

Enabling Rural Banking through Technology

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Abstract

This paper sets out the need for financial inclusion of the rural community for India's development and the important role that the ICT can play in this endeavor. We suggest an integrated framework for the use of the ICT for delivery of rural services in a cost-effective, financially viable and sustainable manner. We identify the major issues in rural finance and indicate the possible ways for the use of the technology for improving the situation. We then describe a model developed by us for establishing rural information infrastructure and supporting the delivery of banking services to the rural people and the findings from its pilot implementation. We also outline a model for rural services with banking and ICT as core infrastructure. We conclude by indicating how ICT can be harnessed for achieving financial inclusion.

Contents

PART I

- I. Introduction
- II. Rural Banking Delivery Channels - Multi- Agency Approach to Rural Lending
- III. An ICT Structure for Rural Banking Enablement
- IV. GANASEVA Model for Rural Banking: Implementation Experience
- V. ICT Framework for Delivery of Rural Services

References

I. Introduction

Rural banking in India has been the subject of study Survey Committee Report in 1954, literally thousand of reports have examined and investigated the problems relating to the credit delivery for agriculture and rural area. Latest magnum opus on the subject is the National Agricultural Credit Review report 2000. The Expert Committee on Rural Credit (Chairman: Professor V.S.Vyas) submitted its report in 2002. One more High Power Committee headed by Professor Vyas set up by the Reserve Bank of India recently to review and advice on improving credit delivery to agriculture has also given its report.

As the majority of the Indian population lives in rural areas, there is an urgent need to deliver citizen services to them in a cost effective way with assured quality. This involves mainly the following:

- Enabling the ready access at the place of the villagers
- Reducing transaction cost to make the services affordable
- Reduction in delays
- Improving the quality of services available

The criticality of this need may be seen from the fact that even with concerted and extensive attempts to meet the credit needs of the farmers for agricultural operations etc., informal agencies including money lenders are currently providing substantial portion of the total credit to this sector. Besides, the agricultural credit flows themselves are inadequate and the gross capital formation can be improved only if substantial amount of investment funds flow to the rural areas in the form of credit. Likewise, there is also a need to provide market information, extension services, marketing support and government and other public services to the people in a cost-effective manner. For achieving financial inclusion and economic growth, the ICT can play an important role by increasing effective access and improving delivery and governance in banking services. Against this background, the key issue is how technology can be harnessed for improving the efficacy of the credit delivery and for the minimization of the transaction costs involved, for ensuring that bank credit actually increases and promotes productive capital formation and investment in rural area and helps address the critical problem of the rural-urban service divide.

II Rural Banking Delivery Channels - Multi-agency Approach to Rural Lending

Rural credit has been a laboratory for various policies, initiatives, investigations and improvements since 1955. The first major strategy adopted for improving rural credit delivery was the institutionalization of the credit delivery system with the cooperative as the primary channels. The multi-agency approach to the rural credit delivery emerged with the induction of the commercial banks into the scene. In 1979, specialized institutions called Regional Rural Banks and subsequently, another breed of institutions called Local Area Banks, came on the scene. With the operationalisation of the Lead Bank Scheme, the area approach to rural lending was formalized and attempts were made to match infrastructure development with bank credit flows for ensuring development of the rural areas. The Scheme sought to give a special supply-leading role to the banking system in rural development and also to ensure access of the rural population to bank services through rural branch expansion. A multi-agency credit delivery system is in place for financing credit-based development activities, under the Lead Bank Scheme. In 1988, the Service Area Approach was also introduced as a strategy for improving the quality of rural lending. The Lead Bank Scheme Information System and Service Area Monitoring Information System (SAMIS) have also been operationalised using monitoring arrangements. The micro-finance and linkage of the banks to the self-help-groups / NGOs and the issue of Kisan Credit Cards are among the recent developments in the area of rural lending in India. The latest policy initiatives are the enabling of the Non-bank Financial Companies and of the “correspondent” banking for increasing delivery of rural credit.

The National Agricultural Credit Review Committee (NACRC) headed by Prof. A S Khusru has established that the cost of rural lending by commercial banks and cooperative banks is unsustainable and does not break even.ⁱ In fact, it has been sustained through cross subsidization. The two elements of the costs namely, capital costs and the current expenses are of the rural branches. Rural bank branches are such that the transaction in the rural area cannot support them.

The experiment of having low cost institution for rural lending in the form of Regional Rural Banks also has not been successful in as much as the RRB staff expenses are required by law to be on par those of the commercial banks. Therefore, it is clear that the rural credit delivery system is not performing efficiently and in a cost effective manner. It is against this background that we position a technology based solution for improving the speed efficiency and effectiveness of the credit delivery of the rural people through the application of information technology tools and systems. We propose Model for using Information Technology for improving rural credit delivery system by reducing the cost, increasing the speed of delivery and also increasing the value addition in the service delivery and improving the accountability.

