

Cloud Based Healthcare Architecture, Electronic Medical Record Mining and Context Based User Stereotype Modeling: An Integrated Approach to Improve Healthcare System



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Outline

- ▶ A cloud based architecture to enhance healthcare
- ▶ Enhancement of mobile user interface and human interaction with the system
- ▶ Mining of enormous data which is generated everyday
- ▶ Development of desktop standalone application for doctor
- ▶ Development of two web service based android applications for doctors and general user.
- ▶ Challenges and future work



Motivation

- ▶ Bangladesh is lagging behind in healthcare
- ▶ No use of modern technology in this sector
- ▶ Some computer based standalone systems but no heterogeneity
- ▶ Internet , Computers, smartphones are available in all corners
- ▶ The outcome of a complete system will benefit the people of all walks

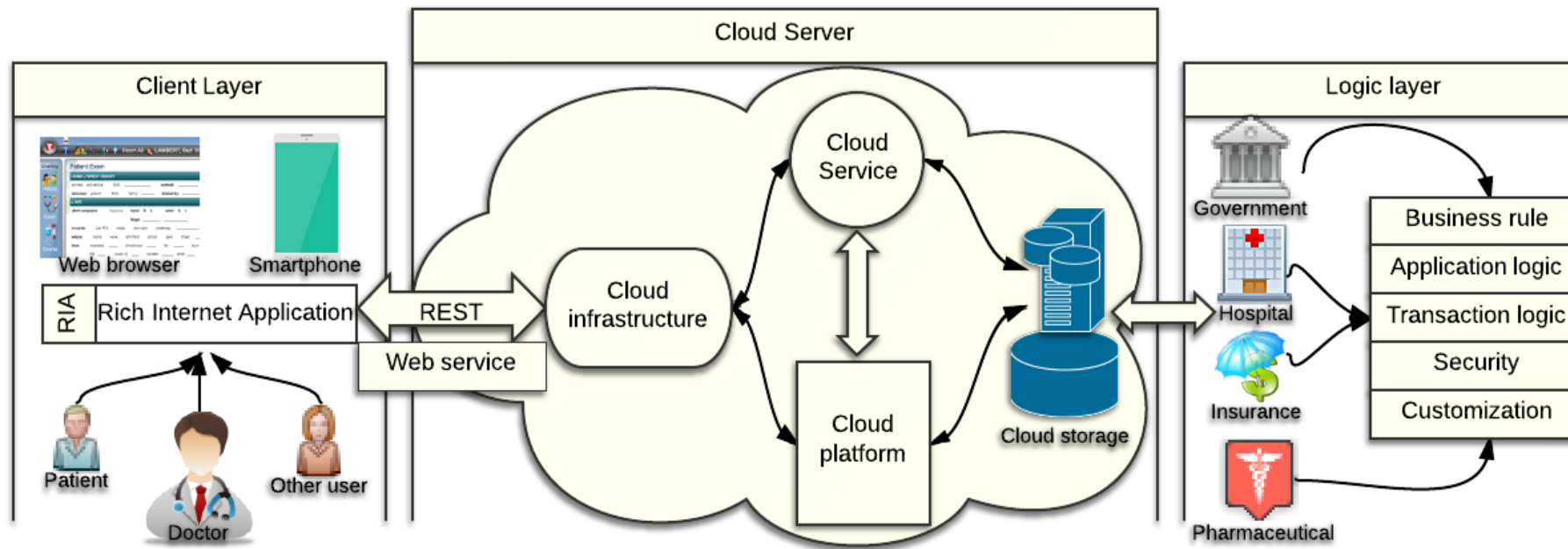


Proposed System

- ▶ Proposed “eHealth Cloud” - a ubiquitous cloud based network to improve healthcare
- ▶ Records of every treatment is stored with both parties' identification, medicine list, diagnosis, lab tests etc.
- ▶ Use of web based and smartphone application
- ▶ The total functionality of patients and doctors will be easier
- ▶ Pharmaceuticals, insurer, hospitals will be much benefited



Three-tier eHealth Cloud Model



Existing System

- ▶ No electronic medical data is stored for further use
- ▶ Doctors are not able to view patient's previous medical history
- ▶ Finding appropriate doctor and getting appointment
- ▶ Analyzing large amount of EMR data
- ▶ No heterogeneous communication possible among doctors, patients and other parties

