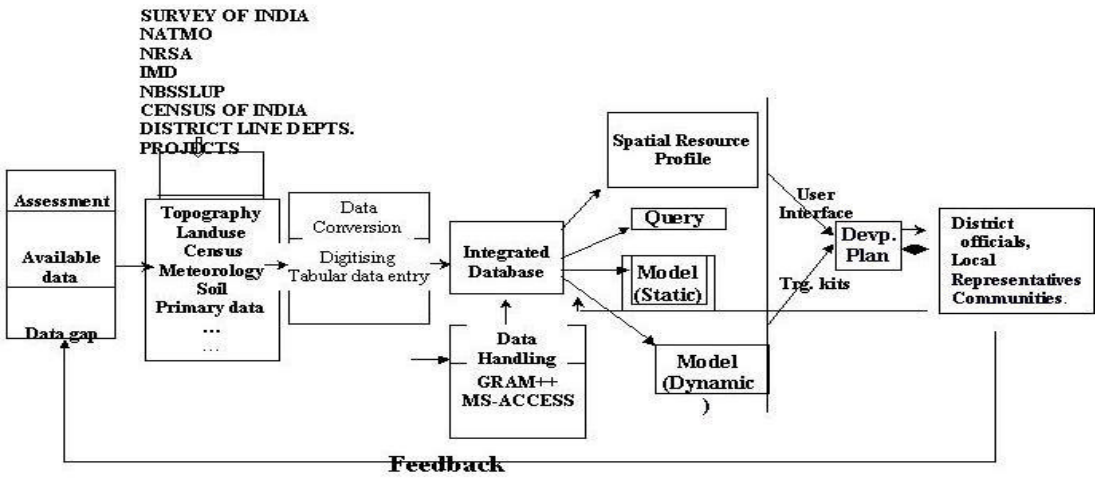

Figure2. NRDMS Methodology evolved during Second Decade (19922002)

As seen in Fig.2 target groups for NRDMS had been identified as communities, line department officials and representatives of local governance institutions. Under NRDMS a methodology had been developed for their information need assessment. A multi -pronged strategy was being

adopted to identify the data needs for performing GIS analysis. The approach was (i) Study and survey of all the reports, manuals and guidelines on all the government schemes and programmes in operation at the district, (ii) interaction through workshops with selec ted line department officials and stakeholders at multi -level to assess their information needs in implementing the schemes (iii) analyse and capture the needs of the decision support systems to be developed in the main sectors of integrated development pl anning viz. Land use planning, water management, amenities location and energy management. Based on this exercise, a list of the probable applications in different sectors and Master Data List were being prepared indicating the nature of the data, its scal e / resolution / frequency of collection. A survey were then to be undertaken to assess the availability of the data with various national mapping agencies like Survey of India, National Atlas & Thematic Mapping Organization, India Meteorological Department, Census of India, local scientific institutions and line departments to generate the required information. The data sets that were still needed but not being collected by any survey agency or line departments were identified as the data gaps, which were then to be generated through primary survey . The available data were then be collected and converted to digital mode.

The next step was the development of an integrated database as per the database principles for easy and efficient storage, management a nd retrieval of data for relevant information generation. For this purpose, integrated database design had been developed under NRDMS, which took care of the relationship between natural resources and administrative features and the available feature codes for them standardized under National (Natural) Resources Information System (NRIS) programme of the Department of Space were used. Under NRDMS the codes were upgraded in terms of scale and non -existent features like flora, fauna etc.

Development of in tegrated database is a pre -requisite for developing different information prod -ucts required for integrated planning like: a) Resource profiles, b) Query -based information , c) Static and dynamic outputs based on Spatial Decision Support System (SDSS). St ructured organisation of the relevant datasets on an inventory is an essential pre -requisite to the preparation the resource profile. Information can also be generated by overlaying and querying on different laye in the resource profile . Decisio n Support Systems (DSS) are defined as computer -based informat systems designed to support decision -makers interactively in thinking and making decisions ab relatively unstructured problems. Traditionally, DSSs have three major components: a databa se model base and a user interface (Fig. 3). An extension of the DSS concept, Spatial Decision Supp Systems (SDSS) , which are the integration of DSS and GIS was initiated by Densham and Goodchi 1988).Two types of outputs can be generated out of SDDSs , a) Static like water yield, silt yield maps etc. and b) Dynamic like alternate developmental Scenarios. All these information products became inputs for different developmental plan Preparation .