The National Agricultural Credit Review Committee Report documents the history, development and the status of the various important issues involved in rural credit delivery in India in great detail. It is interesting to know from this voluminous report that solutions have been advised and implemented for almost all the real as well as “perceived” problems in rural credit. Yet, this area remains a problem defying

adequate solution. For example, some of the key concerns like the end-use of credit, infrastructure gaps, and the high costs of lending have been repeatedly attended to. Despite that, the delivery of credit for agriculture and rural development still remains unsatisfactory.

It has been a matter of concern that the multi- institutional rural credit delivery system has not been very successful in delivering required amount of credit to agriculture and small scale industries and small and medium enterprises.¹ The share of bank credit for agriculture has declined from 17.6 percent in 1985 to 9.8 percent in 2002.¹ The institutions are in place, the systems repeatedly revamped several times on the basis of multiple committees are also in place. In spite of this, the growths of the agricultural credit in the country during the last three years have been less than the growth of credit for services and corporate sector. The value addition to the GDP by the agriculture has been low as compared to the industry sector and the services sector. The income disparities as reflected in the poverty are still a matter of serious concern.

Various approaches have been adopted for improving rural credit from time to time. It was felt that project lending will revolutionize rural credit. This was followed by area approach and extension- based schemes and then the lead bank scheme providing for forward and backward linkages and the scheme of linking banks to Primary Agricultural Credit Societies and the linkage of bank to microfinance institutions. Under the hypothesis that social factors like education, training and social pressures have critical bearing on the credit off-take and its productive deployment in rural areas; several attempts have been made and are being made to address them. Accordingly, the group-lending, the family approach and entrepreneurial development programme, the involvement of NGOs and voluntary agencies, the social groups and the use of self-help-groups are all being tried out for channeling adequate credit to agriculture and rural sectors. With considerable enthusiasm followed by disappointment, the cooperatives were positioned as the primary, rather the exclusive channel, for rural credit delivery for about two decades and the latest reports on the cooperatives is that, by and large, they themselves require assistance rather than being of any assistance to the farmers. Despite concerted efforts by a multitude of agencies, the agricultural credit delivery still remains a problem. The 2003 November Review of the Monetary and Credit Policy takes up this and provides for the constitution of an Advisory Committee to review the various exiting arrangements and “to suggest appropriate changes in the institutional and procedural arrangements for the smooth flow of credit to agriculture” The Policy also states that the Committee is “expected to help in capturing technological developments in the cause of improving credit delivery” [4].

Despite the large number of initiatives, the rural credit delivery system still requires improvements. Credit off-take and its quality have to increase to facilitate rural capital formation, employment and growth. The speed of loan processing should be faster and the cost of delivery should be reduced. These issues are currently relevant and important and have been identified as such in the November 2003 credit policy statement of the Reserve Bank of India as well.

III. An ICT Structure for Rural Banking Enablement

We have developed an ICT based Solution in which the banking services delivery can be done using the electronic platform. The three key principles used in this model are a) unbundling and outsourcing non-statutory services needed for banking and establishing digital rural information infrastructure b) automating the workflow, the records management and follow-up and recovery ,and c) the use of entrepreneurship model for achieving effectiveness, efficiency and economy in the performance of the rural information infrastructure, rural information services and other follow-up functions e.g., credit rating of rural individuals and analytics for decision support.

The Model: An ICT-based solution for improving the delivery of credit and other services of the rural areas.

The solution proposes common infrastructure for the rural data collection and information management and processing and the sharing of the delivery channel by the banks with a view to substantially reducing the transaction costs and improving the speed and quality of delivery. The elements involved in the solution are the establishment of a data center and ensuring its two way connectivity to the mobile multi-service delivery system available at the villages for providing the banking, extension and other services as well as connectivity to all the concerned banks and other service-providing agencies.

