CHAPTER **18**

Dharitree:
The Web-Technology-Based Total Land Records Management System of the Government of Assam

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ABSTRACT

This chapter aims to highlight the background of the land records management system computerisation project, called *Dharitree*, and its success story in providing efficient, cost-effective services to the citizens, administrators and other stakeholders. The project was initiated by the Department of Revenue, Government of Assam, India, with the financial support of the Government of India, and complete technical support from the National Informatics Centre (NIC), Assam. This chapter also highlights citizen (landowners)-centric service orientation features, cost-effectiveness, self-sustainability mechanisms and technology used, particularly in the third phase (the current phase) of implementation of the project towards achieving success.

Last but not least, the chapter describes the future roadmap for enhancement and integration with other systems like property registration, digitised cadastral (land parcel) maps for continuous improvement and to meet and exceed user requirements.

Background

Like any other state in the country, the manual land records system in Assam was plagued with many problems, such as the following:

i. Huge backlog of land records data updation in every district and circle office
ii. Inconsistent maintenance of records/data at the RKG (Registrar Kanangoo) branch of the district and sub-divisional offices and the circle offices
iii. Time- and cost-consuming, inefficient services to the landowners, stakeholders and other institutions/sectors of the government administration
iv. Unavailability of reliable on-the-desk management information system (MIS) reports for the administrators of the land records (revenue officials) for timely and reliable planning and decision making
v. Delay in mutation workflow system processes

vi. And other inherent problems of manual records, like illegibility of records

These problems have been realised by the Department of Revenue, Government of Assam but the government could not initiate any action because of shortage of funds. But, the kind dawn was not very far. The financial assistance from the Department of Land Resources (DLR), Ministry of Panchayat and Rural Development, and the Department of Information Technology, Government of India, during 1994–1995 and 2004, respectively, finally allowed the induction of ICT for e-governance in the land records management system.

The Revenue Department, Government of Assam, with the technical support of NIC Assam undertook the land records computerisation project under the brand name of *Dharitree*.

A Brief Walk Through of the Project

The project has gone through various phases of implementation since 1991. Land records computerisation was first started in Assam in the Sonitpur district as a pilot project in the year 1991. This project was started on storage-device-less first-generation stand-alone PCs. Although, the data entry was completed by 1993, the project could not continue because of problems like data storage, integration and maintenance of information technology (IT) infrastructures. The Government of Assam had started this phase with the technical support of the Assam Electronics Development Corporation. Although, this pilot phase failed, it gave a lot of knowledge to restart the project with renewed confidence.

Again in the year 1993–1994, the first phase of implementation of the project was started in two districts, viz., Kamrup and Nagaon, with a view to capture the ownerships records from the *jamabandi* (Record of Rights, RoR) registers and to provide efficient and correct services to the citizens as well as to the land records administrators and other stakeholders. With the experiences gained from these first phases of implementation, and with greater financial support from the DLR, Government of India, during 1998–1999, this project was rolled out to 21 districts of Assam with the same objective. This phase of implementation was treated as the second phase. In the first and second phases, the project was implemented at the district headquarters only and it was implemented on a host machine connected to a number of multi-lingual graphical and intelligence based scripting technology (GIST) terminals in a multi-user environment. Until the end of 2003, this phase had been running well in all these 21 districts of Assam, and many districts had been providing significant number of RoR (copy of relevant pages of *jamabandi*) to the citizens and had earned a considerable amount of revenue by means of quality citizen-centric services towards the financial sustainability of the project.

Then in the year 2003–2004, the project went to its third phase (the current phase), with financial assistance from the Department of Information Technology (DIT), Government of India, to the Sonitpur district of Assam, as one of the 25 pilot districts of India. This mission mode was to provide cost-effective, faster, total land-records-based services to citizens by implementing online mutation system and to apply process re-engineering. In the third phase, process re-engineering was applied to cut down the delay in mutation processes and service delivery to the citizens and administrators by shifting the focal point of implementation from the district headquarters to the circle offices (the third level of district administration or the grassroots level of government administration). And in this (the current) phase, the project was implemented using web technology with an aim of providing services anytime anywhere ideally, but in reality, as of now, because of network resources constraint, the service can only be provided anytime on the desktop of the administrators during office working hours.