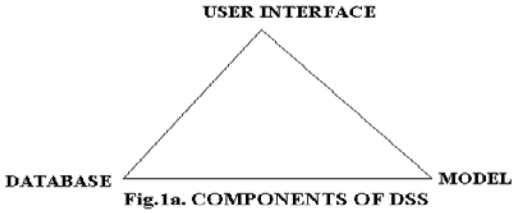

Fig.1a. COMPONENTS OF DSS

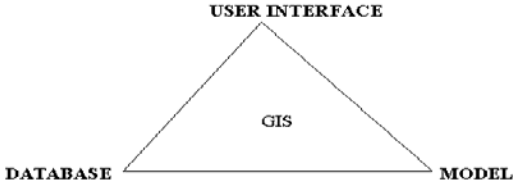

Fig.1b. COMPONENTS OF SDSS

Figure 3. Components of DSS and SDSS.

At the end of the second decade, about $2.1 million had been spent on the NRDMS programme. This included a support of $1.26 million from the UNDP. The major outputs at the end of second decade have been enumerated in the Table 2.:

Table 2. Major Outputs of the NRDMS programme (1992-2002)

1. Improved procedures for data collection, collation and processing at local level developed.
2. Indigenous GIS package GRAM upgraded to Windows based GRAM++ and allied tool s like GRAM controls, VECVIEWER, GRAM-DRISHTI developed for customization and applications development.
3. Tutors (GIS Tutor, GRAM++ Tutor) developed for the training of officials and Line Department staff, NGOs and Communities in principles of GIS.
4. Spatial Decision Support Systems for Water management, Energy management and infrastructure development developed.
5. Software to aid watershed management spatially developed e.g. GRAM SWAT, WMDSS, and ECOLAND.
6. User- friendly interfaces developed for language conve rsion, visualization and web-based applications.
7. Spatial resource profiles and user specified applications developed and demonstrated at district level in selected sectors of land and water management, road construction, infrastructure location, health pl anning, natural disaster management, election management etc.
8. Pilot scale district level GIS databases developed and demonstrated in 40 districts. Stage has reached for proliferation of the Geo -information technologies at other districts.
9. Availability of the Core Expertise in Spatial Data Management in R&D institutions and concept champions at districts / states.

NRDMS is a technology – driven programme. During its two decades of existence, the programme developed many tools and technologies, which had be en used to build up the technological capacity of the users. Impacts of the programme during its two decades of existence have been summarized below:

1. Awareness about usefulness of GIS technology in local level planning has been developed at different leve ls of decision-makers. As a result many of them championed the introduction of geo - spatial technologies in local level.
2. Availability of integrated database , spatial profiles and tools like GRAM++ GIS package, Decision Support Systems (DSS) , VECVIEWER et c. made it possible to develop and demonstrate applications in different sectors for many districts, which attracted Local Government Departments (LGDs), representatives of Institutions of Self Governance (ISG) and Non Governmental Organisations towards the NRDMS centers. This resulted in introduction of spatial information and technologies in local level planning in limited scale.
3. State Governments (like West Bengal, Karnataka, Uttar Pradesh) and District authorities have felt the need of adapting geo-spatial technologies and tools for decision -making and thus took over operation of some NRDMS centers in states and state level GIS committees have been formed in the

states.

4. Availability of Geo-Information and Communication Technologies (Geo-ICT) and trained manpower at local level have created an environment favourable for application of these technologies at local level. This has created business opportunities for private sector firms dealing in GIS.

But, still the shortcomings in usage of Geo-spatial information in local level decision making are:

Data

Multiplicity of agencies in generating similar but incompatible data sets on land, ground water, forest, soil etc. causes redundancy in data collection, utilization and its integration for pl anning purpose. The incompatibility may arise due to differences in the format of data collection, time windows, accuracy and resolution, methodology and spatial connotation. Lack of information on data quality, completeness and lineage is also hampering data utilization As a result it is difficult to match and inter-relate the different data sets and inhibiting their integration for information generation. Moreover, mostly data are available at 1:50,000 scale and has not been upgraded with high-resolution data to address the local level requirement.