The solution involves the outsourcing of the data management as well as of the delivery channel establishment and operations with required safeguards regarding the data ownership and operations. The model envisaged provides a cost-effective but efficient technology platform for rural banking. Technologically, the solution involves four main elements:

- ESTABLISHMENT OF DIGITAL RURAL INFORMATION INFRASTRUCTURE
- MULTI SERVICE DELIVERY SYSTEM (MSDS)
- INTEGRATED MULTI-ENTITY DATABASE SYSTEM (IMDS)
- SERVICE PROVIDER'S WORKSTATION

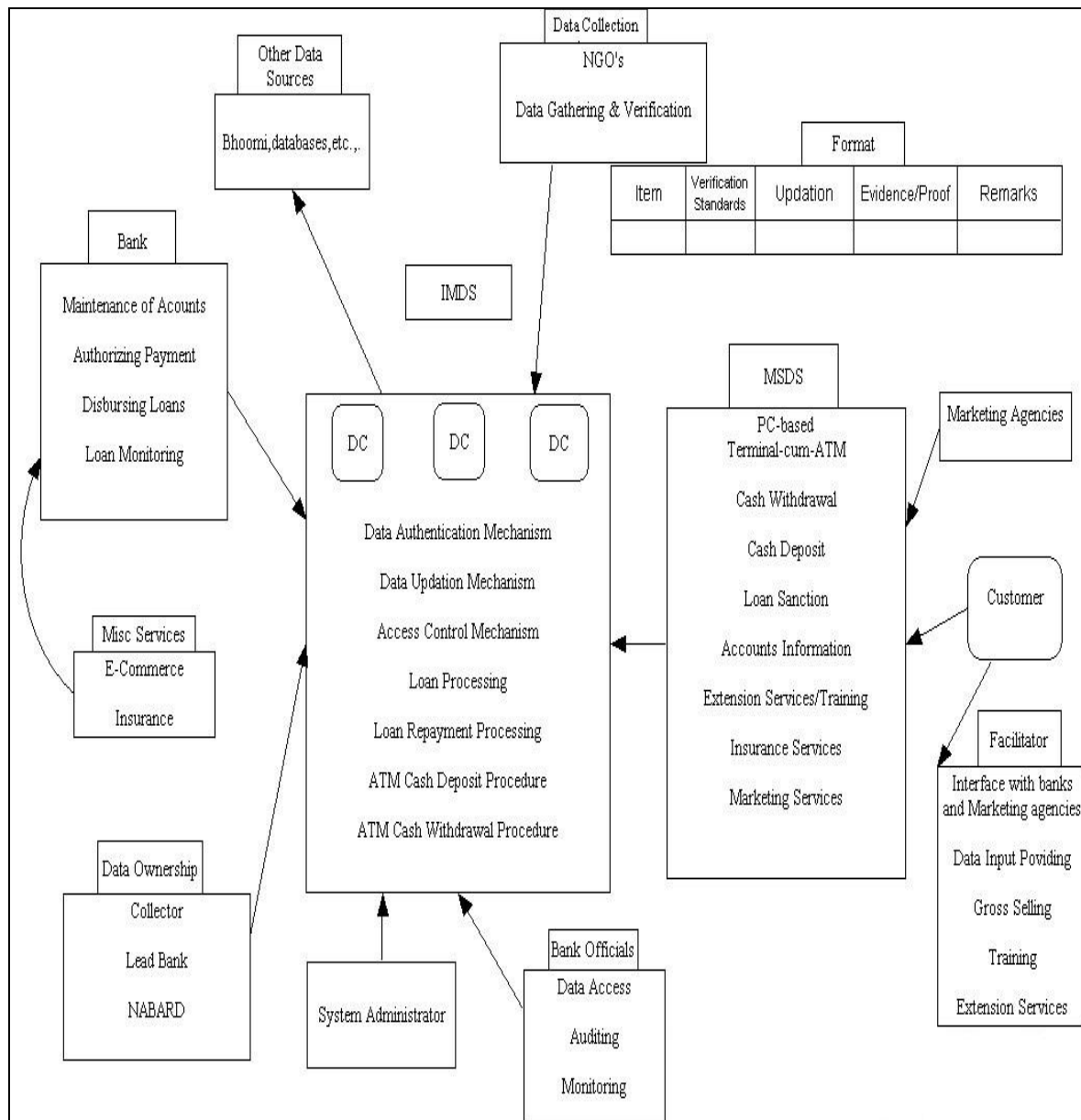
The special Features of the Model are the following:

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- Comprehensiveness of the solutions covering both front-end and back-end operations involving the delivery of credit and other services.
 - Proactive provision of services to the people
 - Provision for exploiting the existing sources and interfacing with available data services and other e-governance solution- providers.
 - Expert systems for processing of credit and other services
 - Easy and secure interface for the rural people with biometric security measures
 - Assisted credit delivery with provision for clarification from the banks etc., through the voice & video
 - Provision of the information required for credit approvals
 - Provision of a data base tool for capturing of the rural data and the technical specifications of such rural data base and its architecture

Figure 1 below gives a diagrammatic representation of the Model.

