THE OPEN GROUP ®
INITIATE
Work Group

Project Title:

**Enhancing Patient  Care through IT: A Healthcare case**

Team Name:

**VisionArchiX**

Course & Institution:

**Faculty of Technology, University of Delhi**

Mentor:

**Ms. Reshma Nachnani**

THE OPEN GROUP ®
INITIATE
Work Group

# Table of Contents

THE OPEN GROUP ®
INITIATE
Work Group

# Enterprise Architecture: Phase B Document

## Version History

| Version | Date Released | Last Update | Notes |
|---|---|---|---|
| v1 | 28-03-2025 | 01-04-2025 | Aligned the initial version with TOGAF. |
| v2 | 03-04-2025 | 05-04-2025 | Added business principles, goals, drivers, and key TOGAF Phase B artifacts. |

## 1. Introduction

In recent years, the rapid evolution of digital technologies and national healthcare reforms in India—such as the Ayushman Bharat Digital Mission (ABDM)—have created both a compelling need and a significant opportunity for AIIMS (All India Institute of Medical Sciences) to transform its business operations. As a premier institution delivering complex tertiary care, research, and academic services, AIIMS faces increasing challenges around data fragmentation, manual processes, non-integrated IT systems, and operational inefficiencies. These hinder the institution's ability to deliver seamless, patient-centred, and data-driven healthcare services at scale.

To address these challenges, this Business Architecture document forms part of a comprehensive Enterprise Architecture initiative modelled on **The Open Group Architecture Framework (TOGAF)**. Specifically, this phase corresponds to **TOGAF ADM Phase B**, which focuses on understanding the **current (baseline) business architecture**, designing the **future (target) business architecture**, and identifying **strategic gaps** that need to be bridged. This effort aligns with broader digital health transformation goals—such as NDHM interoperability, ABHA-linked health records, and improved clinical workflow automation—and ultimately supports AIIMS in delivering safe, efficient, equitable, and responsive care to patients across India.

By analysing AIIMS's existing organizational structures, business processes, services, and stakeholder roles, and by projecting how these must evolve in a digitally enabled future, this document lays the foundation for informed IT, data, and technology architecture development in subsequent TOGAF phases.

# 2. Business Principles, Goals, and Drivers

## 2.1 Business Principles

The following business principles are derived from the core mission and vision of AIIMS, industry best practices in digital healthcare, and TOGAF-recommended architectural thinking. These principles serve as guiding values to inform decisions, architecture design, and IT implementation:

- **Patient-Centricity**
  All healthcare processes and digital systems must prioritize the needs, safety, and experience of the patient. This includes timely access to services, personalized care pathways, and data transparency to empower informed decision-making.
- **Interoperability**
  Systems should be designed for seamless data exchange across departments, hospitals, and with national healthcare platforms (e.g., NDHM/ABHA), ensuring continuity of care and minimizing redundant data entry.
- **Evidence-Based and Data-Driven Management**
  Decisions at clinical and administrative levels should leverage reliable health data, analytics, and performance indicators to improve quality, efficiency, and outcomes.
- **Compliance and Ethical Integrity**
  All business and IT systems must comply with government regulations (e.g., NDHM, HIPAA-equivalent local laws), uphold patient privacy, and follow ethical standards in medical practice and data handling.
- **Scalability and Future Readiness**
  Architecture must allow for adaptability with changing technology trends, expanding patient loads, and evolving regulatory frameworks. Modular, cloud-ready solutions are preferred.

## 2.2 Strategic Drivers

These internal and external factors are shaping AIIMS's strategic push towards business and digital transformation:

**External Drivers:**

- **ABHA (Ayushman Bharat Health Account)**
  The national initiative aims to create a unique health ID for every citizen, enabling lifelong, accessible, and secure digital health records. AIIMS must align with ABHA to support national integration.
- **NDHM (National Digital Health Mission) Compliance**
  AIIMS must conform to NDHM guidelines regarding health data exchange, consent frameworks, and adoption of standards like HL7 FHIR to facilitate interoperability.
- **Government Push for Digitization in Healthcare**
  Policy incentives and funding are being directed toward modernizing government hospitals through IT systems, cloud services, and AI-driven solutions.
- **Public Expectations and Patient Experience**
  Increasing digital literacy and demand for tech-enabled healthcare services (online appointments, digital reports, telemedicine) are pushing institutions toward customer-centric redesign.

**Internal Drivers:**

- **Fragmented IT Systems and Manual Processes**
  Current systems at AIIMS are siloed, paper-based, and lack real-time data sharing capabilities, leading to inefficiencies and patient dissatisfaction.
- **Need for Real-Time Clinical Decision Support**
  Clinicians require integrated access to medical histories, test results, and AI-driven insights to improve care quality and response time.
- **Operational Inefficiencies and Long Wait Times**
  Poor coordination, bottlenecks in scheduling and records, and lack of resource tracking hinder operational efficiency and patient throughput.

## 2.3 Business Goals and Objectives

To realize the vision of a digitally mature and patient-centric AIIMS, the following goals have been established. These are SMART – Specific, Measurable, Achievable, Relevant, and Time-bound.

| Goal | Objective | Target Metric | Timeline |
|---|---|---|---|
| Enhance Patient Experience | Enable digital registration, appointment scheduling, and access to reports | >75% of patients onboarded to digital flow | Within 6 months |
| Improve Care Coordination | Implement integrated Electronic Health Record (EHR) system | 100% departments integrated into EHR | Within 12 months |
| Reduce Patient Wait Time | Automate and optimize patient flow processes | Reduce OPD wait times by 30% | Within 6 months |
| Ensure Regulatory Compliance | Align systems with NDHM, ABHA, and data protection norms | Compliance audit score >90% | Ongoing, first audit in 3 months |
| Enable Data-Driven Decision-Making | Build dashboards and KPIs for clinical, administrative use | Real-time dashboards for all key services | Within 6 months |
| Promote Staff Efficiency and Satisfaction | Reduce time spent on manual admin tasks | 40% reduction in paperwork-related activities | Within 4–6 months |

# 3. Baseline Business Architecture

## 3.1 Current Organization Structure

AIIMS operates under a complex hierarchical structure composed of multiple departments, administrative units, and clinical teams. The structure can be broadly classified into the following roles:

**Administrative Leadership**

• Director

• Dean (Academics)

• Medical Superintendent (MS)

• Additional MS for various services (e.g., OPD, IPD, Emergency)

**Clinical Departments**

• Each led by a **Head of Department (HoD)**

• Includes specialized units like Cardiology, Neurology, Surgery, Pediatrics, etc.