Existing data management system at the districts or lower levels is not fully geared in terms of technical and organizational capacity to address the information needs at the level of the panchayats and nagarpal ikas.

Technology

Developed integrated database could not be implemented fully due to lack of user-friendliness of the package, data availability in field and training of people. Data at required large scale could not be collected in absence of technology for high-resolution data capture. No access mechanism has been developed so that whatever geo-spatial data are available can be utilized by the end-users.

Technology Transfer

GIS tools like GRAM++, VECVIEWER, SDSSs have only been demonstrated , but not adopted by any LGDs , due to lack of hands on training . Capacity in terms of hardware, software and human ware have not been developed in the LGDs.
In lower area units like blocks or village panchayats, officials or communities are not adequately trained or attitudinally oriented towards using the modern tools for accessing information relevant to local level planning. It has also been observed in certain instances that availability of tools, institutions and training are not enough for realizing the ir operational scale use in planning activities. Non-availability of the urge to adopt data / information in deciding complex issues has been an important inhibiting factor before NRDMS in restructuring decision-making at smaller area units.

2.3 Current decade (2002 onwards)

At the end of the second decade of NRDMS, the institutional and technological conditions have considerably changed to support the introduction of Geo Spatial information in local level planning. The task of planning has shifted from district head quarters to lower tier of Institution of Local Government (ILGs) i.e. Local Government Departments and Institutions of Self Governance. With the maturing of the Geoinformatics i.e. remote sensing, GIS, GPS, communication, internet, on-line data updating, it is now possible to make digital maps with village communities. Demonstration of utility of Remote Sensing and GIS has lead to adoption of technologies by the State Governments.

In order to make standardised geo-information and services accessible to the wide range of users, Department of Science & Technology and Department of Space have launched the Indian National Spatial Data Infrastructure (NSDI) initiative. The Department of Space has also launched the Natural Resource Information System (NRIS) for the creation of state and district level information nodes. Availability of the core set of tools for data packaging like GRAM-VIEWER, GRAM-Drishti etc and training of different level of users have raised the technological capacity at the local level for utilization of Geo Spatial Information in local level planning

planning.

At the policy level Science & Technology Policy (2003), Information Technology Policy (1999) of the Federal and some State Governments have emphasised on utilization of ICT fo r masses. Changing nature of spatial data products and services need has catalysed the possibility and requirement of a public-private partnership for providing Geo-information products and services.

Vision 2020 conceived by the Indian Planning Commissio n has emphasized on India evolving into an information society and knowledge economy built on the edifice of information and communication technology (ICT) and shifting determinants of development from Manufacturing to Services and Capital resources to Knowledge resources (2003).

In view of the above situation, the vision, goals and objectives of the NRDMS programme have been updated as follows (2003):

Vision

Enabling people, communities and institutions of local-self Governance with requisite databases a nd S & T tools for informed participation in local self-governance .

The corresponding goal of the Programme to realize the above vision is to strengthen the S&T inputs in developing tools and techniques for integrated resource management and for capacity building at various levels for planning and implementation in a spatio-temporal context in a multi-level framework below the district.

The objectives are to:

- Demonstrate and promote the use of Spatial Data Technologies for micro level planning under div erse terrain conditions
  - Provide software support for data management, modelling and operation research
  - Promote R & D in spatial data technology
  - Technology Transfer & Capacity Building of potential users
  - Forge linkages with the users at different leve ls
- Provide S&T inputs for framing Policies related to Spatial Data Technologies
- Develop & Demonstrate pilot scale spatial infrastructure and provide research support to National Spatial Data Infrastructure.
- Documentation and dissemination

The focus is on catalyzing R&D and application of Geo-spatial information technologies for finding locale-specific solutions on planning.

After two decades of existence of NRDMS programme , it is apparent that though technological development has taken place under it , institutionalization of NRDMS methods, tools and technologies in local level planning has not taken place. As observed by the World Bank, in developing economies, main constraints for deploying informatics for development are human resource and institutional capacity deficiencies (Moussa and Schware, 1992).