Figure 1

DIAGRAMMATIC REPRESENTATION OF THE MODEL



IV. GANASEVA Model for Rural Banking: Implementation Experience

The project was implemented in five villages in the Honavar block of the Uttara Kannada district of Karnataka, India having approximately 4000 families, involved in essentially agricultural activity. The banks which are participated in this project are State bank of India, ING Vysya Bank, Syndicate Bank, who has agreed to use the data / documents available through the system. Besides the rural information service and credit rating, there is support in the system for the crop loan and Kisan Credit Card and Savings Bank Account Operations. The Project also wanted to link the Primary Agricultural Co-operative Societies (PACS) to the system for providing banking services through their automation. The project was expected to demonstrate the feasibility of the model on the ground.

The deliverables of the project are:

- Identification of the villages where the project would be implemented.
- List of participating banks and institutions
- System Requirement Study
- Economic data and economic document from the project region collected at the household level and some at the personal level.
- Rural credit delivery software developed for the project
- Project report on the implementation experience.

Methodology

Information System

We developed a model for rural information infrastructure. A reputed market research agency was employed for collection of data and documents in proof thereof in respect of adults in all the households of the five selected villages viz., Idagunji, Apsarakonda, Kelaginoor, Malkod and Manki located in the backward Honavar block of Uttara Kannada District in Karnataka. The data collected was validated by a control set of 500 cases collected by the project coordinator and further by the members of the Project Monitoring Group. Pre-programmed PDAs were used for collection of data/information, the documentary evidence and uploading of this data into Server. The information was collected as per the requirement developed in consultation with the banks for providing banking services and the authentication requirements.

PDA Software

Since PDAs were used for collection of data, documents and voice, there was a need to develop a solution for that. This was done by the Envision Company and the software was integrated with the RCDS System at the backend to facilitate seamless data transmission from the PDAs to the RCDS Server using web services.

Rural Credit Delivery System

The functional specifications for the banking services to be provided were worked out in consultation with the bankers at the project area as well as their controlling authorities. Based on these specifications, the System Requirement Specification was worked out for the TCS to develop the software. Further, the software development process was reviewed by the Microsoft Consulting Services and feedback given to the TCS for completing the development. The delivered system has been installed in various user locations for testing like the SBI, Honavar and PACS Kelaginoor.

Credit Rating Solution

A credit rating solution for the rural individuals was prepared using a separate model developed for the purpose. Likewise, a voice-based authentication system was also developed for testing. The solution development was done by the Shastha Infotech.

PACS Bank Software

In order to enable the rural co-operatives to link to the RCDS system, the PACS in the area were computerized after a thorough study of their business processes and developing separate software for the purpose. This work was done by the Nelito in consultation with the CBIT, the banks and other authorities.

Document Management Software

The document management software which was integrated with the RCDS system was provided by the software company Stex.

ATM Feasibility

The technological feasibility of deploying the ATMs in the Project villages was tested and was found to be adequate.

Project Location, Coverage and Implementation

For testing and demonstrating the implementability of the above solution with respect to essentials, we undertook, and completed, a pilot project during October 2004 and January 2006 with funding from Microsoft and technology support from a coalition led by them which included the Tata Consultancy Services, HP, Envision, Nelito Systems, Reliance Infocom. The Government and the local NGOs also actively participated. Banks like State

Bank of India, Honavar and Primary Agricultural Co-operative Credit Societies have started using the systems. The project objectives were

- Establishing ICT-based Rural Information Infrastructure for providing banking services on a shared basis
- Managing and processing this data and for making it available to the various banks for acquiring customers both on the liability and assets sides.
- Shared delivery system through mobile ATMs for increasing access to rural people.

The project area comprised select interior villages chosen on the basis on connectivity, contiguity and proximity in the backward Honavar block in Karnataka. Participating banks and financial institutions in the project were the State Bank of India, Syndicate Bank, and the Primary Agricultural Co-operative Credit Societies at Kelaginoor, Balkoor and Manki. The coverage included all adult individual in the villages and was not limited to any target group like micro finance or self-help-groups.

Benefits to Banks, People and to the System

The benefits to the banks from the model are the availability of mechanism for achieving and expanding effective access to the rural areas in a non-traditional economical way, identifying the potential customers and providing highly individualized banking experience in proactive manner including individualized risk assessment; availability of reliable information infrastructure in digital form with a mechanism to update on a continuous basis; facility to do offsite identification of the prospects online; credit rating to enable building of quality portfolio and facility for building portfolio according to the ALM requirements of the banks. The benefits to the rural people are banking. The benefits to the economic system include availability electronic platform for services delivery, digital rural information infrastructure enabling the development of nation-wide data grid; authentic inputs for grassroots level planning and Government's socio-economic interventions; ready availability of the information for the markets and market participants to penetrate rural area and provision for enabling different methods of service delivery like kiosks. ATMs for pursuing cost-efficiency through extensive outsourcing and lean processes to suit the local realities.