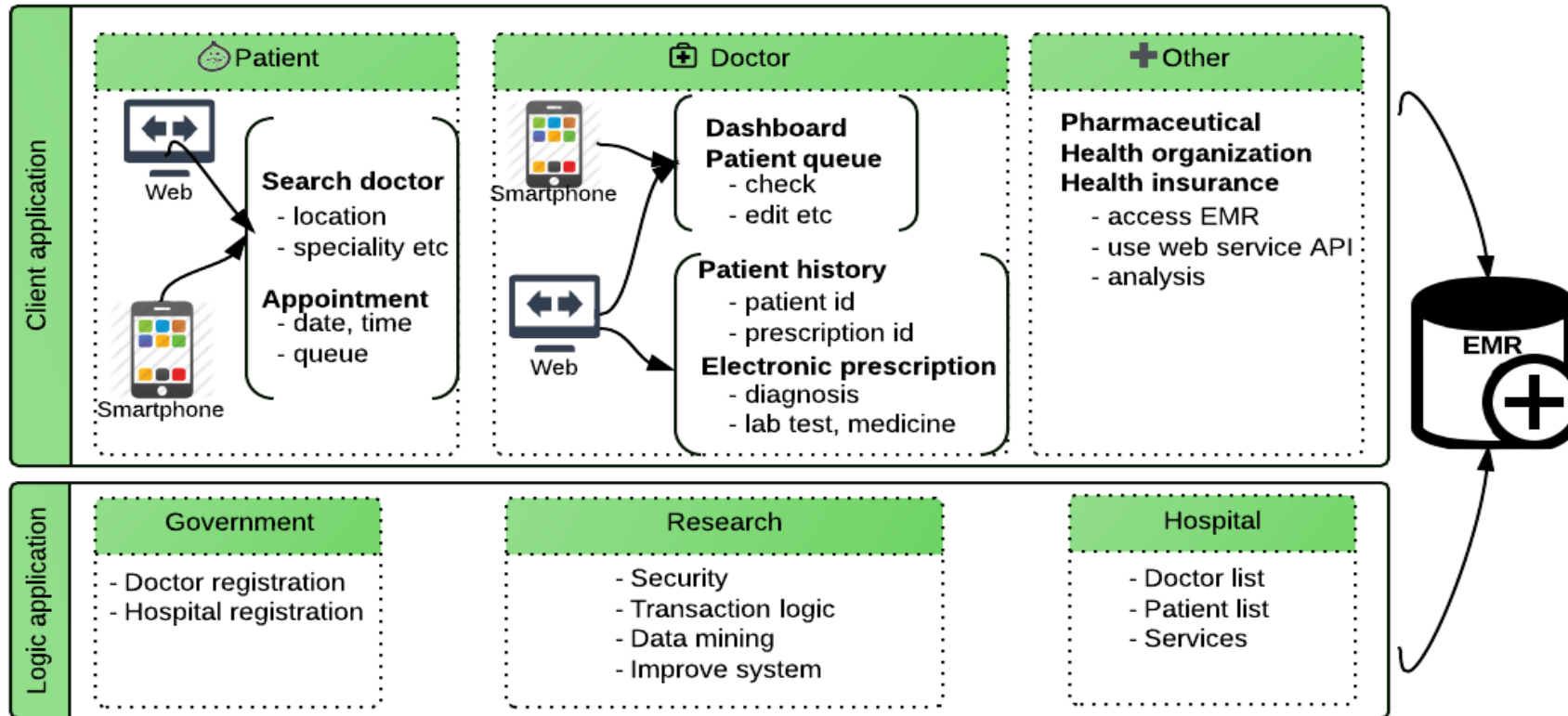


Architecture

- ▶ RIA based client on web browsers or smartphone apps
 - ▶ Doctors and patients interact with the system
 - ▶ Rich UI with several functional units
- ▶ Cloud server with integrated with Amazon's SimpleDB
 - ▶ Jobs are offloaded to the cloud
 - ▶ REST is used for interconnection with other units
- ▶ Logic layer
 - ▶ Controls the system with application and transaction logic
 - ▶ Data security, maintenance and mining is done
 - ▶ Government control over top level abstraction