The mission-mode third phase of the project, with the support of DIT, Government of India, the Revenue Department, the IT Department of Government of Assam, and, last but not the least, the technical support of NIC Assam, was successful in achieving the objectives of e-governance, which was initially started in the Sonitpur district on 1 January 2004, and implemented in all the seven circle offices of the district by 15 June 2005. With a circular of the DIT, Government of Assam, on 14 February 2006, the current phase has now been gradually rolled out to all the districts of Assam.

Current Objectives

The objectives of the project with which the current phase has been running in Assam are as follows:

i. Automation of mutation workflow processes (online mutation) for timely, correct and up-to-date maintenance of land records
ii. Efficient, quality and cost-effective government services for land property to the landowners, administrators and other stakeholders of the project which are sustainable in the future.

How Has the Project Succeeded in Achieving its Objectives

The Dharitree project has succeeded in achieving its currently set objectives with the application of process re-engineering in the design and implementation of the project, integration of appropriate functionality and methodology in the design, and use of state-of-the-art technology and proper care of the sustainability issues. The major highlights of the project are discussed in the following sections.

Process Re-Engineering

The existing land records system has been re-engineered in the following major ways to bring efficiency to the web-technology-based Dharitree system.

i. In the present system, the citizen (landowner) approaches the Dharitree counter of the circle office (*chakrabisoiar karjaloy*) for any type of mutation or information services, instead of commuting between the circle office and the district or sub-division offices, as in the earlier system. This has drastically cut down his or her time and money required, from all considerations, for mutation and any other services.
ii. Now, the circle officer himself or herself presses a button of the Dharitree system to automatically compose the mutation order and correct the land records in the concerned registers, instead of ordering the *lot mandal* (village accountant) to do so, as was done in the earlier system. The circle officer also presses the buttons of the Online Data Transmission Module (ODTM) to transmit recent mutation records from the circle office to the RKG branch of the district office (*sadar* office) for correction and maintenance of the same records at that office also.
iii. In the earlier system the *lot mandal* (LM), after correction of the hand-delivered *jamabandi* in the circle office, was required to visit the RKG branch of the *sadar* office, once a year, to correct the same records in the registers maintained there also, which generally does not take place owing to many reasons cited by the LM, and remains pending for several years. The ODTM of Dharitree has eliminated this.
iv. In the present system there is no need to separately correct/update the *jamabandi* (the land ownerships register) and the *taujibahira* (allotment) registers. The Dharitree system updates and generates the *jamabandi* and the *taujibahira* registers from the *chitha* (the plot-wise details) register automatically.

The re-engineered processes of list items (ii) and (iii) have ensured correct, up-to-date and consistent maintenance of records both at the circle office and the *sadar* office, and thereby it has eliminated the serious problem of non-up-to-date and inconsistent records that has plagued the earlier system.

Major Functionality of Dharitree in Improving Efficiency

The Online Mutation Sub-System (OMS), the Online Data Transmission Module (ODTM), the MIS reports and citizen-centric services, the major functions of the Dharitree system have improved the performance for up-to-date records correction and maintenance, both at the circle office (*chakrabisoiar karjaloy*) and at the RKG branch of the deputy commissioner's office (*sadar* office), and planning and decision making by the administrators. In

addition, the DHARITREE system has enabled generating revenue, through total citizen-centric services, for sustainability of the project.

OMS This automates all the process workflow activities of any type of mutation, starting from registration of a mutation request to final passing of order and correction of mutation records in the relevant registers.

ODTM This, on the other hand, enables up-to-date maintenance of records in the *sadar* office also, by transmitting mutation records from the circle office to that office.

The OMS and the ODTM have also made the users' activities much more convenient/efficient (cuts down time required for completing a mutation process) by reducing the need to type data to a great extent, providing largely filled-in forms, notices, receipts, reports, etc., and providing dynamically the list of pending activities of mutation of each the of land records officials on their mutation login menu.

Citizen-centric Services Module This helps in registering a request from a citizen for a service, and automatically generating the money receipt and the document sought by the citizen within a few minutes, and providing him or her the manually signed, authenticated document within hours of registering the request.

MIS Reports Module This basically facilitates in generating a set of very important MIS reports enabling the administrators faster planning and decision on land matters. Specially, it helps prepare revenue demand statements within hours, thereby enabling administrators to get a real scenario of land revenue demand and collection, which was quite difficult in the earlier system.