Findings from the Project Implementation

Major findings from the Project implementation are the following:

- a. Building rural information infrastructure is possible using technology, in the rural areas.
- b. The service providers have uniformly expressed the need for such an information system.
- c. There is a need and scope for developing and making available rural credit rating.

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- d. The computerization of the PACS is useful to improve the quality of working of the PACS, besides having potential for improving governance through linkage to the Credit delivery system.
 - e. ATM-based mobile service delivery systems are deployable in rural areas using the CDMA technology

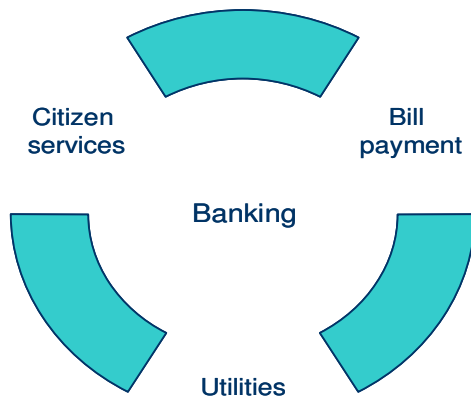
V. ICT Framework for delivery of rural services

The need and potential for the application of Ganaseva Model Framework with regional and functional variations of processes and the delivery channels in India and even beyond appear to be substantial. Since the information and banking are direct services as well as infrastructural services, the Model can be expanded for providing various other services.

Rural Services Delivery Framework

As the *raison d'être* of the Indian Rural Information Infrastructure (RII) is to enable the provision of rural services of high quality at low costs in a sustainable manner in a self-financing framework, it has to be derived from model for delivery of rural services. In our framework of such rural services, the banking services occupy the preeminent position. Given the scenario of poverty and economic deprivation and the need for accelerating capital formation in rural areas for promoting growth and income in villages, the gamut of rural activities need to have the economic transactions at the centre. This focus is relevant because the existing delivery systems have been found to be wanting, for whatever systemic reasons, in making credit and banking services available in adequate measures in the rural areas in India. Therefore, any rural services strategy will have banking services delivery as a core function. The utility service provision which partly use banking as the payment system infrastructure could be the second layer. The delivery of the rest of the services like governance, information, education, health, extension and occasional requirements like investment, trade and documentation might form the third dimension. This integrated approach to rural services delivery is graphically represented below in Figure 2.

Figure 2 RURAL SERVICES DELIVERY FRAMEWORK



Since there is a need for the Rural Information Infrastructure, we propose a model involving the collection of comprehensive data about the social and economic aspects of the 700 + million rural people at the level of individuals in a self-validating and ready-to-use form and for updating the data on an ongoing basis and managing and processing this data for making it available to the various users viz., the banks, the governmental authorities and various service and utility providers for enabling the delivery of high quality services to the rural people in a cost effective manner. The current and potential users are commercial banks, cooperative institutions and other rural financing agencies, Governmental authorities, Planning & Development Agencies Private businesses, service providers and international agencies.

Digital Rural Information Infrastructure

The emphasis on data quality and reconciliation processing, coverage of various subject areas – patient data identification for health care, customer identification for e-commerce, beneficiary identification for the poverty alleviation programs / Employment guarantee schemes of the state, removal of the barriers for providing financial services to the poor, the swamping of conflicting / segmented information, the need to anticipate the need of users for sentient computing- have all accentuated the need for establishing a robust rural information infrastructure, for the provision of authenticated authentic information about the rural people using the ICT tools for increasing the speed, and usability and cost effectiveness.

The rapid growth of technology and communication infrastructure with ubiquitous footprints is a great enabler of the rural information infrastructure (RII). The telecommunications and technology penetration of the rural areas is no longer the problem in the current Indian context of its exponential growth in availability, reach and

affordability. The Rural Information Infrastructure in this context ought to put emphasis on enabling of the reaching of services to the rural people rather than taking technology to their doorsteps. The objectives of this effort could be identical with the mission of the the National Information Infrastructure (NII) in the United States which is “to deliver to all Americans the information they need when they want it and where they want it at an affordable price. The Rural Information Infrastructure (RII) that is the part of the NII will reach into America’s rural areas, providing access to a broad range of information and information services [1].” Despite this assertion, the focus of the RII in the US was on the technology. In our model, the focus is on identifying and capturing of information content, modeling it and presenting the data in a proactive manner to support the provision of various services to the rural people.