In the context of the NRDMS programme, the main reasons for non - institutionalization in the local level planning have been identified as, (i) lack of technological and organizational capacity o f ILGs (ii) poor linkage of geo-ICT with the organizational work flows at ILGs, (iii) unavailable standardised and up-to-date spatial data at all levels and (iv) lack of data sharing.

Currently, joint federal efforts between DST and the DOS to implement the Indian National Spatial Data Infrastructure (NSDI) are expected to address the data availability and sharing problem at a federal level. Hence, building the requisite technological and organizational capacity at ILGs deserves special attention.

Capacity building is the process by which individuals, groups, organizations and institutions strengthen their ability to carry out their functions and achieve desired results over time (Morgan, 1997). In the current era of accelerating technological and institutional changes , strengthening the capabilities of individual, organization and institutions is essential to ensure the sustainability of development efforts. Capacity building involves the acquisition of new knowledge and its application in pursuit of personal and organizational goals .

3. The Approach

While technological development under NRDMS has reached a level that the potential of Geo -ICT is largely realized, the main challenges are to find methodologies for up scaling the numerous disjoint applications and successful pilot cases into effective operational systems that can truly develop the capacity of ILGs in addressing the local developmental problems more efficiently and effectively.

Unless ILGs have the technical, organisational and institutional capacities to articulate local demand and to absorb federal supply, federal initiatives like the NRDMS, NNRMS and last but not least, the NSDI will have few chances of success. Currently the federal and state IT policies, as well as federal S&T policy emphasis on utilizing IT for improving the efficiencies of government departments in satisfying their users and stakeholders requirements. In the view of current advances in organizational performance assessment methodologies and organizational capacity development models by different international organizations like International Development Research Center (IDRC), United Nations Development Programme (UNDP), World Bank (WB) etc. and models for aligning core business and Information Technology (IT) in organizations, it is suggested to adapt and customize them in the context of Geo -ICT for building up a capacity-building framework for local government departments.

The proposed framework for development of the technological and organizational capacity of ILGs is based on the following steps: (i) Selection of Local Government Departments (LGDs), who have potential of Geo-ICT usage in their work processes and/or it in their mandates, (ii) Diagnosis of the current performance of selected LGDs, (iii) Determining their desired future based on mission, vision and policy requirement , (iv) Gap analysis at both the levels and (v) Development and validation of a plan (model) for technological and organisational capacity building by aligning their core business and Geo-ICT technologies and strategies to enable these institutions absorb the outcomes of federal initiatives and articulate local needs to provide a demand pull to NSDI.

For this purpose, it is proposed to adapt the framework for organizational capacity and performance assessment developed by Lusathus *et al* (1995) for IDRC and updated by Lusathus *et al* (1999) , which has been used by Horton *et al* (2000)in Latin America and Strategic Alignment Model (SAM) developed by Henderson *et al* (1992) for organizations trying to develop IT capacity for measuring the current performance level of selected Local Government Departments and to build up a strategic plan for improving their performance through introduction of Geo -ICTs.

In IDRC methodology, performance of an organization can be conceived as falling within three broad areas: performance in activities that support the mission (effectiveness), performance in relation to the resources available (efficiency), and performance in relation to long -term viability or sustainability (ongoing relevance).

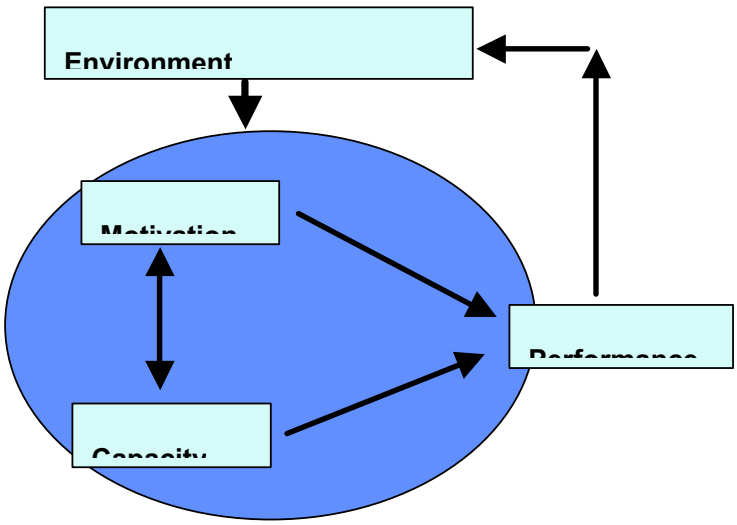

Figure 4: The dimensions of capacity building afterLusathus *et al* (1995) and Lusathus *et al* (1999)