• Supported by faculty, residents, nurses, and support staff

**Non-Clinical Support Services**

• Hospital administration, finance, HR, procurement, records, pharmacy, IT department

• **Academic and Research Units**

• Handling postgraduate training, medical research, clinical trials

## 3.2 Existing Business Capabilities

AIIMS provides comprehensive tertiary care services and academic functions. Key business capabilities include:

• **Outpatient Department (OPD)**

Handles large volumes of daily patients for consultations across specialties. Manual queue systems, high wait times, and limited visibility into real-time patient flow are current issues.

• **Inpatient Department (IPD)**

Offers surgical and medical admissions. Coordination between doctors, nurses, and support staff is mostly offline.

• **Laboratory Services**

Diagnostic and pathology labs support clinical decisions but lack integration with patient records or real-time dashboards.

• **Emergency & Trauma Services**

Highly active units but with minimal data tracking and limited predictive resource allocation.

• **Pharmacy and Drug Distribution**

Operates through in-house units but is poorly digitized; no inventory alerts or prescription linking with EHRs.

• **Billing and Accounts**

Partially computerized but not fully integrated with patient journeys or diagnostics.

• **Medical Records Department (MRD)**

Maintains paper-based records; retrieval and update are time-consuming and error-prone.

• **Academics and Research Support**

Paper-based research submissions and data collection; lacks centralized digital repositories.

## 3.3 Key Business Processes

Some of the primary healthcare workflows currently operational at AIIMS include:

1. **Patient Registration and Appointment Booking**

• Done mostly in person; digital portals exist but are underused

• Re-registration is common due to lack of unique patient ID mapping

2. **OPD Consultation and Follow-up**

• Patients navigate through a fragmented system with no real-time scheduling

• Paper prescriptions and manual referrals

3. **Diagnostics and Lab Tests**

• Tests ordered manually; reports are collected physically

• No centralized dashboard for clinicians or alerts for abnormal results

4. **Admissions and Discharges (IPD)**

• Manual admission forms, bed allocation done offline

• Discharge summaries handwritten, and physical file-based

5. **Billing and Payments**

• Partially digitized, but not integrated with EHR or lab systems

• Separate queues and delays in billing clearances

6. **Pharmacy and Prescriptions**

• No e-prescription systems; pharmacy has no visibility into patient diagnostics or physician orders

7. **Reporting and Medical Records**

• Managed via physical registers or excel sheets

• Data entry duplication and loss are common

## 3.4 Current IT Systems and Limitations

| System Area | Current State | Limitations |
|---|---|---|
| **Hospital Information System (HIS)** | Fragmented modules, not centrally integrated | Silos in OPD, IPD, Billing |
| **Electronic Health Records (EHR)** | Minimal EHR adoption; mostly paper-based | No centralized patient record |
| **LIS (Lab Info System)** | Standalone; some lab automation exists | No integration with HIS or EHR |
| **Telemedicine Systems** | Pilot stage or non-existent | No infrastructure or awareness |
| **Appointment Scheduling** | Partially online; walk-ins dominate | Long queues, inefficiencies |
| **Data Storage** | Local servers, no cloud use | Scalability and availability risks |
| **Analytics & Dashboards** | Very limited use | No actionable insights for decisions |

## 3.5 Stakeholder Pain Points and Business Constraints

### Stakeholder Pain Points:

**Patients**

• Long wait times for OPD and diagnostics

• Confusion navigating hospital processes

• Multiple registrations, poor follow-up care

**Doctors and Medical Staff**

• Lack of integrated patient history

• Overburdened with manual documentation

• Inability to access lab/test data instantly

**Administrators**

• Limited visibility into resource usage

• Difficulty managing data from multiple departments

• Low adoption of IT systems due to training gaps

**IT Staff**

• Outdated infrastructure, lack of support

• Difficulty maintaining fragmented systems

• No standard data formats or APIs

### Business Constraints:

• Budgetary and procurement delays for IT upgrades

• Resistance to change from staff used to manual workflows

• Legacy systems with poor interoperability

• Security and data privacy concerns with digitization

• Insufficient training programs for digital adoption

## 3.6 Summary of Pain Points and Constraints

| Category | Pain Point / Constraint |
|---|---|
| Process | Manual, repetitive tasks; redundant data entry |
| Technology | Disconnected systems; lack of analytics |
| People | Low digital literacy; resistance to new tools |
| Governance | No centralized IT strategy or digital governance model |
| Infrastructure | Limited server capacity; no cloud or remote access |
| Policy | Lack of standard operating procedures (SOPs) for digital workflows |

# 4. Target Business Architecture

## 4.1 Target Operating Model and Vision

The future vision for AIIMS is to function as a **digitally integrated, patient-centric, and data-driven smart hospital** that delivers **efficient, personalized, and coordinated care** across all departments. The **Target Operating Model** envisions:

- Seamless care coordination across OPD, IPD, diagnostics, pharmacy, billing, and discharge
- Unified digital platforms for managing clinical, operational, and administrative functions
- Real-time decision-making using integrated health data and analytics
- Compliance with national digital health initiatives such as **ABHA**, **NDHM**, and **Ayushman Bharat**
- Empowered healthcare professionals and improved experience for patients

**Key Pillars:**

- **Patient Empowerment** via digital health IDs and patient portals

- **Interoperable Systems** using open standards like HL7 FHIR
- **Real-time Data Accessibility** through centralized EHR/HMIS
- **Automation and Efficiency** in workflows (registration, diagnostics, discharge)
- **Data Security and Compliance** aligned with NDHM and HIPAA principles.