Our RII model involves the use of ICT for building and operating this information infrastructure involving collection, storage updation, consolidation and processing of the data and making customized offering; Entrepreneurial model with provision for assurance review by public authorities or users or both; Pay- for- use business model.

The technology model involves the use of personal digital assistants (PDAs) with specially made applications for data (Voice, Picture and Data) capture, verification and validation and updating; Data Center with storage, processing and management; Delivery Nodes at the user-ends and Three-way connectivity between the PDA, Data Center and Delivery Node.

We have developed customized information offerings to banks and financing agencies for exemplifying our model and exploring the usefulness and implement ability of our RII model for enabling the customer acquisitions and follow-up by the banks, both on the liability and asset sides. It may be pointed out that the need for automated digitized rural information infrastructural support is needed for rural financing, not only in India but in other parts of the world as well. According to The Economist Microfinance Survey “The cost of micro-finance will have to come down. At present, it is far too manpower intensive...Credit evaluation relies on character or cash flow valuation rather than the statistical techniques..... it will not be sustainable..... More competition will help reduce costs, but the biggest hope comes from new technology” and further, “In the past, the two main obstacles to providing Financial services to poor people have been lack of information and costs.... Ultimately lower costs and better information are good not just for the poor, but for everyone. [2]”

Digital Rural Information Infrastructure Model

Collection of data about people, including rural people, for governance and commercial purposes is a well-established activity the world over, including in India. However, in the Indian context, the collection and validation of the data about the Indian people on a comprehensive basis; the processing, analysis and presentation of this data in a user-friendly manner in electronic form are yet to be done. Currently, this has assumed urgency for the following reasons: (i) Achieving greater comprehensiveness about the data to meet the increasing variety of requirements at a single point (ii) Formulating delivery goals for various functionalities (iii) Need for a different implementation framework rather than the application of standard data warehousing methodology (iv) The complexity of the need.

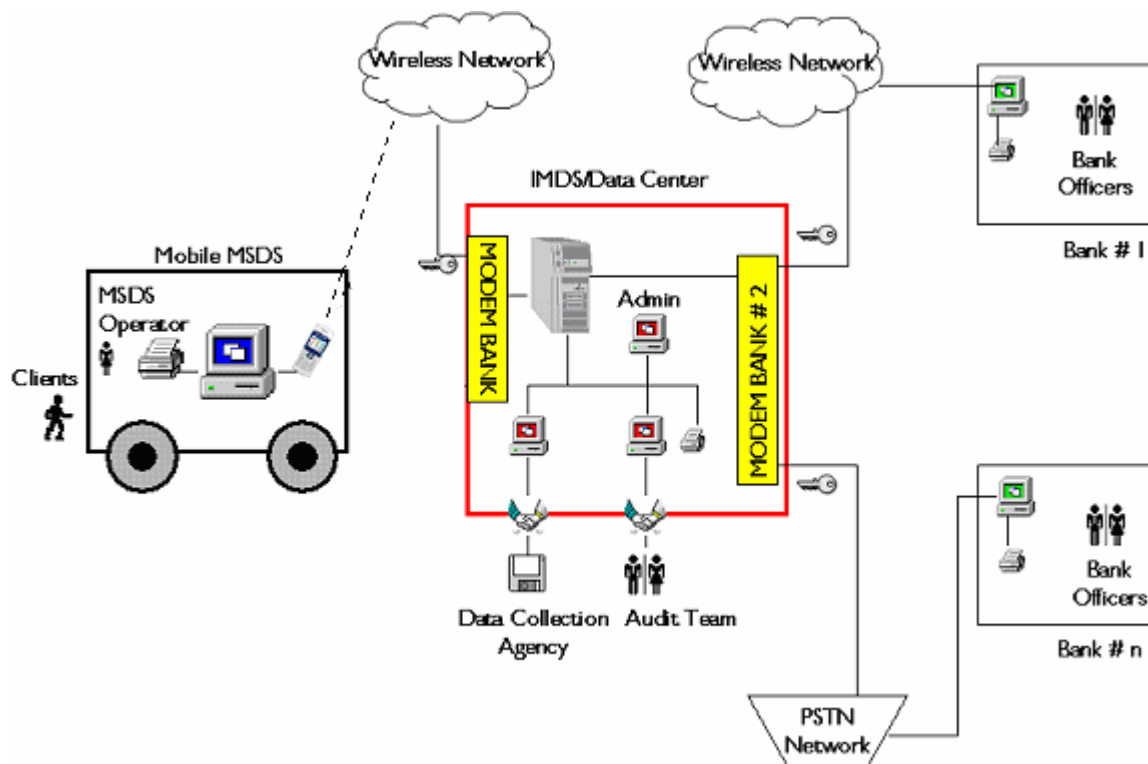
The proposed RII solution involves the use of information and Communication Technology for building and operating robust reliable authentic comprehensive digital information infrastructure involving the sourcing of the data to the maximum extent possible, together with supporting documentary and non-documentary evidence, the images of the assets and the personal identification features like pictures and voice clips; the online storage of such information in a data center directly and the classification and consolidation and processing of the data and making customized offerings to various users after appropriate value addition through analytics. We also propose an entrepreneur-based model for implementing the solution in a large country like India with a view to creating the economic incentive for the completion of this large scale multidimensional rural census with provision for the assurance review of this information infrastructure by public authorities or users or both, depending upon the purposes for which such information has to be used and also for preventing any abuse of this data for anti-social purposes. Another key feature of the model is that the users will have to pay for accessing the information needed according to the specific offerings required in order to make this model self-financing and financially viable.