Technology

Architecture

The architecture of Dharitree (Fig. 1) is based on the transmission control protocol/ internet protocol (TCP/IP) and hypertext transmission protocol (HTTP) based web-enabled technologies. It has been implemented on a client–server architecture-based intranet (private IP-based LAN) environment of the circle office and the RKG branch of the *sadar* office, which are connected to each other via dial-up-connection over the internet, at the time of online data transmission from the circle office to the *sadar* office. This architecture enables low-cost online data transmission between the circle office and the RKG branch of the district headquarters for online mutation, record correction/updation at both the locations of record keeping/maintenance in a synchronised manner.

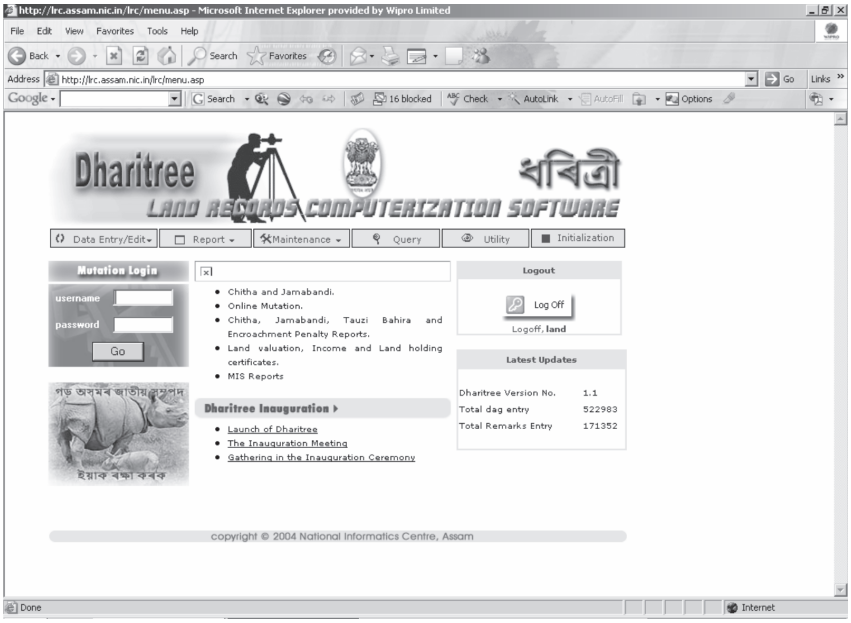

Fig. 1 *Snapshot of Dharitree web page*

Standards

Judicious thought was applied to use cost-effective universal standards, from analysis to design and development stages, of the Dharitree system.

- The state-of-the-art Institute of Electrical and Electronics Engineers (IEEE) standards have been used for preparing the software requirement specifications (SRS), and the user manual of the system.
- Microsoft's universal Windows 2000/2003 server OS and Windows Professional/XP client OS platforms have been used to maintain a uniform standard in Dharitree system in all the locations of districts and circles of Assam for the purpose of ease of replication, use, integrity, and access of data. At the same time, Microsoft's cost-economic and performance-critical SQL server relational database management system (RDBMS) has been used as the database standard for better performance, operation, integrity and maintenance of the system.
- Also, the Statistical Testing and Quality Certification Organization (STQ), Government of India certified International Standards Organization/ International Electro-technical Commission (ISO/IEC) 9126, and 12119 quality standards have been adopted for usability, reliability, efficiency, maintainability, functionality and portability of the system.
- Above all, standards and uniform data codes, have been used in all the locations of replication for seamless operation, interpretation, integration and implementation of the system.

Security

Taking into consideration the sensitivity of land records data, the following prevailing data access and operation security tools have been used in the Dharitree system:

i. Authentication using a biometric thumb impression device has been used for access to use a particular machine of the intranet system.
ii. Also, two layers of application-level login and password authentication with MD5 (Message-Digest algorithm 5 is a widely used cryptographic hash function with a 128-bit hash value) security standard have been used to authenticate a user of the software system.
iii. Also, privilege (role)-based access control mechanism has been adopted as an additional means of security.
iv. Error-handling/trapping measures have been taken care of to prevent accidental unauthorised viewing of the codes and access to data.
v. The Indian Script Code for Information Interchange (ISCII) over American Standard Code for Information Interchange (ASCII) makes automatic encryption of data providing an additional security.