Applications



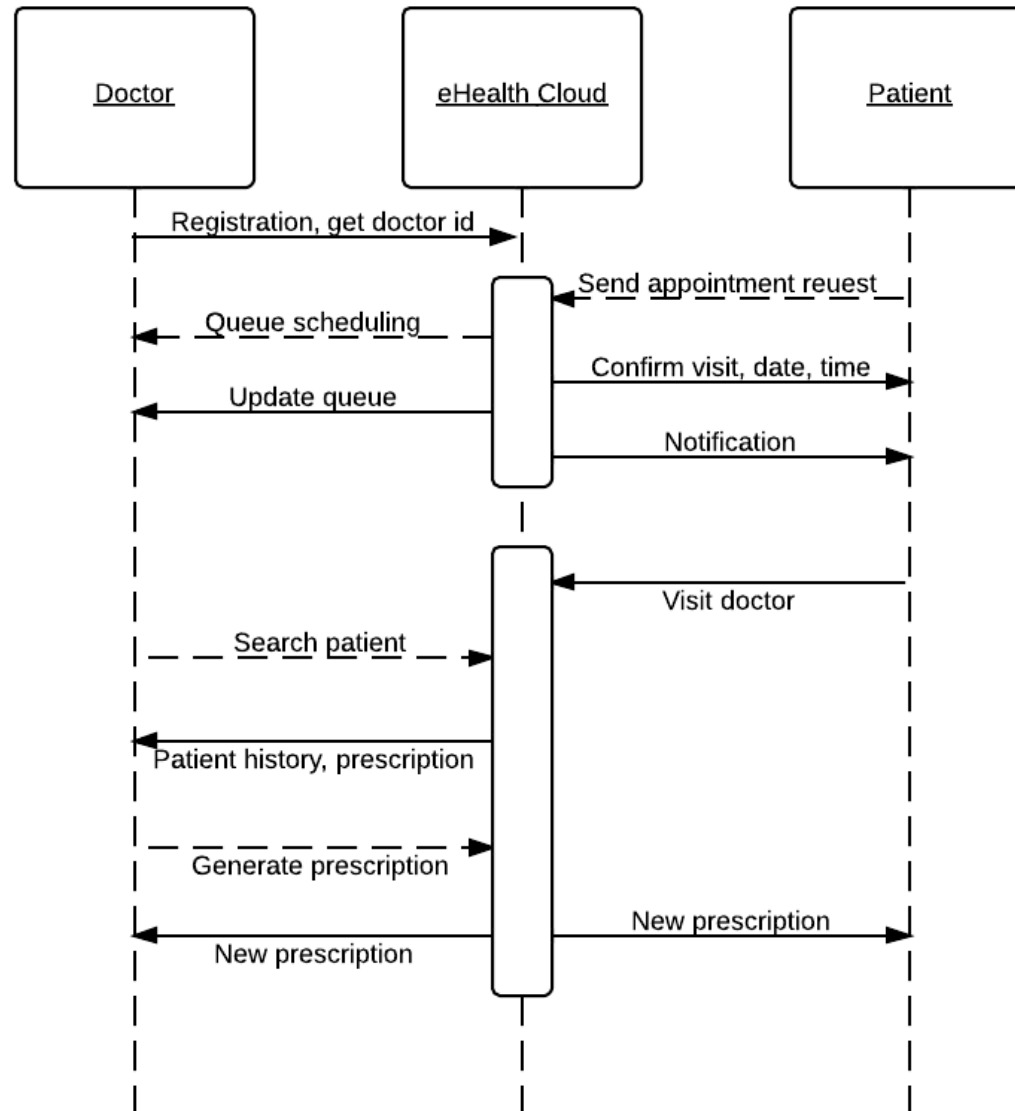
Applications

- ▶ Patient side
 - ▶ Find appropriate doctor, take appointment
 - ▶ Check previous treatment history
 - ▶ Get medical facilities with the eHealth Cloud ID
- ▶ Doctor side
 - ▶ View patient's details and history
 - ▶ Electronic prescription generation
 - ▶ Better communication, better treatment
- ▶ Administrative
 - ▶ Manage users and data
 - ▶ Perform complex query and take appropriate action
 - ▶ Research options



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Communication



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Technology Used

- ▶ Cloud computing (IaaS, PaaS, SaaS)
- ▶ Simple Object Access Protocol (SOAP)
- ▶ Representational State Transfer (REST)
- ▶ SimpleDB by Amazon



