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STRENGTHENING VITAL STATISTICS IN INDIA BY USING UNIQUE IDENTIFICATION NUMBER (NPR) BASED ONLINE CENSUS SYSTEM

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INTRODUCTION

Reliable estimates of population and its components are a pre-requisite for any planning done by government for upliftment of society and providing infrastructure for national development. In fact, creating a database is also a strong component of policy and programs of the government at each level of administrative units. Even today basic data especially related to health of the population of different groups are not available at the district level for planning and implementing development strategies. Thus, a database at different levels of administration is an important component of any program database provides essential inputs to monitor and evaluate achievement.

In the developed countries and in most developing countries, civil registration data is used to estimate vital rates and other important indicators like infant mortality, sex ratio at birth etc. on a routine basis. In India, with the enactment of the 'Registration of Births and Deaths (RBD) Act, 1969' the registration of births and deaths was made compulsory in the country. The Act aimed to have a uniform system of registration and data collection on vital statistics. However, being aware of the inadequacy of the Civil Registration System (CRS) in India, the Office of the Registrar General of India introduced a dual recording system on a sample basis, called the Sample Registration System (SRS).

The Census is the main source of information on the growth of population and its various charactersitcs.However, the census, being a decennial operation, does not provide the measure of population change from year to year. The measures of fertility and mortality derived from the census are centered around the midpoint of the decade and therefore do not provide realistic annual changes.

To overcome this situation, the civil registration system (CRS) is designed primarily to obtain changes in the population growth on a continuous basis through registration of births and deaths. In India, civil registration is still very poor and for many part of the country it cannot be used to get vital rates. However, this is the only source/system that can provide information at the district level or local administrative units. In the absence of such data from the CRS one has to explore alternative source available in the country that can be used generate vital rates at regular intervals. The registration records can be of great use to individuals for their value as legal documents and can also have administrative uses. These records generate current and continuous statistics, which can be more accurate than any other method of data collection and can be available anywhere and at anytime at any geographic and administrative level. There is also a great deal of diversity and the national level

achievement conceals the principle of understating the disparity across the states. In fact, in the case of India even the state is a large unit and a district level analysis would be the best alternative.

ABSTRACT

E-Governance refers to the delivery of government information and services via the Information and communication technology (ICT) to citizens, businesses and governmental agencies. Census is the citizen socio-economic data collection process for the preparation of the citizen database. Census data collection has been facing various barriers like high human resources requirement and time-consuming process. An Online Census System (OCS) permits the users to enter the census data via the ICT. The twelve-digit Aadhaar Unique Identification (UID) number issued by Unique Identification Authority of India (UIDAI) is an individual identification number specific to each citizen. OCS has an important role in the implementation of e-Governance services in India. In this paper, the design of UID based online census system (UIDOCS) is proposed. The design includes the design of online data collection forms with relevant user interface, user authentication based on one time password and integration of census data with UIDAI database for fetching existing citizen information. A number of e-Governance applications of UID based online census system are also discussed. It is concluded that UIDOCS can be effective and efficient in all type of e-Governance applications as it can provide accurate and timely information within reasonable amount of time.

Keywords : E-Governance, Aadhaar Number, Census, One Time Password,NPR

I. INTRODUCTION

E-Governance refers to the delivery of national or local government information and services using Information and communication technology (ICT) to citizens, businesses and government agencies. ICT refers to technologies that provide access to information through

Telecommunications. This includes the Internet, wireless networks, cell phones and other communication medium. The important e-Governance scheme is the Unique Identity Project (Aadhaar). The authority of Aadhaar provides 12 digits unique identifier number, which is unique, to an individual and will remain valid for life. Government needs basic information of residents for purpose of planning, development and improvement in services required by citizens. Availability of reliable, accurate and detailed information of citizens is providing quality services. Census is the procedure of acquiring information about every member of a given population. Census data is the only source of primary data in the village, town and ward. The Census process involves enumerator visiting every house and gathering information on population characteristics such as Economic Activity, Literacy & Education and many other socio-cultural and demographic data manually filled in the census form. Manual census procedures comes lot of manual effort and resource consumption.

This paper focuses on changing the door-to- door survey by adopting an online census information system. An online census is the web-based system, which permits the users to enter the census data via the ICT. The conceptual framework of proposed system is described in detail with the help of Unified Modeling Language

(UML). UIDOCS integrated with UID number for various purposes like user authentication and automatically fetching the individual existing information from UIDAI database such as name, gender, date of birth, mobile number etc. Currently, UID number project has already been implemented in various
Successful e-Governance applications like Digital Locker, Biometrics Attendance System etc.

