

DISSERTATION PROJECT

**Time Efficiency and Functional Outcome Improvements in
Radiology department performance. A Comparative study of
two Radiology Information System Models**

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ATHMA is a healthcare operating system designed to revolutionize care delivery in India. It provides a comprehensive suite of healthcare apps designed to cater clinical, operational, and financial workflows in healthcare. ATHMA offers doctor and patient apps with video consultation and online health records.

ATHMA is built on four fundamental pillars-

USER EXPERIENCE

“Athma's user-centric approach ensures that patients and healthcare professionals find the platform intuitive and easy to navigate.”

SCALABILITY

“Athma recognizes the importance of scalability to cater to increasing user traffic and data volumes.”

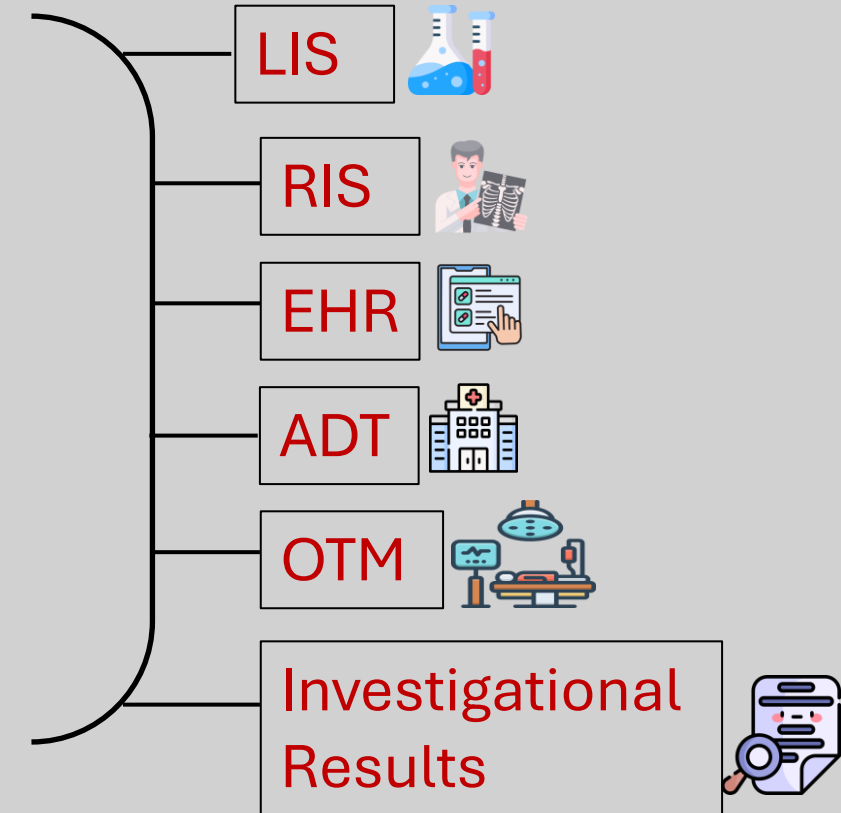
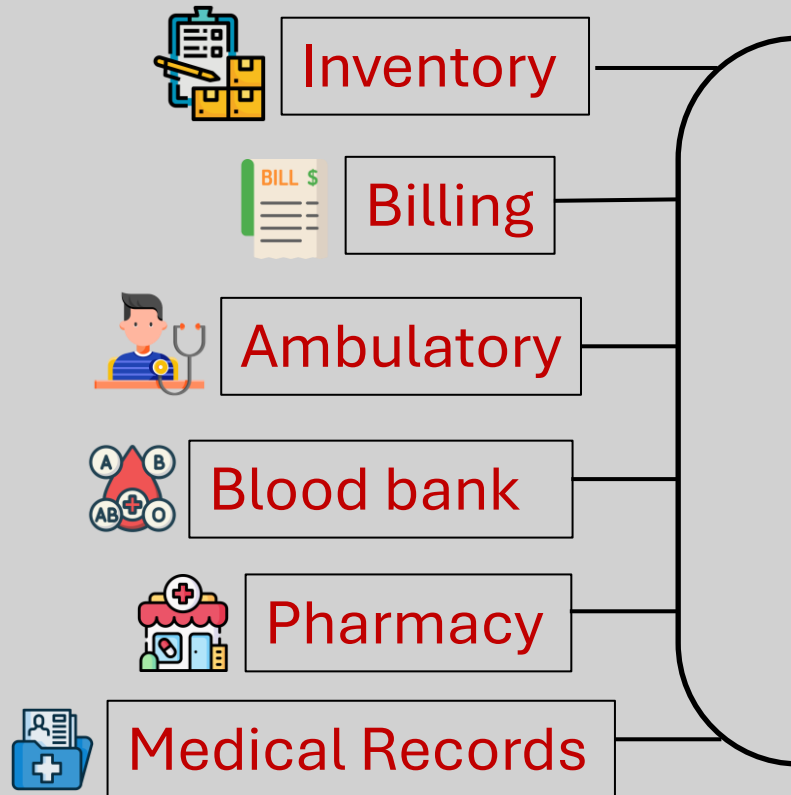
PERFORMANCE