Modularity

A top-down modular design approach has been adopted to develop the Dharitree system for better maintenance. The entire system has been divided into the following sub-systems:

i. Data entry/edit sub-system
ii. Initialisation sub-system
iii. Reporting sub-system
iv. Online mutation sub-system
v. Maintenance sub-system
vi. Utility sub-system
vii. Query sub-system

Again, each sub-system has been divided into either further sub-systems or different modules, each of which carries out a particular function of the system. Similarly, the entire land records data-base has been designed into a number of related groups of tables (objects) and each group of tables holds data of a particular nature, data entity, or function. In other words, the entire design of the Dharitree system is modular.

Service Orientation

The main mission of Dharitree is service orientation – service to the citizens (government to citizen, G2C), service to judiciary and other sectors of administration (government to government, G2G), viz., agriculture, registration, and financial institutions with 24×7 access facility, and quality.

Citizen-centricity

The prime objective of Dharitree is citizen-centricity. To achieve the objective of citizen-centricity, it has been re-engineered extensively as mentioned above. The following table highlights the various types of citizen-centric services offered by it, and the comparative scenario of performance improvement before and after implementation of Dharitree:

Service type	Time taken in manual system	Time taken in computerised system
G2C services like, issue of *Jamabandi*, Land Holding Certificate, Land Valuation Certificate, Agricultural Income Certificate, etc.	7 days	1 day
Field mutation	10–20 days	2 days
Office mutation	90 days	35 days
Field partition	10–20 days	2 days
Office partition	90 days	35 days

Quality of Service

A computer-printed legible document, alongwith a computer composed mutation order supported by the OMS, and computer-derived remainder area of land (if any) after mutation, are generated, which have improved the quality of service significantly compared to the manual system.

Ease of Access

- The web-technology-based Dharitree has provided the scope of 24×7 availability of data, thus making data access easier.
- A GUI-based, and dynamically defined job-specific menu system has made the use of Dharitree friendlier and comfortable.
- Automatic generation of notices, proceedings, largely filled-in forms, mutation orders and citizen-centric documents (services) have reduced the data entry/feeding work to a great extent, and hence made the use of the system very comfortable and fast.
- Above all, the use of the local language (Assamese/Bengali) has brought the system more closer to the users community and the public.

Cost-Effectiveness

Cost Reduction

The following steps have cut down a considerable amount of the project initiation cost per installation.

- NIC Assam has developed the web-technology-based Dharitree software system free of cost saving approximately Rs 3 lakhs per installation in the commercial market. A cost which is multiplied as the number of installations increases.
- Also, a 6-month long period of quality audit of the Dharitree software was carried out by NIC through STQC, Government of India, to obtain a ISO/IEC 9126-1: 2001, ISO/IEC 9126-2: 2003 and ISO 12119: 1994 standards quality certificate for usability, reliability, efficiency, maintainability, functionality and portability, at its own cost.
- Several rounds of capacity-building workshops/discussions and training programmes for all the users of the system have been conducted by NIC Assam in association with district centres of NIC and district administration (also utilising the resources of NIC, free of cost). This also has saved a sizable portion of the project initiation cost.
- Lastly, Microsoft's world-class, competitively-priced Windows OS and SQL Server database software platforms have been used in all the places of replication to cut down the project initiation cost.

Cost Recovery

Service charges of varying prescribed rates for different citizen-centric services have been levied, as permitted by the Information Technology Act, 2000, for quality services as a measure to recover the initial cost of investment and self-sustainable continuation of the system. This not only help in recovery of the initial investment of the project, but also in managing money for procuring the consumables needed to deliver the ICT-based information services and annual maintenance cost (AMC) of the ICT infrastructures.

Indirect Cost Reduction

Since NIC has been giving continuous implementation, gradual improvement and enhancement support since the beginning till date, free of cost, there is indirectly huge savings shift in recurring expenditure of maintenance of the land records system.

Sustainability

Dharitree is a proven solution for self-sustainability with the following philosophies in its core:

Workshops/Training

Several rounds of capacity-building workshops/discussions were held with the stakeholders before undertaking the project, and rigorous trainings have been imparted to all the users of Dharitree to make them confident in the operation of the new system.