Stereotyping Users

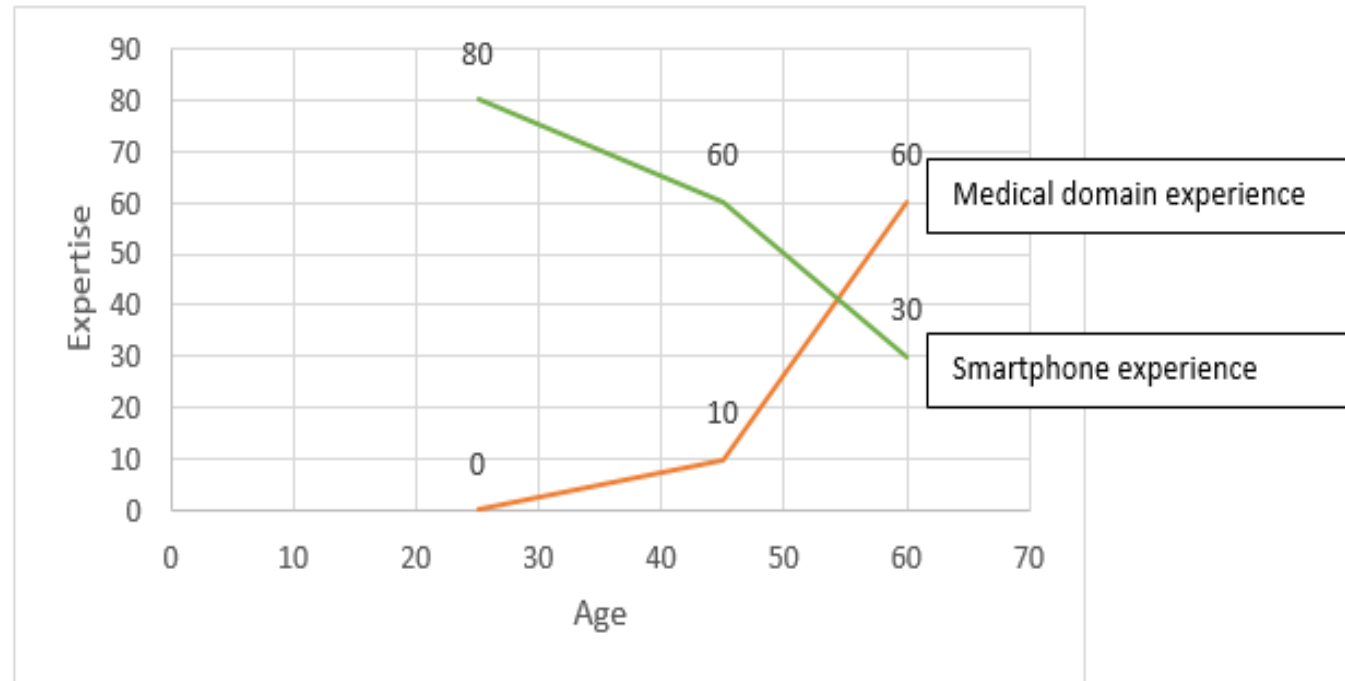
Considered characteristics:

- ▶ User age group or gender
- ▶ Experience in his/her domain
- ▶ User behavior regarding mobile application adoption
- ▶ User preferences