II. REVIEW OF LITERATURE

The techniques based on the Civil Registration System, Sample Registration System and any estimate obtained by direct questioning in survey are classified as diet methods of the estimate of fertility levels. On the other hand, indirect methods are those where age-distribution of a population or any other means are adopted to estimate the level of fertility.Demograhpers have developed several mechanisms to estimate fertility from these sources of information.Chandraserkaran and Deming(1949) gave the concept of the dual record system based on three assumptions

1. Two sources are independent
2. All events belong to the universe and to the sample
3. Identification of duplication by matching the events of two sources this method suffers from there kinds of bias response correlation bias, matching bias and coverage bias. This was difficult to operainlize, but is being used in the sample registration national level system to provide fertility and mortality estimate at the state and national level.

The literature is reviewed under online census, e-Governance services, UID based applications and One Time Password based authentication projects. Oluwagbemi.o et al. [3], proposed a systematic, responsive and coordinated Web-based census database for eliminating various natural and human made barriers. The objective of this research store and manages census data and design a functional database that ensures information integrity, accuracy, secure, organized and to store biometric information of each person registered.

In [2], the authors described three phases (information, interaction and transformation) for government circulating information and services among citizens, business and other departments. Aadhar based e-Voting systems for elimination of direct physical involvement and provide virtual participation of voter is presented in [21]. For voting process, five interfaces are designed as user interface, verification, monitoring, auditing and system configuration. Khan et al. [13] proposed a One Time Password authentication based on two-factor time stamps and sequence numbers. Articulated Entity Relationship (AER) diagram is proposed in [12], which used the Functional Dependency (FD) information as its important part for complete automation of normalization. In [21], the survey has done on e-Government development status around the world. In [11], the authors suggest some development approaches like as reusability, middleware technology standards and Service-Oriented Architecture (SOA) for reusing the component in e-Governance. In [10], the survey has done on e-Government development status around the world.

The authors described the comparative status of countries on e-Governance readiness based on some key parameters including web presence measures, telecommunication infrastructure measures, E-Participation and human capital measures. From above literature review online census system can provide great values for planning public services like education, fund allocations, public transportation as well as in private businesses

like locating new factories, shopping malls, banks as well as marketing particular products. The countries like Switzerland, Canada and Australia have successfully implemented the online census system for providing good governance services for policymaking, daily administration and management of economy.

To bring out a report every year and disseminate the methods of quality check through District level and state level review

District level prepare an instruction manual for calculation of the above vital stat To identify the definition and conceptual issues with regard to indicators like life expectancy at birth and infant mortality rate.

To develop a methodology for calculating district level total fertility rate, life expectancy at birth and infant mortality rate and to examine the feasibility of software Uidai and other demographic software.

Indicators:

The major indicators that are possible from data at the district level are:

1. Birth rate
2. Death rate
3. Sex ratio at birth
4. Sex ratio at death
5. Still birth rate
6. Infant mortality rate
7. Life expectancy of birth
8. Various reasons for Cause of Deaths
9. Update house listing and household amentias
10. Updated village level and other population available

Sources of Demographic data in India

- Census
- Civil registration system
- Sample registration system
- Demographic Health surveys such as

  (i) National Family Health Survey (NFHS)(IIPS)

The demographic variables which are of our interest ate the Crude Birth Rate, Total Fertility Rate, Infant Mortality Rate and Life Expectancy at Birth. We will discuss the source, periodicity as well as limitation on these indicators at the sub national level (state and district level).