## 4.2 Business Capabilities

| Capability Area | Future-State Capabilities |
|---|---|
| **Patient Management** | Digital registration with ABHA integration, centralized appointment scheduling, AI-based triage and patient prioritization |
| **Clinical Services** | Unified EHR system accessible across departments, real-time patient vitals monitoring, AI-assisted diagnosis tools |
| **Diagnostics & Labs** | Integrated Laboratory Information System (LIS), e-orders from doctors, auto-report upload to patient EHR |
| **Pharmacy & Medications** | E-prescription and inventory-linked pharmacy management |
| **Billing & Insurance** | Automated billing workflows, integration with health insurance platforms, Ayushman Bharat and PMJAY claims support |
| **Discharge & Follow-up** | Smart discharge planning, auto-generated summaries, digital follow-up reminders and teleconsultation options |
| **Research & Academics** | Centralized digital repository for research data, automated consent tracking, digital collaboration platforms |
| **Operations Analytics** | Dashboards for patient load, diagnostics usage, staffing, and resource allocation insights |

| | |
|---|---|
| **Telemedicine** | Fully integrated virtual care platform with patient access via mobile apps or kiosks |

---

# 5. Architecture Requirements Specification

## 5.1 Functional Requirements

These requirements define the essential **functions and workflows** the new digital ecosystem must support.

| Category | Requirement |
|---|---|
| **Clinical Workflows** | - Electronic Health Record (EHR) accessible across OPD, IPD, Labs, Radiology, and Pharmacy - Computerized Physician Order Entry (CPOE) for lab tests and prescriptions - AI-assisted clinical decision support (e.g., diagnosis suggestions, alerts) - Patient vitals and monitoring data feed into system in real time |
| **Patient Management** | - Digital patient registration with ABHA and NDHM profile sync - Smart appointment scheduling and wait-time prediction - Self-service check-in kiosks and mobile portal |
| **Administrative Automation** | - Automated billing workflows linked with diagnostic and pharmacy services - Integration with insurance and government portals (e.g., PMJAY, Ayushman Bharat) - Discharge planning and coordination dashboards |
| **Telemedicine & Follow-up** | - Video consultation platform integrated into EHR - Automatic follow-up scheduling and digital prescriptions |

| | |
|---|---|
| **Support Services** | - Digitized inventory and asset tracking for pharmacy, equipment - HR and workforce management portal |
| **Data Analytics & Dashboards** | - Real-time dashboards for clinicians (bed occupancy, vitals alerts) - Operational KPIs for admin (turnaround time, OPD load) - Predictive analytics (e.g., patient readmission risk) |
| **Education & Research** | - Centralized repository of clinical data for research - Digital collaboration tools for academic activities and student-teacher coordination |

## 5.2 Non-Functional Requirements (availability, performance, privacy, etc.)

These define the **system qualities** essential for dependable, scalable, and secure operation.

| Category | Requirement |
|---|---|
| **Availability** | - 99.9% uptime for critical services (EHR, billing, pharmacy) - Failover and disaster recovery mechanisms |
| **Performance** | - Sub-second response times for data retrieval (EHR) - Ability to support concurrent access by 10,000+ users across hospital |
| **Scalability** | - Modular microservices architecture to scale horizontally - Cloud-native or hybrid architecture to support future expansion |
| **Security & Privacy** | - Role-based access control (RBAC) - End-to-end encryption for patient data in transit |

| | |
|---|---|
| | and at rest - Audit trails and anomaly detection mechanisms |
| **Compliance** | - Compliance with HIPAA, NDHM data privacy framework, FHIR standards |
| **Usability** | - Simple, multilingual user interfaces for staff and patients - Accessible via web, mobile, and kiosks |
| **Interoperability** | - HL7 FHIR API support for all data exchanges - Seamless integration with NDHM Health Information Exchange (HIE) |
| **Maintainability** | - Modular codebase and APIs for easy updates - Centralized logging and monitoring |
| **Localization** | - Support for Indian languages and region-specific healthcare processes |
| **Sustainability** | - Optimized energy usage and eco-friendly digital infrastructure (Green IT practices) |

## 5.3 Compliance Requirements (HIPAA, FHIR, NDHM, etc.)

The architecture must comply with **national and international standards and regulations** to ensure legality, privacy, and interoperability.

| Standard/Regulation | Compliance Requirements |
|---|---|
| **NDHM Guidelines** | - Mandatory ABHA ID integration - Compliance with NDHM Health Facility Registry (HFR) and Health Professional Registry (HPR) - Consent-based data sharing using NDHM protocols |
| **HL7 FHIR** | - FHIR-based data models for EHR, labs, imaging, pharmacy - Interoperable APIs for |

| | |
|---|---|
| | internal systems and external health exchanges |
| **HIPAA (US-based but best practice)** | - Data encryption, access controls, and breach notification procedures |
| **IT Act (India)** | - Adherence to Indian cybersecurity and data protection guidelines |
| **ISO 27001** | - Implementation of Information Security Management System (ISMS) for healthcare IT environment |
| **Ayushman Bharat/PMJAY** | - Billing and claims data structure must support PMJAY API formats |
| **Telemedicine Guidelines (MoHFW, 2020)** | - Audio/video documentation, patient consent protocols, platform certification |

## 5.4 Traceability to Business Goals and Capabilities

This section maps how each requirement aligns with the business principles, drivers, and goals defined earlier in the architecture.