Performance is gauged by the perceptions of the organisation's stakeholders and customers and is influenced by a number of external and internal factors:

- the external Geo-ICT technological context & the institutional environment, the latter referring to the administrative/legal, political, economic, social/cultural context within which the organization operate
- the organizational motivation refers to internal factors (historical evolution, mandate, mission, culture, incentives/rewards system) that influence the direction the organization is headed
- the organizational capacity refers to internal factors such as str ategic leadership, human resources, other core resources (infrastructure, finance), innovation and development capacity, process management capacity & linkages with other organizations within a Geospatial Data Infrastructure (GDI) (Figure 4).

In the IDRC methodology, technological capacity of the organization is considered as a part of external environment while performance measurement is explicit. On the other hand, the SAM considers the technological strategy as an important internal component to be al igned with the core business process of an organization and performance measurement is implicit in it. The important components of SAM are: (1) Business strategy, (2) Geo-ICT strategy, (3) Organizational infrastructure and (4) Geo -ICT infrastructure, all within the context of the external business and geo -ICT environment (Figure 5).

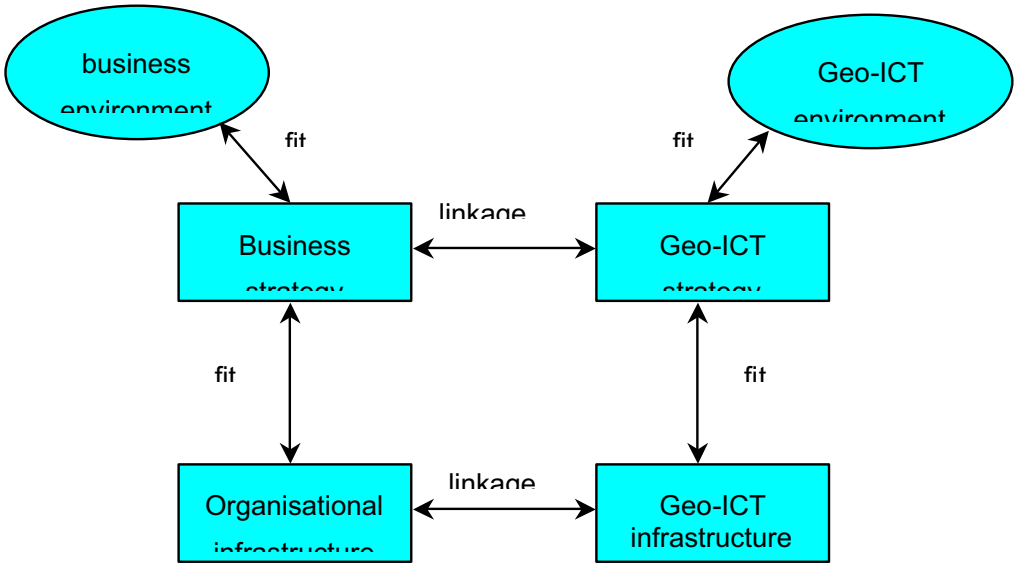

Figure 5: Components of Strategic Alignment Model (SAM) by Henderson *et al* (1992)

Business strategy includes the business scope, governance (strategic alliances, join t ventures etc) and distinctive competencies (pricing, quality, value added service, distribution strategies etc). Organizational infrastructure includes organizational design, geo -information production processes (workflows needed to provide the chosen p roducts and services) and skills (human resources required for this purpose).

The geo-ICT strategy includes the geo-ICT scope (scanning the IT market place for appropriate IT systems and capabilities), systemic competences (making choices on system reliab ility, interconnectivity), and joint ventures (partnerships to obtain the required capabilities). The geo -ICT infrastructure includes the architecture (choices of applications, geospatial data and technology configurations), processes, and skills. The l inkages between the business and Geo -ICT domain are of utmost importance. Of similar importance are the fits between the operational and strategic level within the enterprise.