“Athma's focus on performance ensures that users experience quick response times and smooth functionality.”

AVAILABILITY

“Athma emphasizes on uninterrupted availability, allowing patients and healthcare professionals to access the platform 24/7.”

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RIS-In the intricate world of hospital operations, efficiency is paramount, especially within the bustling radiology department. Prior to Radiology Information Systems (RIS), managing X-rays, ultrasounds, and other scans relied heavily on paper records. This resulted in a chaotic system riddled with problems. Locating past exams became a time-consuming task, misplaced folders posed a risk of losing crucial images, and delays in diagnoses were a frequent occurrence. Furthermore, fragmented paper records often left physicians with an incomplete view of a patient's radiology history, hindering their ability to provide optimal care. Communication breakdowns were also commonplace, with reports misplaced or shuffled between departments.

Model A-

Model A boasts a robust suite of integrated modules, including Electronic Health Records (EHR), Laboratory Information Systems (LIS), Radiology Information Systems (RIS), Pharmacy Management, Inventory Control, Blood Bank Management, and Admission, Discharge, and Transfer (ADT) functionalities, among others.

Focusing specifically on the RIS module within Model A, it provides healthcare professionals involved in the radiology process with a comprehensive set of tools. These functionalities include modality worklists, reporting worklists, order processing, scheduling requests, a study browser, tele-radiology capabilities, invoicing, and report generation. This streamlined approach empowers staff to complete radiology tasks efficiently.

Model M-

Model M is a software for RIS, consists of products and services that streamline the medical image scanning operations of a hospital. The solution offers seamless viewing to Radiologists and Clinicians across the hospital.

S.no	Author and Year	Title/ Objectives of the study	Study	Key Findings
1.	Nam et al., 2018	Medical Imaging: From Roentgen to the Digital Revolution, and Beyond	Historical Review Study	- Reduced Report Turnaround Time - Improved Staff Productivity - Enhanced Communication
2.	Lahiri & Seidmann 2018	Analysing the Differential Impact of Radiology Information Systems Across Radiology Modalities	Comparative Cross-Sectional Study	RIS implementation did not have a uniform positive impact on all modalities. There was a significant decrease in report turnaround times for mammographic studies after implementing the RIS.

S.no	Author and Year	Title/ Objectives of the study	Study	Key Findings
3.	Johnson, M. and Davis, K. 2020	Enhancing Radiology Department Performance: Outcomes of Implementing a New Radiology Information System	Longitudinal Cohort Study	Improved Workflow Efficiency Reduced Processing Time: Automation Benefits: Enhanced Patient Throughput Increased Capacity Quality of Patient Care Improved Accuracy Enhanced Reporting
4.	Brown, L. and Nguyen, P. 2021	Assessing Radiology Throughput: A Comparative Study of Digital Radiography Systems	Comparative Cross-Sectional Study	Higher Patient Volume Reduced Turnaround Time Image Quality and Diagnostic Accuracy Enhanced Image Quality Streamlined Workflow



Objective 1:

Comparison of time taken from patient registration to the completion of radiology procedures of two products- Product M and Product A.