As a specific instance of the application, the RII information services together with credit rating of the rural individuals to the banks and financing agencies has been worked out. The RII information in digital form will be stored and processed in the backend system at the data center for affording support to the banking functionalities of the Rural Credit Delivery System. The banking services supported by the RII are the registration of the customer, credit rating and the opening of the bank accounts and provision of loans for agricultural operations. The information stored in the server is classified and grouped and made available to the banks and the customers to perform their activities in a context-sensitive way. The RII data will be used for deriving a credit rating and making it available to the people and the banks. The digital RII facilitates the following in the banks:

- Access to self- validated data / information with documentary proof in the digital form to the service- providers at low costs.
- Providing techniques and tools for evaluation of the credit on an individual basis rather than in a standardized manner.
- Applying of the information and communication technologies appropriately for reducing costs, delays, increasing accuracy, objectivity and reducing governance problems in the credit assessment.
- Enabling more efficient capital allocation and improvements in quality of lending.

Figure 3.

Rural Credit Delivery Solution using Digital Rural Information Infrastructure

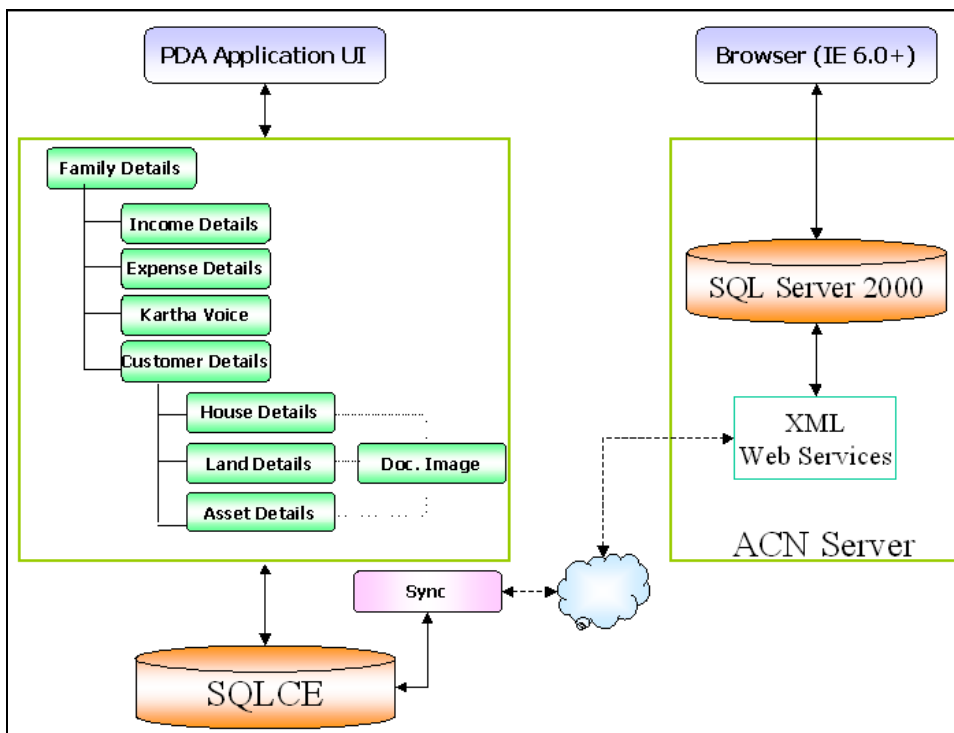


Rural Information Infrastructure-Technology Solution

The technology solution involves the use of PDA's or Laptops with specially made applications for capturing data [voice, picture and data] with provision for clarification and validation and updating. It also envisages a data center wherein all these collected data are stored, processed and managed with suitable control procedure and provision for the audit by the users and / or public authorities. The third element is CDMA connectivity between the users of the data and the data center. There is provision for separation of the user's transactional data from the general information infrastructure in order to make the data center viable and also enable the provision of information services on an application service provider model by keeping such operations distinctly separate from the management of the rural information infrastructure. The fourth element of the model is hubbing all these data centers in order to create an information grid for the country as a whole, in due course.