Stereotyping Users

- ▶ Junior doctor
- ▶ Intermediate doctor
- ▶ Senior doctor

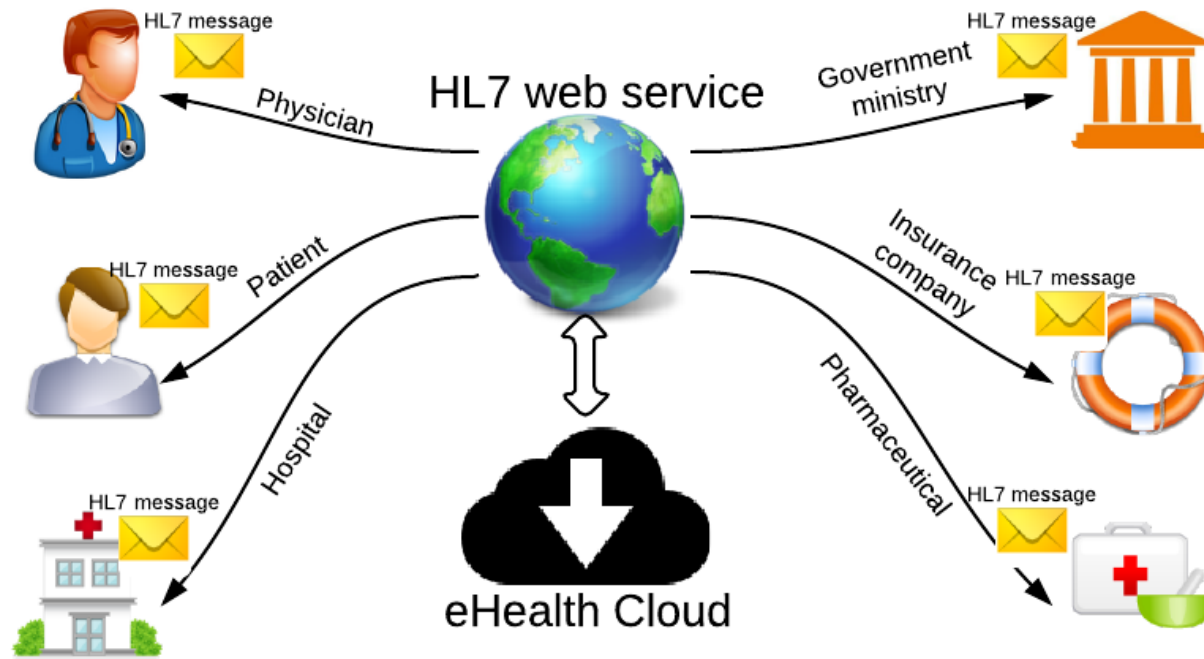


EMR Mining

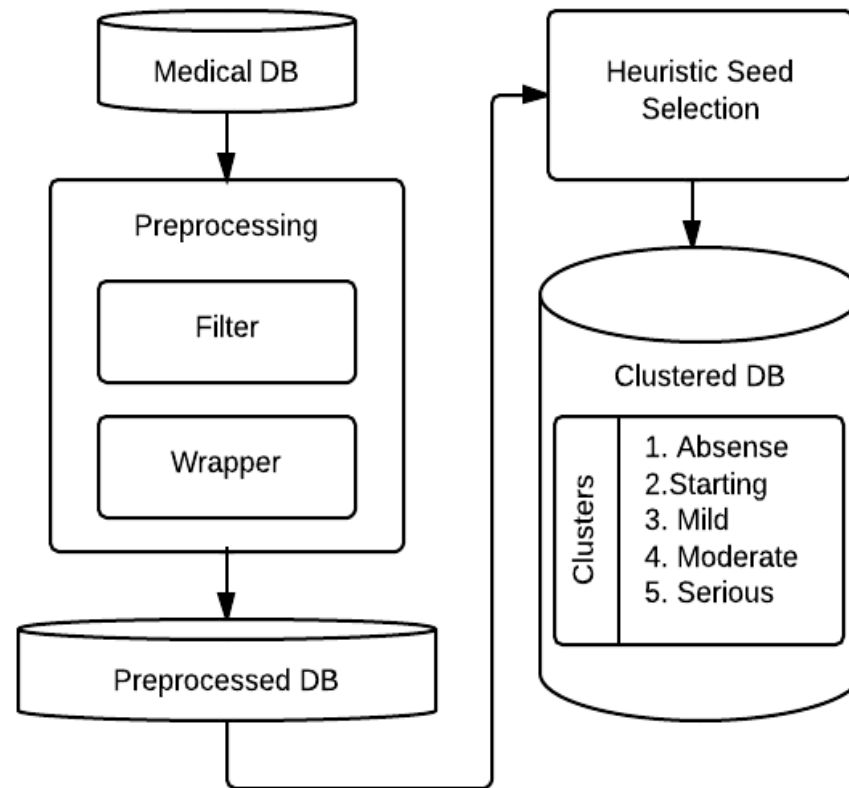
- ▶ Analyze and find hidden patterns from database
- ▶ Provides valuable information
 - ▶ E.g., Malaria infection has been doubled in Dhaka this year
- ▶ Helps to make decision for government
- ▶ Standard data exchange and storage
 - ▶ HL7 and cloud server
- ▶ Defining method based on statistical report
- ▶ Mining of data through the model by Kuttikrishnan et al