01



Objective 2:

Determine the improvement outcomes across different functions of radiology Department after adoption of product A.

02



MONTH 3
June'24

Week 1-2: Draft Report & Recommendations: Write a draft report summarizing the study's findings, limitations, and challenges.

Week 3: Stakeholder Review & Refinement: Present the draft report to seniors at Narayana Health. Gather feedback and refine the report based on their input.

Week 4: Finalize Report & Dissemination: Finalize the study report and disseminate it to relevant stakeholders within Narayana Health.

MONTH 2
May'24

Week 1-2: Staff Interviews: Conduct semi-structured interviews with a representative sample of staff to understand their perspectives on Product A's functionalities, ease of use, and impact on workflow efficiency.

Week 3-4: Data Analysis & Integration: Analyse interview transcripts and combine them with the quantitative data analysis from Month 1. Identify key themes and potential areas for improvement in Product A or departmental workflows.

MONTH 1
April'24

Week 1-2: Data Collection & Review: Gather existing data on workflow metrics and staff experience. Review existing literature on HMIS implementation and best practices for radiology department workflows.

Week 3-4: Data Analysis & Standardization: Analyse the collected data to identify trends and potential areas of impact.

The total sample collected from product A is 674 from three modalities and for product M 963 patient data were collected, which makes total sample size of 1637 patients.

The average time was calculated and compared to three modalities of both the products-

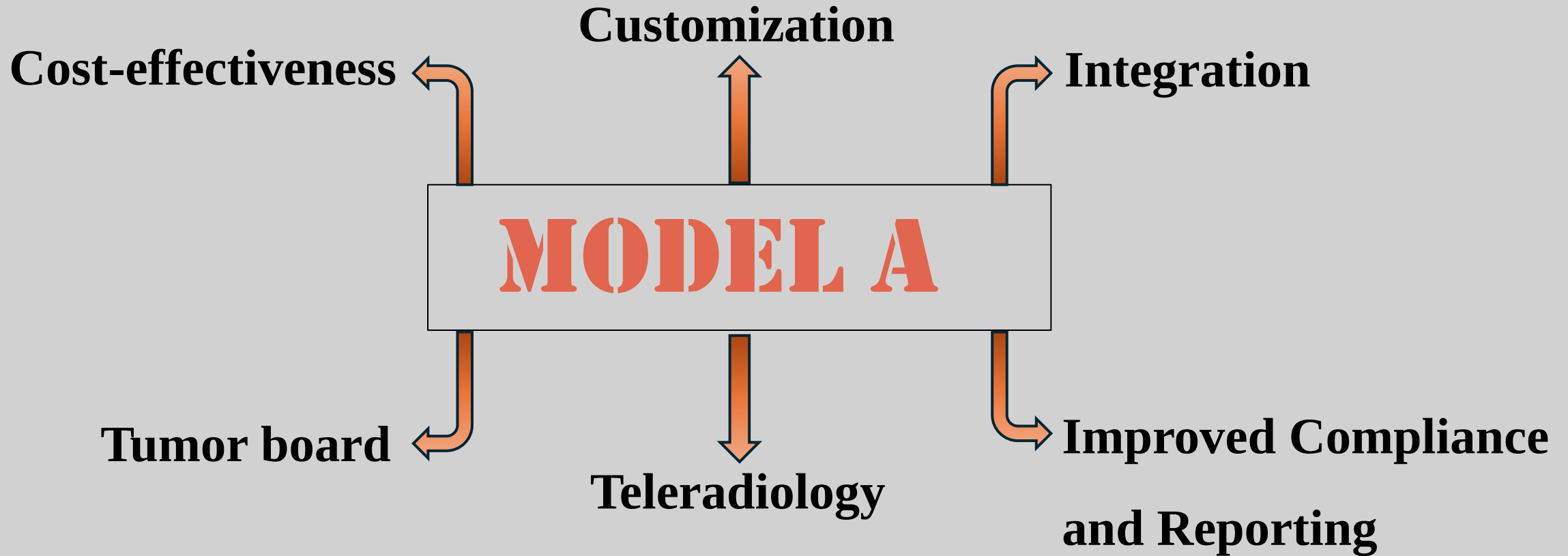
MODALITY	PRODUCT M	PRODUCT A
CT Abdomen & pelvis contrast	05Hr:01 Mins:59Sec	10 Hr:56 Mins:46 Sec
MRI Brain	03Hr:40Mins:57Sec	3 Hr:59 Mins:15 Sec
USG Abdomen	03Hr:23Mins:02Sec	02 Hr:13 Mins:47 Sec



