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E-Governance to E-Health : A Smart Road Map for Society

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Abstract:

In the present days of high price, the developing countries like India are struggling very hard to provide medical facilities to its Citizen within an affordable budget. Due to lack of proper information and resources, Citizen residing at the geographically remote locations are unaware about the state-of-the-art medical facilities. To solve this issue using advanced communication technologies, Government must design a proper co-ordination with its administration and the medical services available under its jurisdiction, so that Citizen can get the information of proper medical facilities during its need. To achieve this objective, Government must uniquely identify the Citizen during secured electronic communication for medical purposes. On the other hand, the Citizen must have an electronic mechanism to collect prompt information about medical services at its nearby location. With this view to deliver various electronic facilities at the door steps of the Citizen, we have already proposed a Citizen centric multivariate electronic smart card based E-Governance mechanism. However, in this paper, we will only discuss the application of our proposed E-Governance mechanism to provide Electronic Health (i.e E-Health) services to the Citizen during its need.

1. Introduction

In the present days of high price, the developing countries like India are struggling very hard to provide medical facilities to its Citizen within an affordable budget. To improve this situation, Citizen must be provided appropriate information during its need, because it is mainly due to lack of proper information and resources, Citizen from the geographically remote locations are unaware about the state-of-the-art medical facilities. To solve this issue using advanced communication technologies, Government must design a proper co-ordination with its administration and the medical services available under its jurisdiction, so that Citizen can get the information of proper medical facilities during its need. For which, the Government must uniquely identify the Citizen while sharing classified medical information through public communication medium like Internet. On the other hand, the Citizen must have an electronic mechanism to collect prompt information about medical services available during its need. With this view to deliver various electronic facilities at the door steps of the Citizen, we have already proposed a Citizen centric multivariate electronic smart card based E-Governance mechanism. However, in this paper, we will discuss only the application of our proposed E-Governance mechanism to provide Electronic Health (i.e E-Health) facilities to the Citizen during its need.

In section – 2 we will discuss the origin our research work. In section – 3 we will discuss our proposed E-Governance mechanism for providing various electronic facilities at the door steps of the Citizen. In section – 4 we will discuss the application of our proposed E-Governance mechanism to deliver various E-Health services promptly to the Citizen during its need. In section – 5 we will mention the conclusion drawn from the entire discussion. Finally the references are listed at the last part of this paper.

2. Origin of Research Work

As Citizen are the ultimate beneficiaries of the society, sensible Government must take appropriate measures to provide all possible services, like administration, education, health, banking, etc, efficiently at the door steps of the Citizen. As the Government of developing countries are usually having shortage of sufficient resources, the use of Information and Communication Technology (ICT) will help them to achieve this goal in cost effective manner. But, to fulfill this objective, Government must uniquely identify the particular Citizen for communication of classified information, so that no ambiguity is created about the identity of the receiver, during this said electronic communication. In India, Citizen are having several identity instruments which mostly comprises of common parameters of an individual. Also Government is launching several identity instruments regularly to deliver various services to the Citizen. Apart from the Government, other organizations like Super-specialty Hospitals, Bank, Credit Societies, etc. are also providing several smart cards, debit cards, credit cards, etc., to its account holders for performing several medical, financial, etc, type of transactions. As a result, Citizen are forced to carry multiple identity instruments to perform several electronic transactions, which ultimately provide an appropriate platform to the hackers to fulfill their ill intentions. To find solution to these problems, we have proposed a Citizen centric multivariate electronic smart card based E-Governance mechanism, which is explained in the next section of this paper.