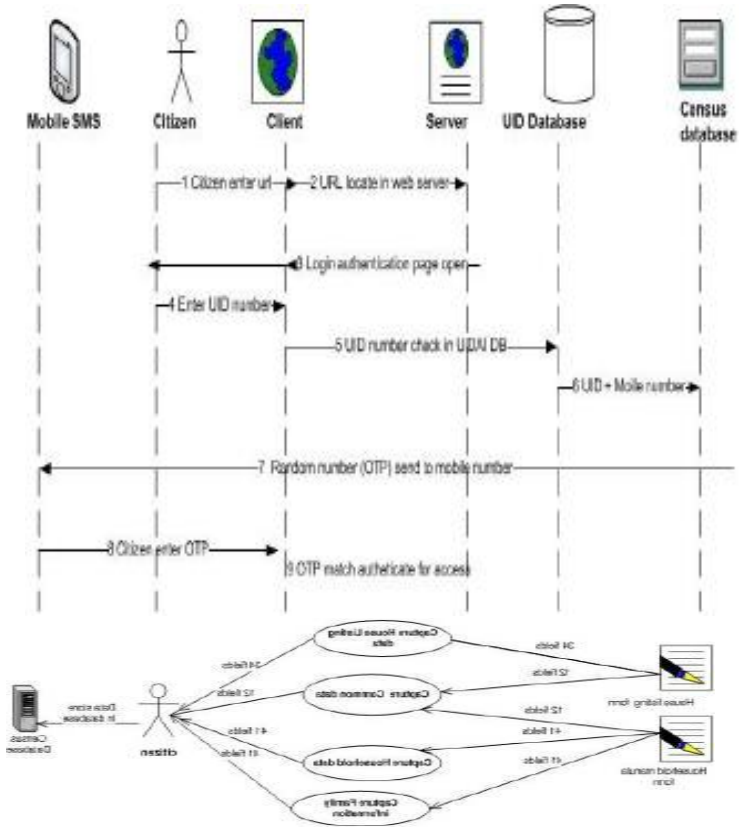
II. SYSTEM DESIGN

System design is the process of transition from problem domain to solution domain. UID based Online Census System (UIDOCS) is represented through logical design and functional decomposition of census forms. The logical design is the process of defining census methods, functions, objects and the overall structure. It also includes specific security features like authentication through One Time Password. Unified Modeling Language (UML) is used for modeling the system. The functional decomposition of web based census system comprises of the following three stages.

1. Design of Online Census Forms
2. User authentication based on One Time Password
3. Integration of census application with UIDAI database

3.1. Design of Online census Forms

The proposed system models the manual census system of data recording to Online Census Form (OCF). The first stage is to analyse the current procedure of data recording. The two forms used House listing and Household having 46, 53 fields respectively in the manual process are converted to four files Common data, House listing, Household and Family member Information with 34, 12, 41 and 41 fields respectively in the online census system as shown in the Figure 1.

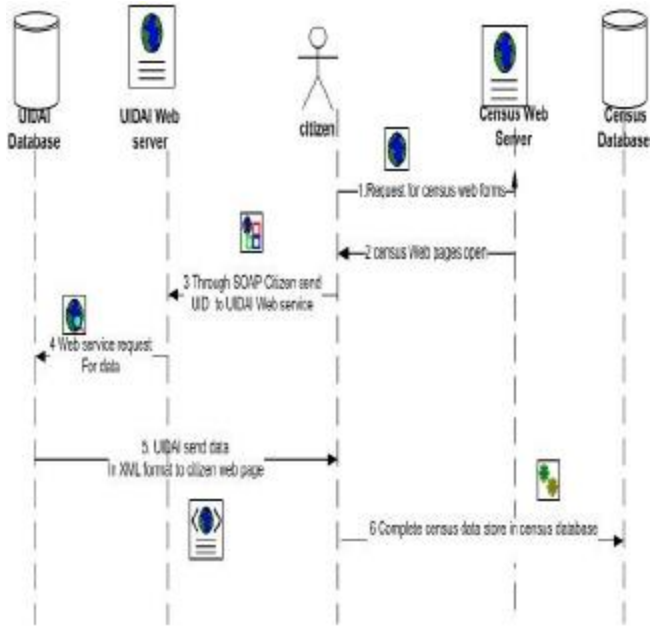


The issues like data redundancy, data normalization and data integrity are addressed in converting manual system to online system. To design effective and user friendly interface various controls like radio buttons, drop down lists, data validation and check lists are proposed to be used during implementation of system. These controls help in automatic error checking and prevent users from submitting invalid or incomplete data. After all the fields are filled online the census data is stored in the census database and organized in relational tables.

3.2. User Authentication Based on One Time Password

For logging into online census information system, one has to go through the authentication process. UIDOCS uses authentication scheme based on One Time Password (OTP). An OTP technology is based on random number generation, which is the technique to generate a unique password for every transaction. OTP number is valid for only one login transaction. Currently OTP authentication is applied in various e-Governance applications like Digital Locker and Internet banking [4]. To authenticate for the UIDOCS citizen need to have

an Aadhaar number and a mobile number registered with Aadhaar database. The authentication process is shown in the sequence diagram of Figure 2. Figure 2.



Sequence diagram of one time password generating

Following steps are performed for user authentication at UIDOCS.

1 Enter the login web page URL of the online census (i.e. UIDOCS web page)

2 2 The login page URL locates in Census web server.

3 3. Login authentication web page open

4 4. Enter 12 digit UID (Aadhar number).

5 5. Check for UID number in Aadhar database. It involves one-to-many match. [if UID number exists then goto step 6 else exit].