| Business Goal / Capability | Supporting Requirement(s) |
|---|---|
| **Patient-Centric Care** | Digital registration, real-time EHR, multilingual app access, AI triage |
| **Operational Efficiency** | Admin automation, smart scheduling, auto-billing |
| **Data-Driven Management** | Dashboards, predictive analytics, clinical alerts |
| **Digital Transformation Alignment** | FHIR-based APIs, unified HMIS, cloud scalability |

| | |
|---|---|
| **NDHM / ABHA Compliance** | ABHA linkage, consent management, registry sync |
| **Quality Care and Continuity** | Integrated clinical workflows, telemedicine, smart discharge |
| **Cost Optimization** | Efficient resource utilization dashboards, PMJAY integration |
| **Interoperability Mandate** | FHIR APIs, NDHM HIE integration, modular architecture |
| **Scalability and Future-readiness** | Cloud-native design, modular workflows, microservices |

# 6. Business Views and Models

## 6.1 Business Interaction Matrix

| **Business Function** | **Interacts with** | **Interaction Type** |
|---|---|---|
| Patient Registration | ABHA Registry, HMIS, Billing | Data Sync, Patient Profile Fetch |
| OPD/IPD Services | Labs, Pharmacy, EHR | Diagnostic Requests, Treatment Orders |
| Lab Services | OPD/IPD, Billing, EHR | Test Results Upload, Costing |
| Pharmacy | EHR, Inventory, Billing | Prescription Fulfillment |
| Billing & Insurance | Admin Portal, PMJAY, HMIS | Claims Submission, Bill Generation |

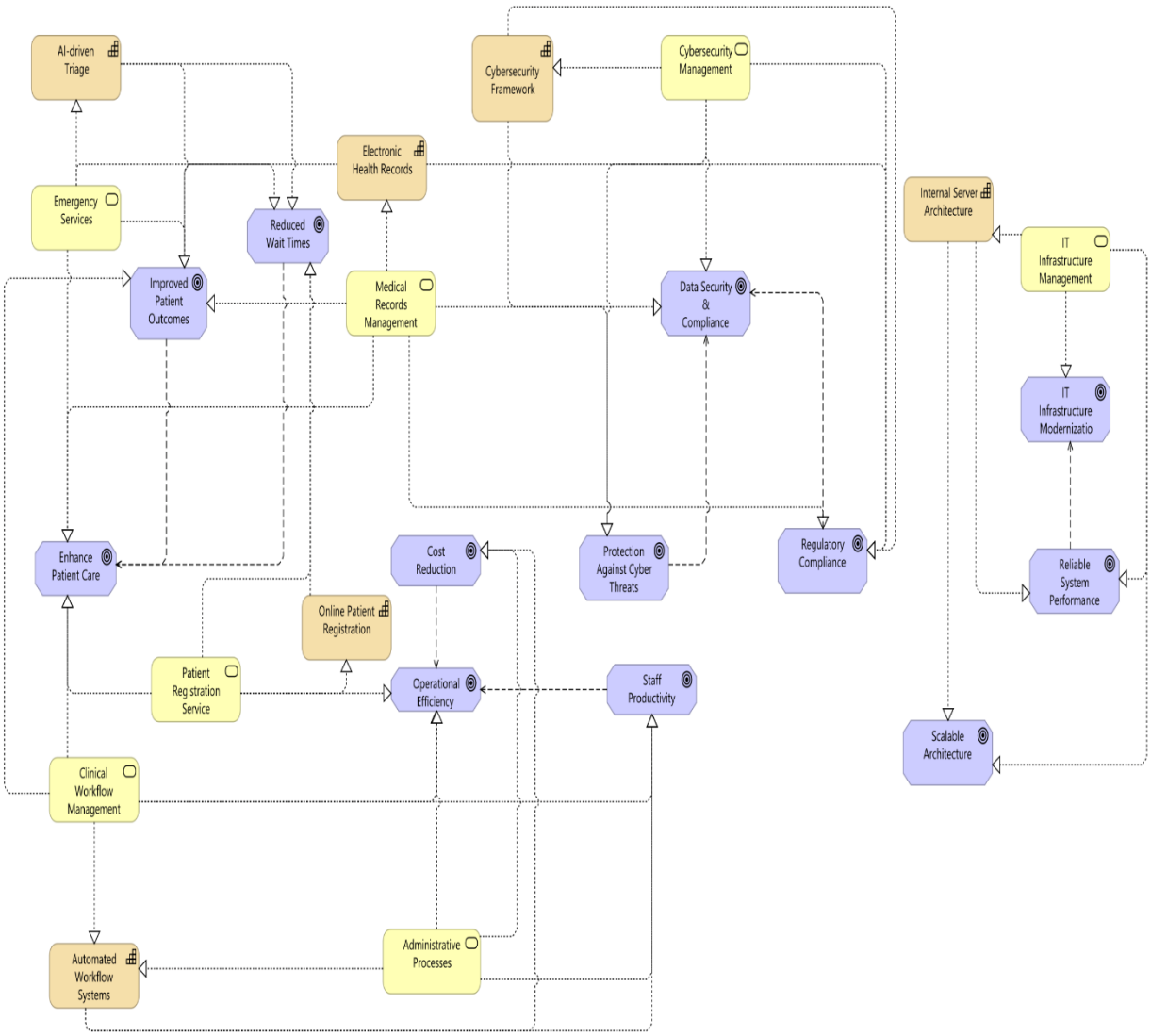
| | | |
|---|---|---|
| Admin & HR | Workforce App, Scheduling, IT Ops | Staff Allocation, Shift Management |
| Telemedicine | EHR, Appointment System, Patient Portal | Virtual Consults, Follow-ups |
| Data Analytics | All Systems | Real-Time Monitoring, Insights |