3. Proposed E-Governance Mechanism

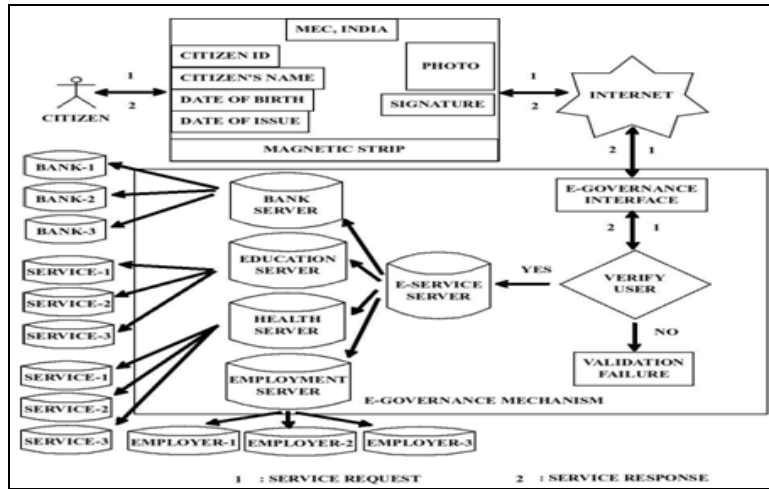


Figure 1: Schematic diagram of proposed E-Governance mechanism

Our proposed mechanism whose schematic diagram is shown in Fig – 1, will help to perform all types of electronic transactions like governance, education, banking, health, etc with a Citizen centric approach. The description of our proposed E-Governance (Roy and Karforma, 2014), (Roy and Karforma, 2014), (Roy and Karforma, 2014), (Roy and Karforma, 2013), (Roy, Karforma and Banik, 2013), (Roy and Karforma, 2013), (Roy and Karforma, 2012), (Hoda, Roy and Karforma, 2012), (Roy, Sarkar, Mukherjee and Mukherjee, 2012), (Roy and Karforma, 2011), (Roy, Banik and Karforma, 2011), (Roy and Karforma, 2011), (Roy, Banik, Karforma and Pattanayak, 2010), (Sur, Roy and Banik, 2010) mechanism are further mentioned below :

- We have proposed a Citizen centric multivariate electronic smart card based E-Governance mechanism.
- Our proposed electronic smart card, named as Multipurpose Electronic Card (MEC) will act as the ultimate interface for performing several types of electronic transactions between Citizen and Government in various sectors like Health, Banking, Education. etc.
- Government will issue this electronic smart card to uniquely identify the Citizen during these classified electronic communication.
- This proposed smart card will contain vital parameters of the Citizen like, name, date of birth, signature, etc.
- Based on these vital parameters, Government will issue the Citizen ID, which will help to uniquely identify the Citizen.
- On the other hand, Citizen will use this proposed smart card to access various facilities provided by the Government in its core and allied service areas.
- Government will allow the Citizen to avail the facilities only after its proper identity verification, so that intruders are prevented to infiltrate into the proposed mechanism.
- Fig – 1 shows the schematic diagram for any type of Citizen-to-Government (C2G) type of E-Governance transaction.

For example, electronic transaction for arrangement of appointment with the Doctor using our proposed E-Governance mechanism may be described below :

- Citizen will use the proposed smart card to initiate the E-Governance transaction.
- Citizen will provide its own Citizen ID through the Internet to Log-in into its account within the proposed E-Governance mechanism.
- Government or an agent acting on behalf of it, will verify the identity of the Citizen using various authentication (Sarkar and Roy, 2013), (Roy and Karforma, 2013), (Roy and Karforma, 2012), (Sarkar and Roy, 2012) procedures, before initiating the actual transaction.
- In case of authentication failure, negative acknowledgement is send to the Citizen to abort the transaction.
- In case of successful authentication, Citizen provides its own medical details to the Health Server of the proposed E-Governance mechanism for fixing appointment with the Doctor. The name of Server will change, based on the type of electronic transaction carried out between the Citizen and Government.
- Based on the information provided by the Citizen, the Health Server of the proposed E-Governance mechanism will communicate with the respective server of the Medical Unit (i.e Hospital) for fixing the appointment requested by the Citizen.
- After successful verification of the Citizen, who is also the registered user of this Medical Unit (i.e Hospital), the Hospital authority will fix the appointment with the available Doctor and send the details to the Citizen.
- Thus, the Citizen-to-Government (C2G) type of transaction i.e arrangement of appointment with the Doctor through our proposed Citizen centric multivariate electronic smart card based E-Governance mechanism is completed successfully.

So far we have only introduced the concept of our proposed E-Governance mechanism mainly to describe its inter-domain relations during its operations, which is revealed by the involvement of Hospital related transactions. For this reason, we can also

refer the above mentioned electronic transaction as Citizen-to-Government-to-Hospital (C2G2H) type of transaction. Thus, the multivariate aspect of our proposed E-Governance mechanism is further explored in the next section of this paper.

