

Case Study 1: Design, Development & Implementation of State-wide Hospital Information System in Himachal Pradesh

S. No	Subjects
1	<p>Abstract:</p> <p>The project concerns a 10-year experience relating to the design, development, implementation and support of Integrated e-Health project in Department of Health & Family Welfare, National Health Mission, Himachal Pradesh. This is the first project in an Indian state which covers all the districts in the state with a free and open source platform (called OpenMRS) and is integrated with the state HMIS, to create an integrated e-health architecture for the state. The project was recognized by the National Rural Health Mission as an innovation in 2013 at an annual meeting in Srinagar. The project is unique as it presents a practical model of a cost-effective and sustainable implementation of an integrated e-health architecture</p>
2	<p>Keywords and tags</p>
	<p>Integrated Electronic Medical Records e-Health Architecture, Free and open source platform OpenMRS Himachal Pradesh, India Sustainable and scalable architecture</p>
3	<p>Note to Practitioners/Instructors</p> <p>A. Design guidelines</p> <ul style="list-style-type: none"> i) Based on participatory design principles ii) Incremental design approach iii) User-driven design methods <p>B. Data management guidelines</p> <ul style="list-style-type: none"> i) Curating meta data standards across all hospitals ii) Allowing flexibility for individual hospitals to add locally relevant data iii) Maintaining data dictionaries for data being used iv) Building compliance to required standards – ICD, SNOMED CT etc <p>C. Implementation guidelines</p> <ul style="list-style-type: none"> i) Technical support to be locally based, committed to the state ii) Use of low cost local resources and reduce dependence on expensive external consultants iii) Incremental model of implementation, in gradual phases rather than adopting a “big-bang” approach iv) First go for the low-hanging fruits (such as registration and billing) and then move to the more complex modules (such as OPD and IPD) v) Support decentralization of IT procurement and support functions <p>D. Policy guidelines</p> <ul style="list-style-type: none"> i) Adoption of decentralized rather than centralized architecture

	<ul style="list-style-type: none"> ii) Give primacy to security of patient data, by keeping it to the hospital servers iii) Promotion of free and open source digital platforms over proprietary based systems iv) Have systematic processes for knowledge transfer and state ownership v) Create enabling environment for promoting local innovations <p>E. Architecture guidelines</p> <ul style="list-style-type: none"> i) Designing architecture based on contextual parameters of patient loads, reliability of electricity and internet supply ii) Avoiding complexity of architecture, by making it easy to use and locally controlled iii) Architecture giving primacy to the protection of patient data iv) Adopt local rather than central architecture
4	Project Context
	<p>Implementation Background:</p> <p>The state of Himachal Pradesh is progressive and one of the high performing states in terms of attaining the goals of Human Development Index. This state is unique in that it has nearly 90% of its population attending to the public health system, thus providing strong political incentive to strengthen public health systems. In line with this progressive agenda, the state made the innovative decision to adopt an e-health architecture based on free and open source software, and have shown great vision in sustaining this project for more than 10 years. The state chose HISP India as their technology partner, an ideologically committed organization to open source software and in strengthening public health systems. HISP India adopted the world leading open source platform (OpenMRS) and through a strong participatory design process, built an integrated hospital systems well suited for the district settings of the state. At the same time, the platform was scalable, and over time has been scaled up to both tertiary hospitals and also scaled down to PHC facilities. Over time, all hospital data flows into a state dashboard where it is integrated with HMIS data to give state level administrators to get a statewide overview of health performance.</p> <p>Deployment Mode:</p> <p>Key aspects of the deployment mode included:</p> <ul style="list-style-type: none"> i) A reference hospital was identified to be the site where the overall system would be designed and developed. This reference hospital was one with a high patient load and with all major specialities. The assumption was that if the system could be made to work in the most complex hospital in the state, it could be made to work in any other state. ii) Once the system was deployed successfully in the reference hospital, it was rolled out in incremental phases to all the other 22 district hospitals in the state. iii) Hospital staff from the reference hospital were themselves engaged in supporting the use of the system in the other hospitals.