## 6.2 Actor/Role Matrix

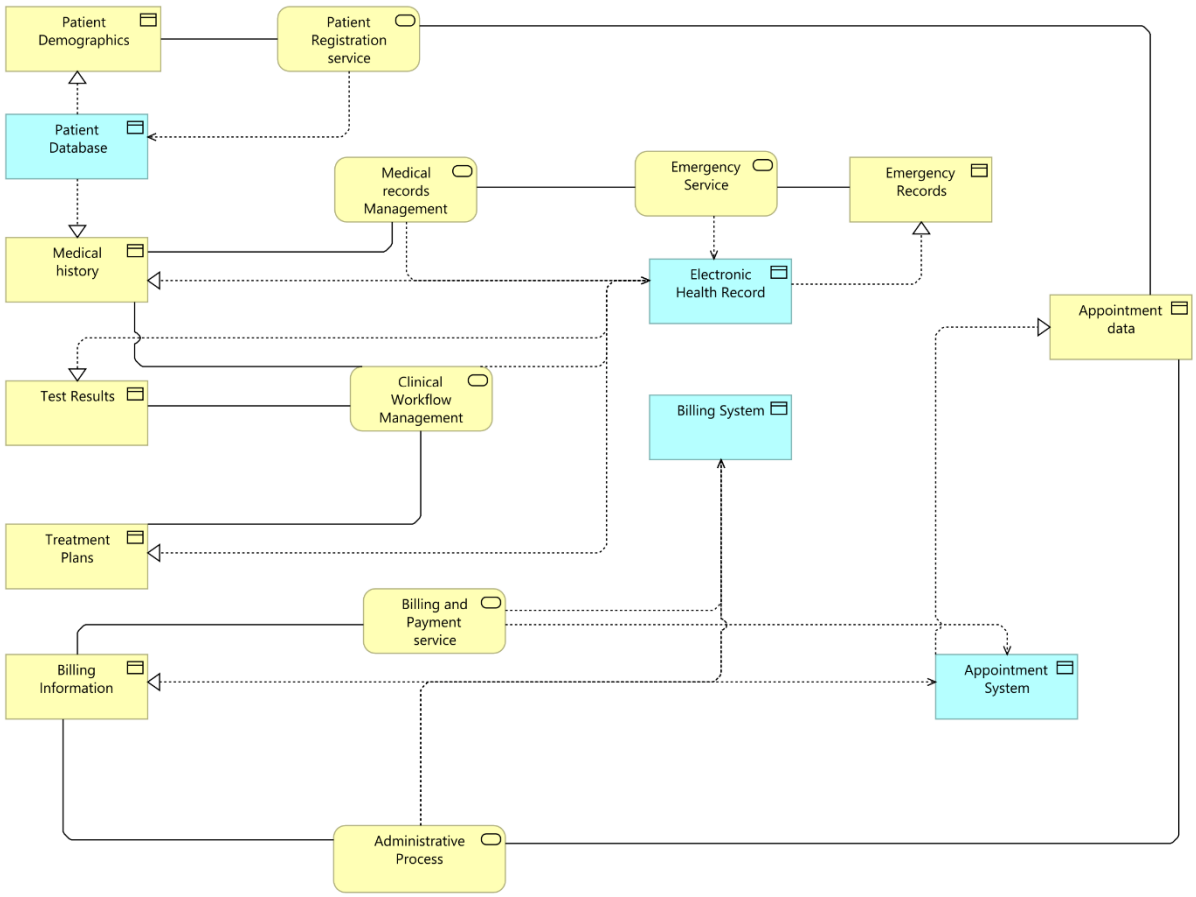
| **Actor/Role** | **Responsibilities** | **Systems Used** |
|---|---|---|
| Patient | Registration, Consultation, Follow-up | Mobile App, Kiosk, Patient Portal |
| Receptionist | Intake, Appointments, Billing | HMIS, ABHA Sync, Billing Portal |
| Doctor | Diagnosis, Orders, Follow-up | EHR, CPOE, Telemedicine |
| Lab Technician | Sample Collection, Test Processing | Lab System, EHR |
| Pharmacist | Dispensing, Inventory Check | Pharmacy System, EHR |
| Admin Officer | Workforce, Resources, Compliance Monitoring | Admin Dashboard, Analytics |
| IT Staff | Infrastructure, Integration, Security | Backend Systems, Cloud Monitoring |