6 6. UID number and registered mobile number sent to census database

7. OTP is generated and sent to mobile number

8. Enter the valid OTP and click on submit button.

9. Once the OTP is validated the login process is completed. 3.3. Integration of UIDAI Database with Proposed System After successful login citizen will be authenticated for entering census information. The proposed system uses UIDAI database for fetching citizen existing information by using web service as shown in the sequence diagram in Figure 3.

Web service is an open standard based web application that interacts with other web applications [6]. Following six steps are performed for integration of UIDAI database with proposed system. 1. By using browser citizen will send request to census web server for opening census web pages. 2. Census web pages display on user side browser screen. 3. Census application automatically sends 12 digits UID to UIDAI web server. 4. UIDAI web server side web service is used to communicate with UIDAI database for fetching citizen data 5. UIDAI database sends data in XML format and data automatically is filled in the form at the desired place. 6. After successfully entering all the information, data is stored in the census database.

Web Service communicates by using standard web protocols and data formats such as Simple Object Access Protocol (SOAP). SOAP is a standard XML based protocol that communicates over HTTP [7]. SOAP is a remote function call that invokes method and executes them on UIDAI remote machine and translates the object communication into XML format. The objective of this integration is to get the citizen's existing information like name, gender, address, mobile number, age and photograph from UIDAI database by using web service. The proposed system will help in saving time and avoidance in the data repetition.

IV. SYSTEM ARCHITECTURE

The System Architecture is organized into the layers in 3-tier as shown in Figure 4. Tier 1 - Presentation Tier (PT), it interacts with the user closely. Tier 2 - Application Tier (AT), it holds the business logic and the data access logic. Tier 3 - Database Tier (DT), it holds the database or data source.

4.1 Presentation Tier

This layer essentially provides the required interactions with all types of users like citizen, education department, policy makers and census administrators. Online Census adopts Browser/Server (B/S) browsing mode according to the characteristics. The proposed system is developed from the two-layered Client/Server mode by World Wide Web (WWW) browser technology. Census web server keeps waiting for requests from client side browser and it picks up a requested HTML page and sends it back to that browser. The biggest advantage of B/S structure is that it can be operated at any place without any special software installation and with zero client maintenance as long as there is a computer connected to Internet. In this way, the whole system becomes simpler with lower cost and easier expansibility in maintenance and upgrading respects. Mobile SMS service is used for ensuring privacy and authorized access [3]. SOAP web service is used for fetching citizen existing information from UIDAI database. Data Tables are used for presentation of census data in readable form.

4.2. Application Tier

This tier provides all essential services needed to manage the entire system in a synchronized manner. It comprises of the following modules.

User Authentication Service: For ensuring privacy and authorized access to data, capturing module Unique Identification number is used for authentication. One Time Password (OTP) procedure is adopted for authentic user login. More detail about One Time Password is explained in section 3.2.

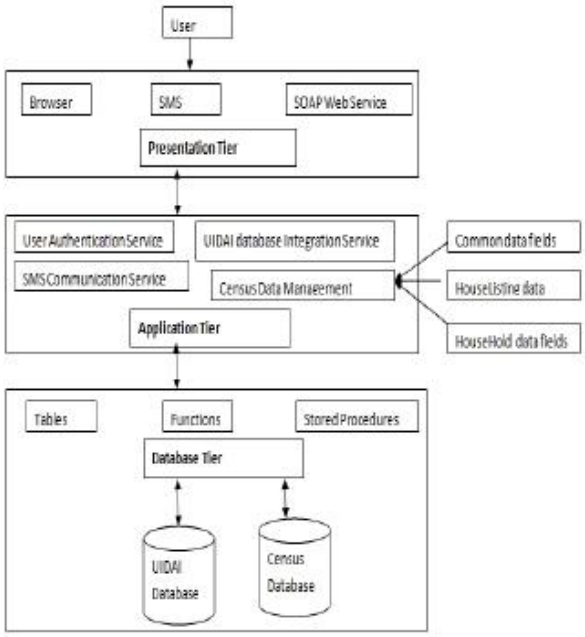
Online data capturing: e-Census data capturing module is used for capturing input through browser channel. This module will be capturing information from common data fields, house listing and household web pages. In this module techniques like session management, Cross-site scripting, password encryption and client script safety will be implemented for security reasons.

UIDAI database integration service: This module manages UIDAI database integration with online census system. More detail about One Time Password is explained in section 3.3.