In view of the complimentary nature of the above two models, it is proposed to adapt the above two models for evaluating the current organizational performance. Performance needs to be assessed in qualitative terms, quantitative terms, and in terms that relate performance to basic organizational and technological capacity. For qu antative assessment , different components of Performance i.e. Effectiveness, Efficiency and Relevance can be given different Grading/ weightage for the selected organization within the current context and then they can be combined to prepare Organisational Performance Index.

Performance and capacity are interrelated concepts. Organizational performance arises from the use of capacity. Assessing performance also leads to areas where capacity needs building. The mission, vision of the organizations and poli cy requirement can guide the pathways for geo -spatial technological and organizational capacity building of the selected organizations which can improve their performance in satisfying the requirements of their stakeholders and customers. For building up such a capacity building model, it is proposed to fuse the IDRC model and SAM and adapt them in the context of ILGs.

In the context of capacity building for GDI , Georgiadou and Groot (2002a) has defined ‘capacity building”as the improvements in the abi lity of organizations to perform agreed tasks either singly or in co-operation with other organizations within the broad set of principles of a Geo -spatial Data

Infrastructure. The above-proposed framework is an effort towards this direction so that the Geo-ICTs can be adopted by the ILGs in their work flow process and their performance in their core businesses improve with it. The proposed framework will be validated in the district of Bankura in the state of West Bengal and for this purpose two LGDs viz. State Water Investigation Directorate (SWID) and District Land Record Office (DLRO) have been selected. It is expected that the outcomes will provide a plan for upgrading the Geo-ICT capacity of SWID and DLRO and will provide a pull factor to the NSDI and will also sow the seed of Local Spatial Data Infrastructure (LSDI) in the Bankura district.

References:

1. Densham, P.J., and M.F. Goodchild. 1988. Spatial decision support systems: A research agency. GIS/LIS'88 Proceedings Volume No.2 Bethesda, Maryland: American Congress on Surveying and Mapping. November-December 2, 1988.
2. Georgiadou, Y. and. Groot, R. 2002a. Beyond Education: Capacity Building in Geoinformatics, GIM International, February 2002, Volume 16, pp. 40-43
3. Henderson, J.C., Thomas J.B., N. Venkatraman (1992). Making sense of IT: Strategic Alignment and organizational context, CISR WP No 247, Sloan WP No. 3475-92BPS, Massachusetts Institute of Technology.
4. Horton D., R. MacKay, A. Anderson, and L. Dupleich , 2000. Evaluating Capacity Development in Planning, Monitoring, and Evaluation: A case from Agricultural Research, ISNAR Research Report No. 17. The Hague; International Service for National Agricultural Research
5. Long Term National IT Policy, 1999, Department of Information Technology, Ministry of Communication & Information Technology, Govt. of India (http://it-taskforce.nic.in/actplan3/).
6. Lusathus, C.; Anderson, G. and Murphy, E., 1995, in *Institutional Assessment: a Framework for Strengthening Organizational Capacity for IDRC's Research Partners.* Ottawa: IDRC.
7. Lusathus, C.; Adrien, M.H.; Anderson, G. and Carden, F., 1999, in *Enhancing Organisational performance : A Toolbox for Self-Assessment.* Montreal : Universalia.
8. Morgan, P. 1997, in *The Design and Use of Capacity Development Indicators.* Hull: Policy Branch, CIDA.
9. Moussa, A. and Schware, R. 1992, in *Informatics in Africa: Lessons from World Bank Experience.* World Development, 20 (12).
10. Report of the Committee on India Vision 2020, Planning Commission Government of India, 2002 (http://planningcommission.nic.in/plans/planrel/pl_vsn2020.pdf)
11. Scientific Policy Resolution, 1958, Department of Science and Technology, Ministry of Science and Technology. Government of India.(http://www.nstmis-dst.org/)
12. Science & Technology Policy (2003), Department of Science and Technology, Ministry of Science and Technology. Government of India. (http://www.nstmis-dst.org/)
13. Technology Policy statement, 1983, Department of Science and Technology, Ministry of Science and Technology. Government of India. (http://www.nstmis-dst.org/)