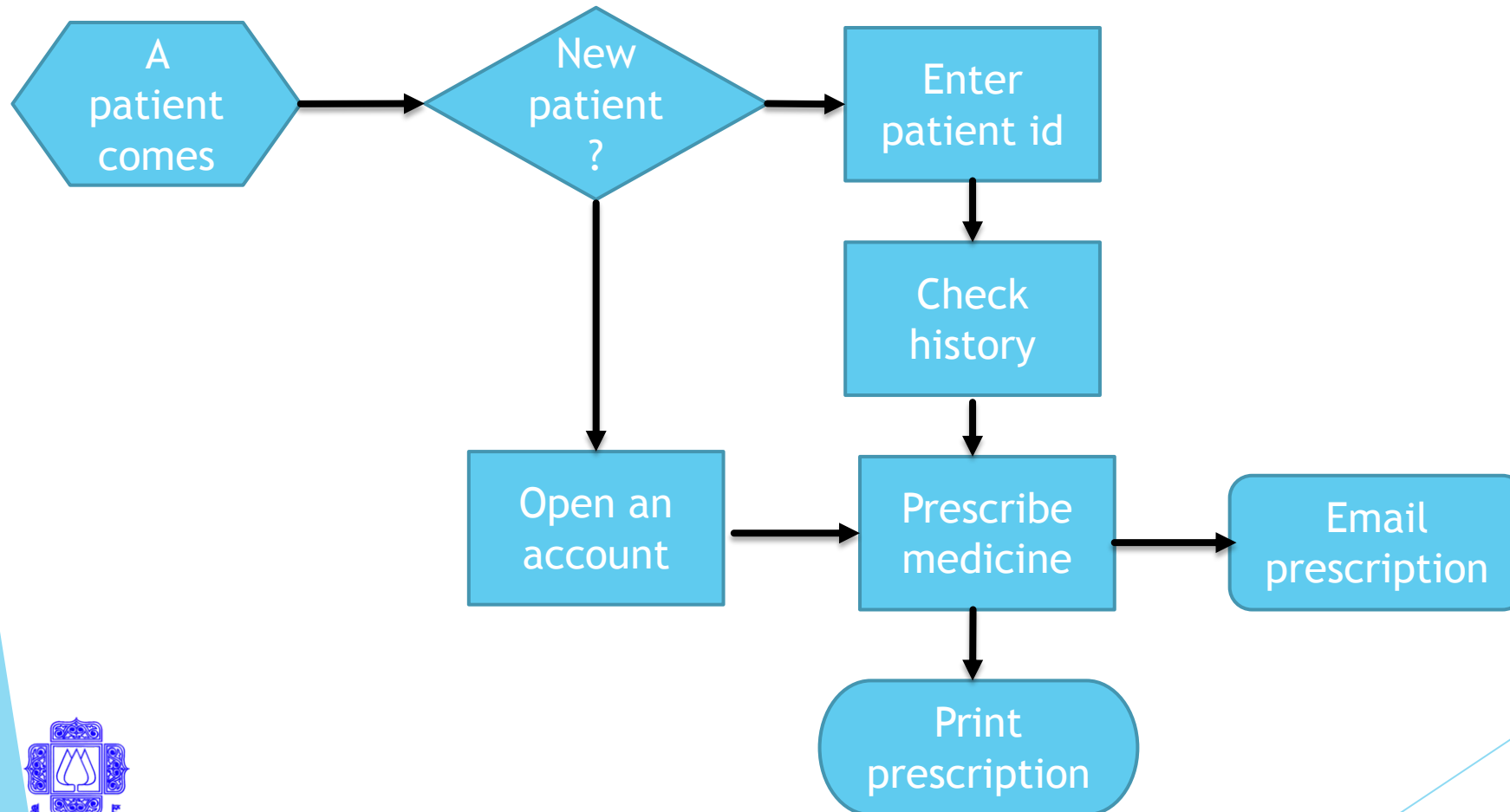
Data Exchange Method



EMR Mining Model



Desktop Application



Application Features

- ▶ Doctor's appointment by SMS
- ▶ SMS module integrated with GPRS modem
- ▶ Maintain patient details by doctor
- ▶ Electronic prescription generating
- ▶ View patient history



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Security & Privacy

- ▶ Sensitive data sharing
- ▶ Ownership of data
- ▶ Proper security mechanism
 - ▶ Encryption in patient side in lieu of cloud
 - ▶ Construction of privacy domains
 - ▶ Secure data while generating in doctor's end



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Challenges

- ▶ Security
- ▶ Data management
- ▶ Scalability
- ▶ User experience and usability
- ▶ Maintainability
- ▶ Legislations and data ownership



Future Work

- ▶ Theoretical and applied research on higher optimization
- ▶ Incorporation with other domains
- ▶ Inclusion of third party services like map or GPS
- ▶ Enhance security



Thank you



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