An analysis of the table reveals no significant difference in TAT between the two products.
WHY?

- The calculation to calculate TAT is not in standardized form
- The calculation of TAT was **calculating the doctor nighttime** also i.e. after 8pm, which resulted in increased TAT.
- Unfamiliarity with the software was also an issue for high TAT.

What makes Model A different from Model M?



- **Integration:**

Model A, being an in-house development, might offer greater potential for seamless integration with other hospital information systems. This could streamline data flow across departments, potentially improving overall efficiency.

- **Customization:**

NH can potentially customize Model A to better suit their specific departmental needs and workflow preferences. This level of control might not be readily available with an external Model like M.

- **Cost-effectiveness:**

Developing and maintaining an in-house system like Model A may offer long-term cost benefits compared to ongoing licensing fees associated with an external RIS like Model M.

- **Tumor board-** Model A's Electronic Health Record (EHR) module streamlines collaboration within the Tumor Board. By centralizing patient information in a single software platform, all stakeholders involved in the patient's care can access relevant data with just a click. This eliminates the need for information gathering from disparate sources and facilitates a more efficient and faster process.
- **Teleradiology-** Model A's tele-radiology screen shatters departmental boundaries within a hospital with multiple units. It treats both in-house and outsourced radiology orders equally, fostering a collaborative environment that prioritizes quality reporting. This unified platform also simplifies report segregation, enabling clear analysis of caseloads handled by healthcare staff for both in-house and outsourced cases.

Benefits of Model A

Model A	Model M
Interconnected Functionalities: better integration between radiology and other hospital departments.	Only used for RIS department
Customization Potential	No customization potential
Automation Capabilities	Only manual scheduling
Reduced Vendor Fees	High vendor fees
Addendum and amend option- helps to add or change patient at any point of time	No options for addendum and amend
Improved Data Security	Risk of data security
Scalability	Problem in Scalability

Benefits of Model M

Model A	Model M
New adoption- difficulty in using	Older software- Familiarity with the functionality of software
TAT increased because of new software adoption	TAT time was better as the users were familiar with the software
New product-will take some years for complete development	Proven Track Record- might have a longer history of development and refinement specifically for radiology workflows.

Challenges

Solutions



Data Quality and Availability



Data Cleaning and Validation



**Retrospective Analysis
Limitations**



Sensitivity Analysis



**Learning Curve and User
Experience**



User Feedback Integration



- Narayana Health's radiology department, handling approximately 30,000 patients per month across two units (NICS & MSMC), recently underwent a significant change. After utilizing Model M, an external Radiology Information System (RIS), for five years, the department transitioned to their in-house developed Model A.
- The study was conducted to compare the average time taken for completing radiology procedures using Model M versus Model A -there was no significant difference in TAT between the two products, because of various factors.
- Functional improvements of Model A- The study assess the broader impact of Model A on various functions. This include aspects like scheduling efficiency, technologist workflow optimization, integration and cost and downtime reduction

THANK YOU