## 6.3 Business Footprint Diagram

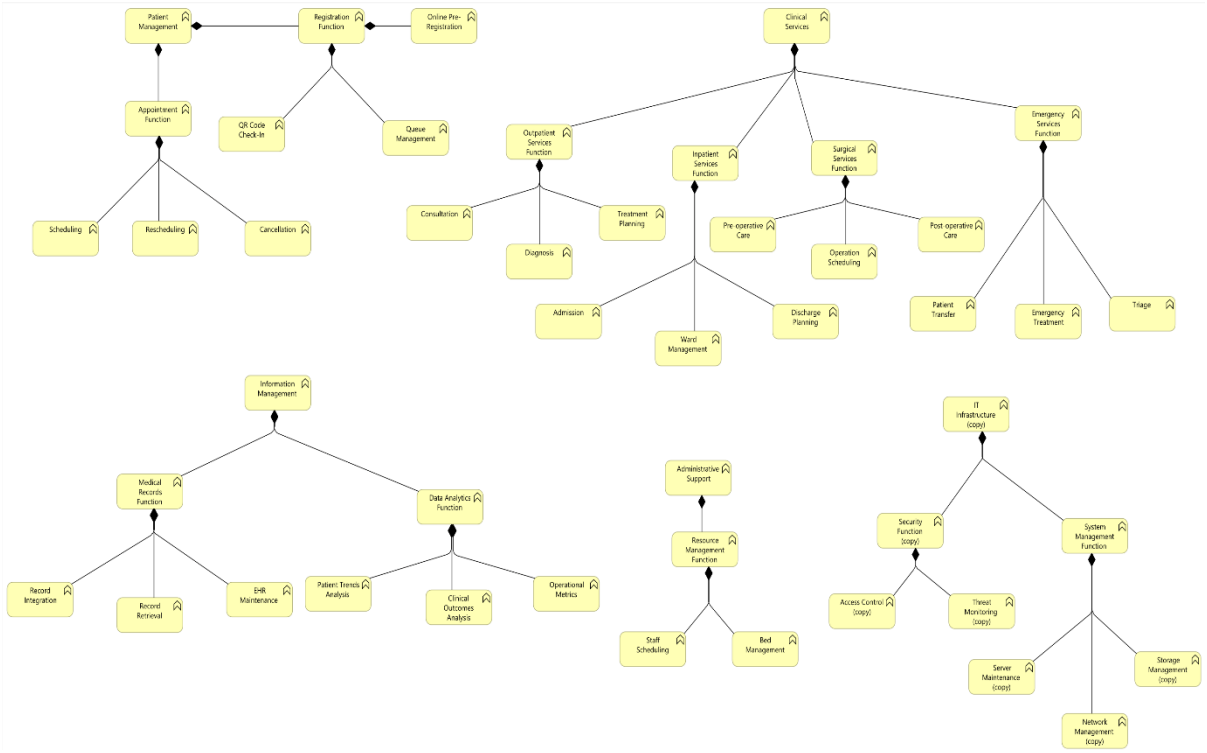
This diagram maps major **business functions** to their respective **organizational units**.


AI-driven Triage
Cybersecurity Framework
Cybersecurity Management
Electronic Health Records
Emergency Services
Reduced Wait Times
Internal Server Architecture
IT Infrastructure Management
Improved Patient Outcomes
Medical Records Management
Data Security & Compliance
IT Infrastructure Modernizatio
Enhance Patient Care
Cost Reduction
Protection Against Cyber Threats
Regulatory Compliance
Reliable System Performance
Online Patient Registration
Patient Registration Service
Operational Efficiency
Staff Productivity
Scalable Architecture
Clinical Workflow Management
Automated Workflow Systems
Administrative Processes

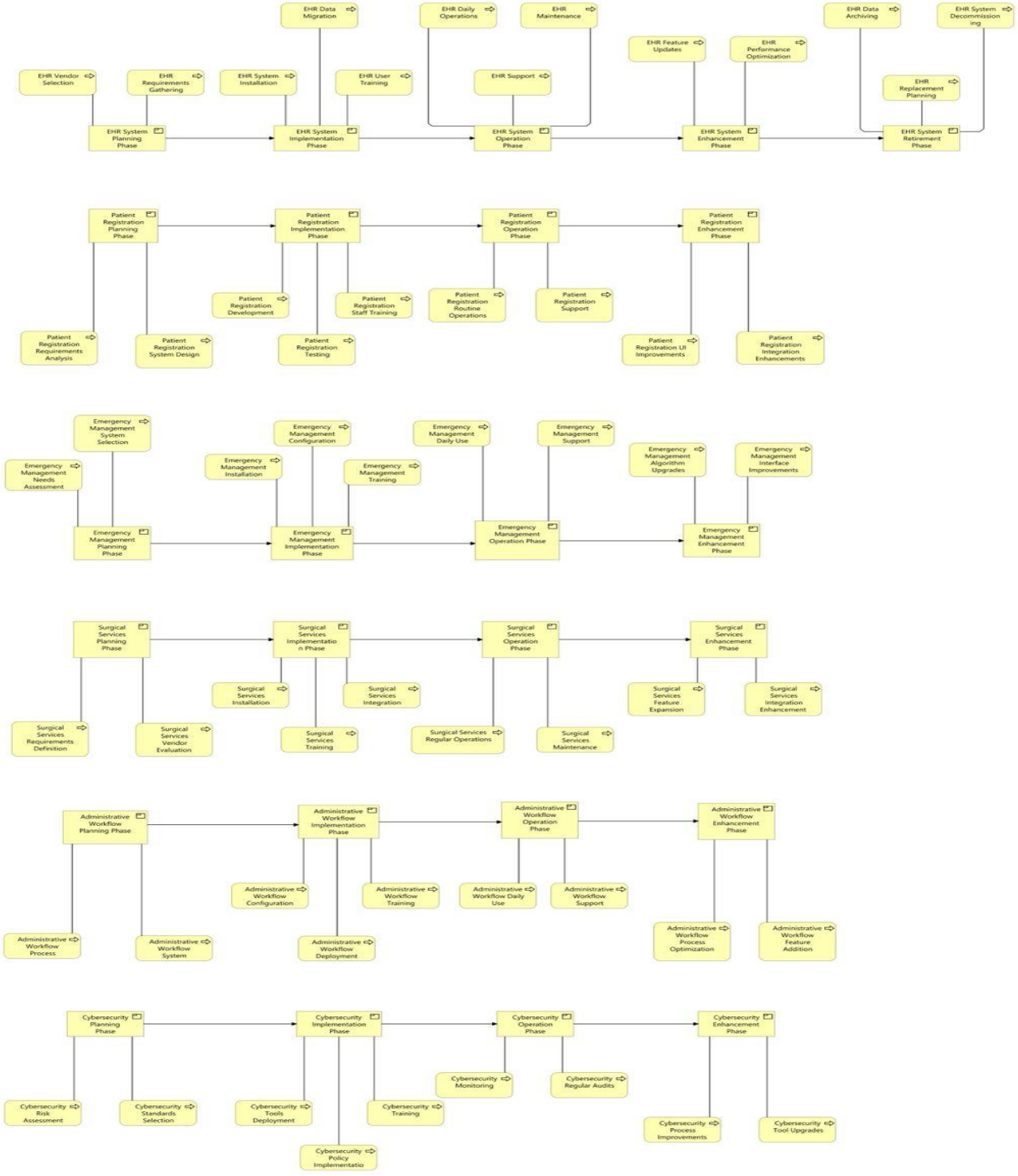
## 6.4 Business Service/Information Diagram