Figure 4

DATA CAPTURING USING PDA



The rural information infrastructure system will act as one-stop customer information source for the banks in the local areas and help them in arriving at the credit worthiness of the customers. The PocketPCs are used for data capturing. The PDA application in this instance has used Microsoft technologies. The application UI in the instant case is the Microsoft Windows based Forms developed using .Net C#. The Pocket PC is running on the Microsoft Win CE 4.0 Operating System. The development platform for PDA is Microsoft .Net Compact Framework. Microsoft SQL CE is the backend database. And Microsoft ADO.Net is used as the interface between UI and Database. Some significant features of the solution are the following:

- **Image Mapping:** The pictures of the individual subjects and their assets and documents are taken as pictures using digital camera to corroborate and validate the information. To map the pictures with the corresponding asset record, the SDF card is taken from the camera and inserted into PDA at periodic intervals and the Image mapping program would replace the picture's file name with the corresponding assets ID.
- **Voice Sampling:** The respondent's voice will be taken as a sample, for future verification, at the time of capturing the family details. The default system API for recording the voice is used for the same. The voice clip can be played back for confirmation and could be used for building speech-based authentication.
- **Database Synchronization:** After collecting data, the data is synchronized with the central server. At that time, all completed (data captured for the whole family without any bending) will be transferred into the central server and the transferred data will be set as transferred to avoid redundant data transfer.
- **Browser-based Access:** The application will be accessible through the Internet. The application will be available using the https protocol. The application will be accessible from a browser based front end (MS IE 6.0). The presentation layer will carry out necessary client-side validations before accepting user inputs for further processing.
- **Windows Server 2003** is used as operating system. Internet Information Server (IIS) 6.0 will be the Web server. The web application containing ASP.NET (C#) pages will reside on the web server, which will internally call business components.
- The solution includes Business Components which ensures separation and will internally call other application components wherever required; Document Management components which internally call the Document Management System APIs, which are involved in the core document management; Workflow Components facilitating the different workflows required for the system such as the persistence of status of different operations in the database; Reporting interfaces that will communicate with SQL Reporting Service via Web Services. and export the reports in the form of PDF and available in regional language for the common users.

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- The customer registrations data will push into RCDS central Database via Web Services.
 - The solution seeks to achieve security by using https protocol to deploy the solution, by maintaining the audit trail by using form authentication to control user access and through the use of workflow to maintain the authenticity of data
 - It has the ability to work in low bandwidth with big screens split into multiple small screens and with provision on the screens for save and submit buttons. Its usability for rural scenario is provided by the generation of reports in local languages and the presence of Text to voice synthesizer as a browser plug-in.
 - The central idea in our approach is that the basic information / data required for catering to needs of the people, needs to be available in a digital form and it should be always kept current through regular updates, and validated with reference to independent sources and through internal statistical processes. Further, automated analytics offerings required by the service providers like the credit rating models for bankers are to be generated in respect of the village people as and when required by the service providers . The innovation of this model is to provide for facilitators in each village who will be acting as an agent of multiple banks for the purpose of providing information in respect of the people in their village. The facilitator has to be an entrepreneur from the village and the facilitator's compensation is based on his performance in the form of fees / commission. Such a performance-based remuneration will provide economic incentive for efficiency and reliability as compared to the existing formal systems of collection of data that have been time-consuming, costly and not always delivering good results.

While the rural information infrastructure model designed has been implemented and shown to be directly usable on the ground, there is a need for further work for perfecting the design in different geographies and particularly for assessing the costs involved. While it is intuitive that the benefits of the rural information infrastructure are wide-ranging, there is a need for the further empirical work to study the details of costing and the methods of reducing such costs. In other words, there is a need to research the appropriate business model for the rural information infrastructure. There is also need for further research for perfecting the information solutions for various users and for commercial implementation and scaling up and rolling out with required and appropriate modifications both in terms of the delivery structure and the management. Further, there is a scope for using the digital rural information infrastructure for building data grid for India as a whole [6] and making it the structure to build the superstructure of ecommerce and provide various services to the rural people.

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i See Chapter XVIII Pp.651-704. Specifically, Table 24 on Page 697 ibid shows that the net margin on agricultural lending by commercial banks was negative at (-) 1.8 percent.

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