	<ul style="list-style-type: none"> iv) Each hospital established a local server, where all patient data was stored, and on a daily basis, individual data was aggregated and transferred to a state-wide server. v) An architecture kind of thing underpinned the overall deployment model. vi) A low cost team of local residents was established by HISP India in the state office, and were responsible for providing all forms of support to all hospitals. vii) While the early years of the deployment were focused on making the systems operational, in the recent years, the focus has been towards promoting the use of information. <p>Key Implementation Highlights:</p> <ul style="list-style-type: none"> i) First state wide, integrated e-health architecture based on free and open source digital platform. ii) iii) Low-cost, scalable and sustainable architecture. iv) Integrated suite of 10 modules with a hospital core module which helps in managing other ancillary services modules. v) vi) Compliant with Clinical Vocabulary Standards (ICD-10), SNOMED-CT, SDMX (for data transfer) making the system interoperable and scalable and capable of generating aggregate hospital reports and management indicators using BIRT. vii) Potentially expandable to integrate with PACS using HL7 and DICOM, and specific LIS/RIS functional at the hospital. <p style="padding-left: 40px;">Integrated with AMR surveillance platform based on DHIS2</p> <ul style="list-style-type: none"> viii) Integrated with interactive dashboards and other data analytic tools.
5	Project Overview
	<p>Project Objectives:</p> <ul style="list-style-type: none"> i) Design , development, implementation and support of Integrated e-Health architecture for HP state covering all district hospitals and more. ii) Building sustainable capacity in the state to manage and own the systems. iii) Contribute to strengthen health outcomes in the state. <p>Key Activities Undertaken for System Implementation and Support:</p> <ol style="list-style-type: none"> 1. Design, develop an integrated hospital information system comprising of 10 modules, including Hospital Core, Registration, Patient Queue, Patient Dashboard, OPD/IPD, Pharmacy, Billing, Radiology, Laboratory, Inventory, and integrated Reports. 2. Provide upgrades as an when required and reflect them in all facilities.

	<ol style="list-style-type: none"> 3. Provide for ongoing training to all cadres of system users. 4. Provide for help desk support and server maintenance for all facilities. 5. Conduct systematic analysis of hospital specific data to identify trends in registration and caregiving, morbidity and mortality profiles, changes in hospital management indicators and other epidemiological analysis. This analysis was discussed periodically with hospital staff to motivate them to improve use. 6. Provide for various integration services, for example with Mera Aspataal Portal (Dashboard on Hospital Performance based on patient satisfaction feedback) based on Government of India guidelines. 7. Setting-up data migration mechanism from individual health facilities to the online State Data Warehouse based on DHIS2 on a monthly frequency. 8. Setting-up and maintaining State/District level dashboard for key hospital metrics and indicators. 9. Define and establish backup policy and maintain backup of all the applications on at facility level and remotely on other locations / Servers. 10. Conduct annual preventive maintenance of servers. 11. Local 6-members team deputed in the State capital of Shimla for state-wide routine support, and onsite continued capacity building through periodic refresher training. <p>Key Stakeholders:</p> <ol style="list-style-type: none"> 1. State and hospital administrators and policy makers 2. Hospital staff across different departments in each hospital. 3. IT staff in the state 4. Training department in the state 5. Patients – citizens of the state 6. Government of India – for state level reporting
6	<p>Issues and Challenges faced during Implementation</p>
	<ol style="list-style-type: none"> 1. Staff attrition: Frequent transfer of trained staff without proper knowledge transfer to the new incumbent, which raised for frequent rounds of training. 2. Changes in hospital infrastructure: Frequent changes of rooms within in the hospital premises, required frequent changes to the LAN networks. 3. Financial constraints: for systematic annual maintenance of the hardware and new purchases. 4. Inadequate local capacity at the facility: No dedicated technical staff available at the hospital facility. 5. Reluctance of doctors: to use the system due to the heavy patient workloads.
7	<p>Key Lessons</p>
	<ol style="list-style-type: none"> 1. HIS is based on 2 important pillars - information flow and workflow, where one size doesn't fit all, therefore integrated HIS is not a ready-made solution- its tailor made-based on requirements of the user with great user acceptance. 2. All efforts are made to keep the workflow intact, so that the transition is only from paper to computer - keeping all essential workflows the same but with more value addition.

	3. Sustaining the application needs equal contribution from People and Process, takes a dedicated effort to keep the hospital users especially the doctors engaged with the use of the system.																								
8	Methodology adopted for Case Writing																								
	Based on 10 years of direct experience in the conceptualization and implementation of the project Conduct of systematic evaluation of the project impacts Published research from the project																								
9	Case Fact Sheet																								
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		<ol style="list-style-type: none">6. Average users per facility- 407. A hybrid design approach using paper and computers to be sensitive to the context of use.8. Loosely coupled modules that can be easily upgraded or downgraded to meet requirements of district hospitals and other health facilities.	
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