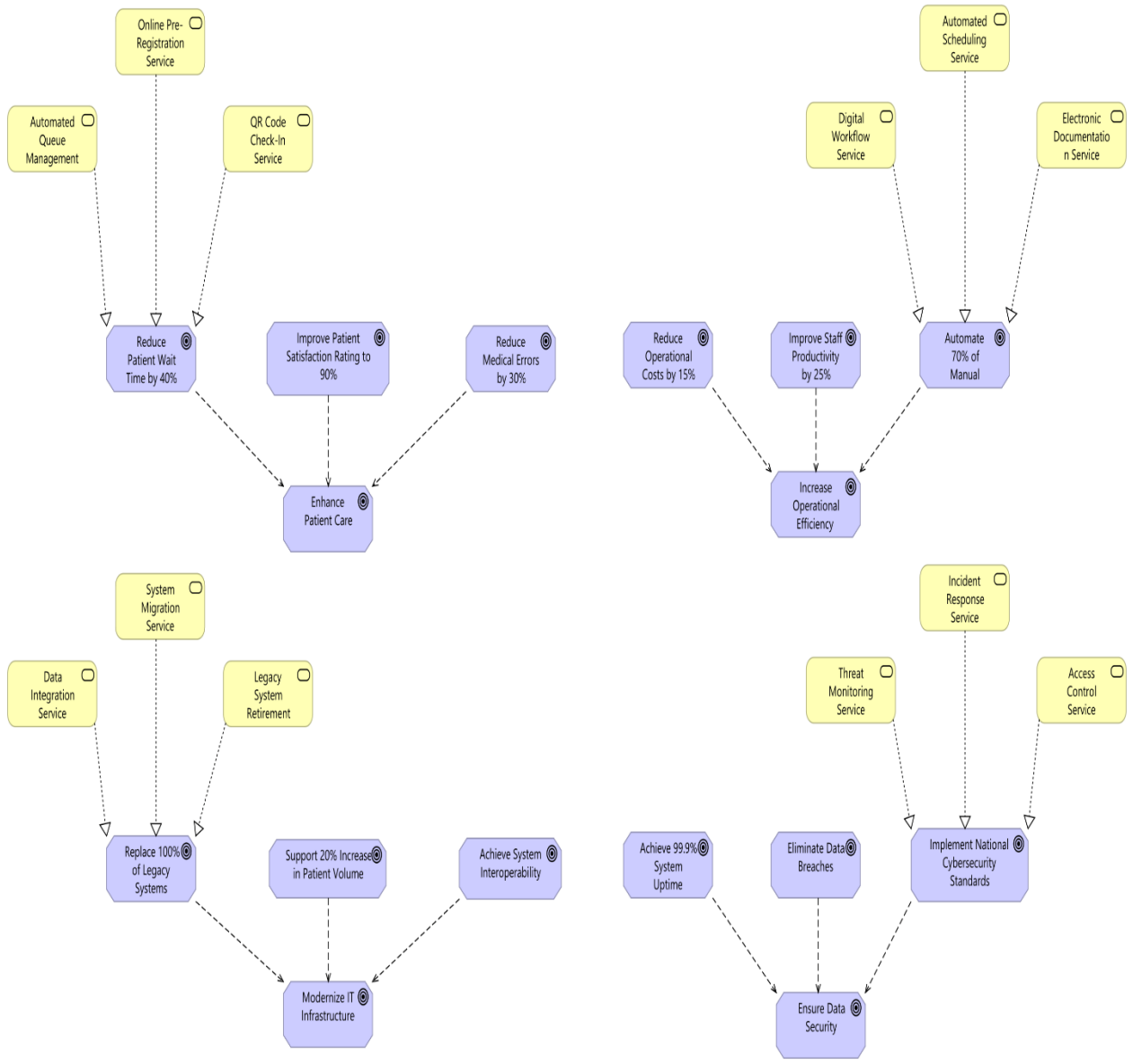
## 6.5 Functional Decomposition Diagram



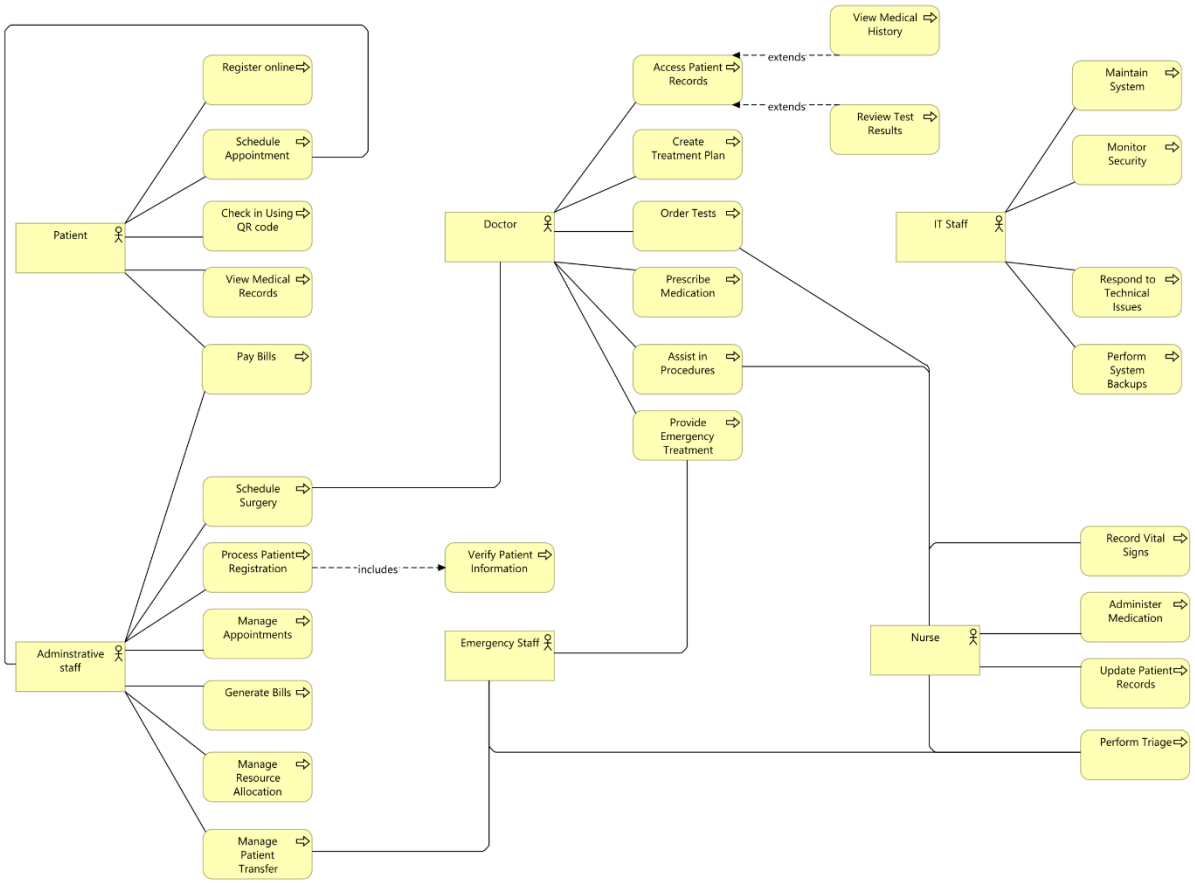