4. Application of Proposed E-Governance Mechanism for E-Health Services

We have discussed the delivery of health services through our proposed E-Governance mechanism. The schematic diagram of our concept is shown in Fig – 2, which considers only the Medical communication through our proposed E-Governance mechanism.

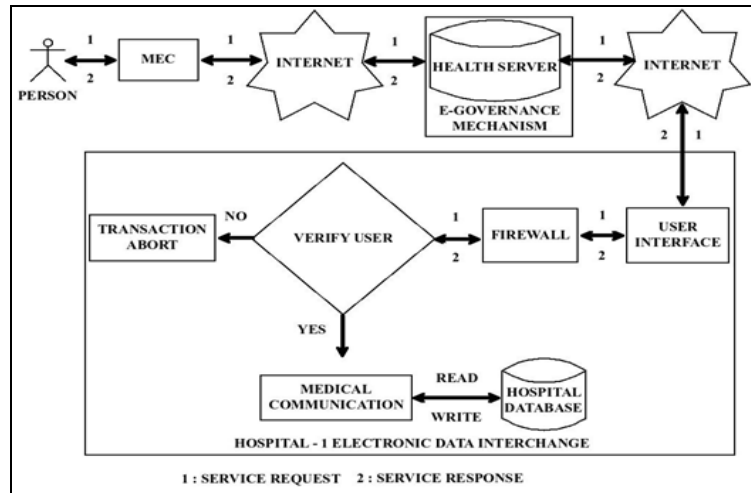


Figure 2 : Multivariate aspect of proposed E-Governance mechanism during C2G2H type of E-Health transaction

The explanation of Fig – 2 for arrangement of appointment with Doctor of Hospital named as *HOSPITAL -1* through our proposed E-Governance mechanism are as follows :

- Citizen communicate with the E-Governance mechanism using its own Multipurpose Electronic Card (MEC).
- Citizen provides it unique *CITIZENID* to the E-Governance mechanism through *PATH - 1*.
- E-Governance mechanism performs authentication of the identity of the Citizen.
- In case of unsuccessful authentication, the Citizen is send negative acknowledgement through *PATH - 2* and the transaction is aborted immediately.
- In case of successful authentication, the Citizen is send positive acknowledgement through *PATH - 2* and the transaction is permitted to proceed further.
- Citizen provides its request for arrangement of appointment with a Doctor for medical check up.
- Based on the request of the Citizen, E-Governance mechanism forward the service request to its *HEALTH SERVER* to perform necessary action.
- *HEALTH SERVER* collects further details from the Citizen, like *DISEASE*, *SYMPTOMS*, etc. Based on these information, the E-Governance mechanism, forward the service request of the Citizen to Electronic Data Interchange (EDI) of *HOSPITAL - 1*.
- Within the Electronic Data Interchange (EDI) of *HOSPITAL - 1*, following operations are executed for arrangement of appointment of Doctor for the Citizen.
 - The User Interface of Hospital asks for the *CITIZENID* of the Citizen for authentication purpose.
 - The *CITIZENID* is forward for verification through the Firewall of the system to prevent the entry of malicious code within the system.
 - In case of unsuccessful verification, Citizen is send negative acknowledgement and the transaction is aborted immediately.
 - In case of successful verification, Citizen is allowed to proceed further.
 - Based on the parameters of the Citizen and the records stored in the Database of the Hospital, the appointment with the Doctor is arranged.
 - The details of the appointment are informed to the Citizen through *PATH - 1*.
- The electronic transaction for delivery of E-Health services through our proposed E-Governance mechanism is terminated successfully.

Thus, in this way our proposed Citizen centric multivariate electronic smart card based E-Governance mechanism will help the Citizen to avail various medical facilities during its need. On the other hand the Government will also have a record about the medical status of its Citizen, based on which further developmental projects can be initiated easily. Our concept will explore future research works in this field, as it have sufficient scope of up-gradations during its implementation. For example, the

- *HOSPITAL DATABASE* shown in Fig – 2 is represented by single database, which should be replaced with distributed database management system to avoid database failures during real world implementation. The *HOSPITAL DATABASE* at least should contain the following information shown in Fig – 3 for its logical operations.