Communication Services: All communications in the form of e-mails, Short Message Service (SMS) etc. are

4.3 The Data Access Tier

Database tier is the most vital aspect of the proposed system. It is where the census data is stored for easy access and retrieval for data mining purpose. Census database is an integrated storage that allows concurrent access for many users. This database an organized collection of structured data for serving many e-Governance applications with minimum redundancy. This layer includes tables, functions, index of tables and stored procedures. Hence, it essentially provides an online repository of the core data and the transactional data for generating the required reports.



5. Design and Implementation Tools Design is performed using Unified Modeling Language (UML) provided with Microsoft Office Visio tool. Microsoft Visual Studio development framework is helpful to construct the proposed system modules like online census forms, Graphical User Interface (GUI) design and development. Web technologies like HTML, CSS, AJAX etc can also be used in implementation of proposed system. Any Database Management System.

(DBMS) with relational/object oriented features such as Oracle / SQL Server can be used for back end data storage. An application-programming interface (API) is a set of routines, protocols, and tools for building software applications. The proposed system can also use online Short Message Service (SMS) and some other APIs for sending One Time Password to mobile phone. The details of tools required for developing the proposed system are shown in Table 1.

Table 1: Tools used for developing proposed system

Tools	Objective
Microsoft Visual studio framework 2010	System Development
C#	Programming Language
Microsoft SQL Server2005	Database
JAVA SCRIPT	Data Validation
IIS	Web Server
Window 8	Operating System
Third Party API	Online SMS Service
Microsoft Visio	System Modeling
Any Browser	User Interface

VI. UIDOCS

Applications for e-Governance The proposed system can assist government to take various decisions like planning of employment policy, fund allocation and opening new institutions at various level of management. At low level, the census database can help district employment exchange for selecting specific skilled person based on age group, gender type and education level. At middle level management, it can assist state government for making policies like opening new educational institutions. Further, the need of institutions can be categorized based on the gender data like co-educational institutions, Boys institutions and Girls institutions. At high level, it can assist Ministry of Human Resource Development (MHRD) and National Institution for Transforming India (NITI) Aayog. It can help MHRD for making national level policies like opening new universities and vocational education institutions. It can help NITI Aayog to know the age trends, educational level, gender type and employment status of the population to estimate future demands.

Present used Technology Options for Census 2001 and 2011:

Following server Hardware and storage has been installed in DP Division and in 15 No's Data centers in India for data processing activities

1. HP Proliant DL 380G6 Quad Core Base Servers
2. HP Storage Works EVA6400, Capacity-10/100 TB
3. Kodak High Speed Scanners

IT resources were created at 15 data centres by installing 36 Nos Microsoft Windows 2008R2 Servvers,SQL Server-2008,Windows 7 Professional Clients, High speed heavy duty duplex scanners(Kodak) and backup.HP storage Works EVA 6400,Capacity-10/100 TB.In addition to above Hardware & Software an intelligent character Recognition (ICR) software eFlow4.5 has also been installed to meet the challenges of Census-2011.About 1200 technical officers and about 500 contractual operators were engaged for electronically data capturing at 15 data centers and processing of census data at DP Division, New Delhi.

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the schedules and use of Computer Assisted Coding (CAC) saves a lot of Government expenditure incurred in the past on setting up of Regional Tabulation Offices. The services of a System integrator were utilized at 15 Data centers for scanning operations and data file creation.

The DP Division has assisted various Technical Divisions of ORGI for data processing projects, such as

1. Preparation of District Hand Book(Social Studies Division)
2. Large size village study data entry and processing (Social Studies Division)
3. Extraction of data from 2001census data and tabulation for slum project(Census Division)
4. Scanning and ICR based processing for verbal Autopsy(Vital Statistics Division)

5. Scanning and ICR based processing for 5th Economic Census of Central Statistics Organization.

VII. CONCLUSION AND SCOPE FOR FUTURE WORK

In this paper UID based online census system is proposed, which can take the limitations of manual census system. The proposed system enhances security of authentication by transferring the OTP to valid mobile number. It also allows a person to fill census data from anywhere. UIDOCS can allow preparing efficient, speedy and cost effective census. The proposed system will be implemented and different e-governance applications that required census data sharing will be developing by using web services. The UIDOCS will be transparent one allowing interoperability between platforms and systems. The UIDOCS will be tested with real time data.

The census is the main source of information on the growth of population and its various characteristics at district or below district level. The measure of fertility and mortality derived from the census are entered around the mod point of the decade and therefore do not provide any information on annual change Reliability of the estimate is also many time doubtful. The Civil Registration System (CRS) has been designed to obtain changes in the population on a continuous bias through registration of birth and deaths. In India, CRS is still very poor and for many parts of country it cannot be used to get reliable vital rates. However this is the only source that can provide information on vital rates at the district level

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