Internal Sustainability

1. Government of Assam's official decision and directive to all the district administrations of Assam to implement and use Dharitree in all the districts/circles is a measure of the internal confidence in the project. Also, an analysis/evaluation committee comprising of six deputy commissioners, and two joint secretaries has been constituted to submit recommendations on the legal changes required in the land records rules/acts, for legalising the new system implemented. This step ensures internal sustainability of the project in the future.
2. A quality service charge of a nominal amount has been levied for different citizen-centric services for managing the recurring expenditure of consumables and AMC of equipments.

An account of service delivery and earnings thereon, given in the following table, in a period of 6 months from January 2006 to June 2006 in the Sonitpur district of Assam, is indicative of the financial self-sustainability of the Dharitree project.

Sl. No.	Type of service	Service charge (Rs)	No. of services	Total earning from all circles (Rs)
1	Issue of *Jamabandi*	30.00	9297	278910.00
2	Agri Income Certificate	15.00	851	12765.00
3	Land Holding Certificate	20.00	3625	72500.00
4	Mutation/Partition	25.00	1270	31750.00
5	Periodic *Patta* (*Patta* Passbook)	100.00	10	1000.00
6	Permanent Residence Certificate	25.00	796	19900.00

Total Earnings = Rs 416825.00

3. Engaging a non-government organisation (NGO) for service delivery in the philosophy of a give-and-take Public Private Participation (PPP) model has helped managing AMC expenditure from their earnings.

External Sustainability

The confidence and assurance given by the hon'ble chief minister of Assam, on the day of inauguration of the third phase of the project on 15 June 2005, to the citizens and other stakeholders on the cutting-edge benefits of Dharitree over the earlier system has made people 'come happily and go happily' with the services of Dharitree. Making citizens and beneficiaries

aware and building their confidence have been the cause of external sustainability of the system.

Future Road Map

The Dharitree system thrives to continually improve and exceed in meeting the users' requirements by incorporating the following integrations with it within a year or two:

i. Integration of digitised cadastral maps (village-wise plot maps) with *chitha* (the plots attributes database) for visual representation of plots' shape, size, type, boundary, ownerships, etc.
ii. Integration of the Dharitree system with the property registration system for faster and reliable registration of land and immovable property as well as mutation processes of land.
iii. Extending citizen-centric services of Dharitree through CICs (community information centres) located at all the 220 blocks of Assam for ease of service delivery to citizens and higher revenue generation through G2C services.

Conclusion

It is well known to all that ICT alone cannot bring in real e-governance in a developing country like India. There are many challenges, which are to be dealt with a strong determination, planning, and policy by the government to achieve the objectives of e-governance. To conclude, we highlight in the following table some of the challenges and their remedies to fulfill the goal of e-governance in land records administration:

Sl. No.	Challenges	Remedies
1	Lack of a system of review and analysis of problems	The government should have a policy to constitute a new team every year (best with a composition of government, public and ICT expert personnel) to review problems, recommend improvements on new changes and submit a report of solutions for improvement to the concerned administration.

2	Lack of government commitment and participation to bring in success through e-governance	The government should be committed to form an e-government team, constantly participate itself in it and take the steering to move the wheel of success. The ministers, the bureaucrats and other officials should be committed by the same mission.
3	Lack of government agenda for citizen's awareness campaign and citizen charter policy	Government should play a proactive role, especially in the rural areas, to make the citizens aware of new government policy, induction of new e-government systems, its facilities and benefits with a proper citizen's charter. Government should hold frequent workshop, trainings, and awareness campaign for the citizens through the *Panchayati Raj* system.
4	Corrupt and inefficient staff	Government should induct ICT skilled or trained young assistants, LMs, and other officials to bring in efficiency in the system. Also, the government should have a system for providing incentives, awards and regular promotions to other officials like police and teachers, for demonstrating sincere and excellent services in the government.
5	Inefficient processes	Government process re-engineering: Government should re-engineer the existing inefficient processes, and eliminate those processes that does not add any value to the system or delays the process. Dharitree is an example in this case.
6	Sustainability	Government should review the existing land revenue rules/acts and incorporate necessary changes in it to facilitate legalising the new e-government system, levying service charges, etc. for sustainability. For example, the Government of Assam has already set up a committee for this in the year 2006.