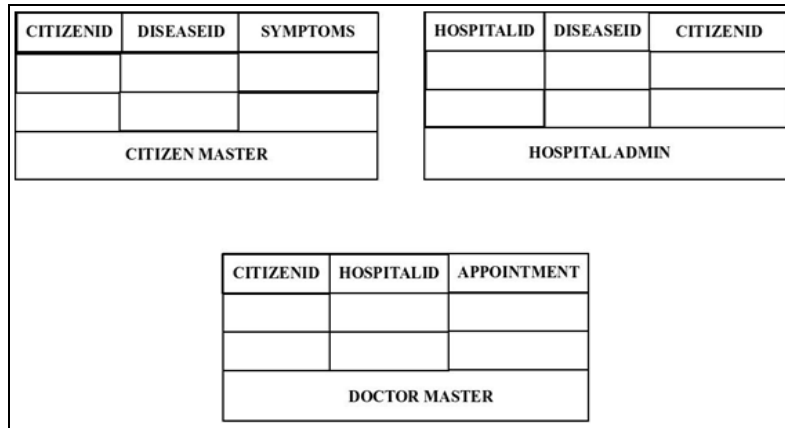


Figure 3 : Database Tables of HOSPITAL – 1

The explanation of the Database Tables shown in Fig – 3 are mentioned below –

- *CITIZENMASTER* – This table contains the primary attributes of the Citizen who wants to avail medical facilities through our proposed E-Governance mechanism. The attributes of this table are further explained below –
- *CITIZENID* – This attribute helps to uniquely identify the Citizen. Hence it is the *PRIMARY KEY* of this table.
- *DISEASEID* – This attribute helps to identify the Disease of particular Citizen, based on which specialist Doctors will be searched from the Hospitals. Hence, this attribute should be *UNIQUE* and *NOT NULL* in nature, as it will also help to build logical relationship with table *HOSPITALADMIN*.
- *SYMPTOMS* – This attribute describes the health related problems of the Citizen.
- *HOSPITALADMIN* – This table contains the primary attributes of the Hospital which will perform vital role for delivery of medical facilities to the Citizen. The attributes of this table are further explained below –
- *HOSPITALID* – As this attribute helps to uniquely identify the particular Hospital among the others, it acts as the *PRIMARY KEY* of this table.
- *DISEASEID* – This attribute helps to identify the Disease of particular Citizen, based on which specialist Doctors will be searched among the Hospitals. This attribute should be *UNIQUE* and *NOT NULL* in nature, as it will help to build logical relationship with table *CITIZENMASTER*.
- *CITIZENID* – This attribute denotes the *CITIZENID* of the Doctor and helps to build logical relationship with the table *DOCTORMASTER*. Hence, this attribute should be *UNIQUE* and *NOT NULL* in nature.
- *DOCTORMASTER* – This table contains the primary attributes of the Doctor database, which are further described below –
- *CITIZENID* – This attribute denotes the *CITIZENID* of the Doctor, which is used to uniquely identify the Doctor from the others. Hence, this attribute acts as the *PRIMARY KEY* of this table. This attribute is also used to build logical relationship with the table *HOSPITALADMIN*.
- *HOSPITALID* – This attribute uniquely identifies the Hospital where the appointment of this Doctor can be arranged for the Citizen.
- *APPOINTMENT* – This attribute denotes the schedule of appointment for the specific Citizen. Generally, as a Doctor can not attend more than one Citizen at a time, this attribute should be *UNIQUE* and *NOT NULL* in nature.
- Thus, in this way Fig – 3 shows the minimum attributes required for successful database operations within our proposed mechanism. However, there are several chances for further enhancements within our concept. For example, we are yet to consider the case, if a Doctor becomes ill and want to avail medical facilities using our mechanism. Thus, the conclusion drawn from the entire discussion are mentioned at the last part of this paper.

5. Conclusion

The objective of this paper was to show the application of our Citizen centric multivariate electronic smart card based E-Governance mechanism to deliver E-Health services to the Citizen. This paper is just a blue-print, based on which future research works will be carried out to apply this concept for the betterment of the society. Here we have shown our concept in a very simple manner for easy understanding our concept, which is obviously going to become more complex during real world implementation. Thus, the modification required within our concept for its real world implementation in a secured manner may be considered as the next part of this paper.

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