# 6.6 Product Lifecycle Diagram (e.g., Patient Case Lifecycle)



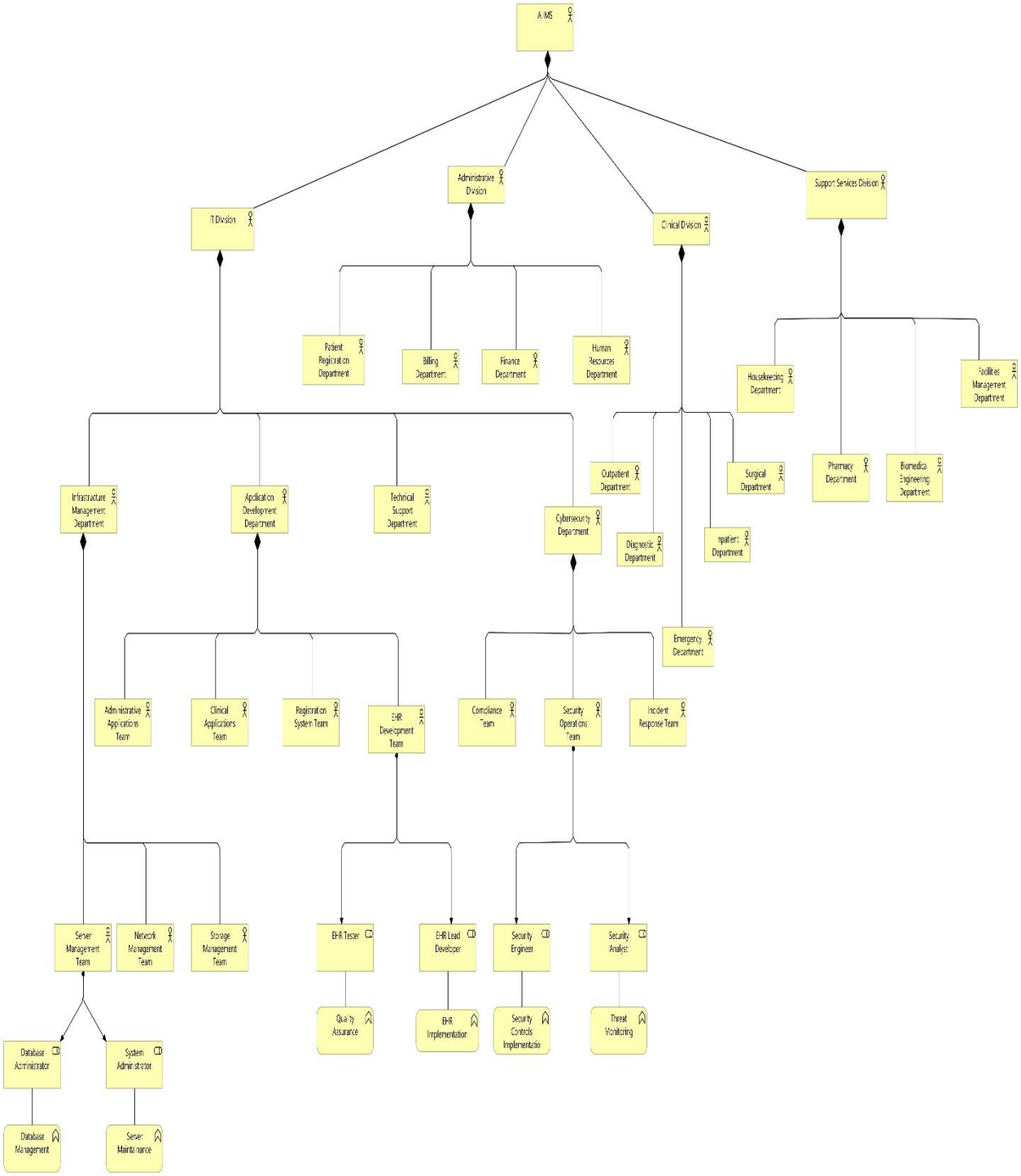
## 6.7 Goal/Objective/Service Diagram



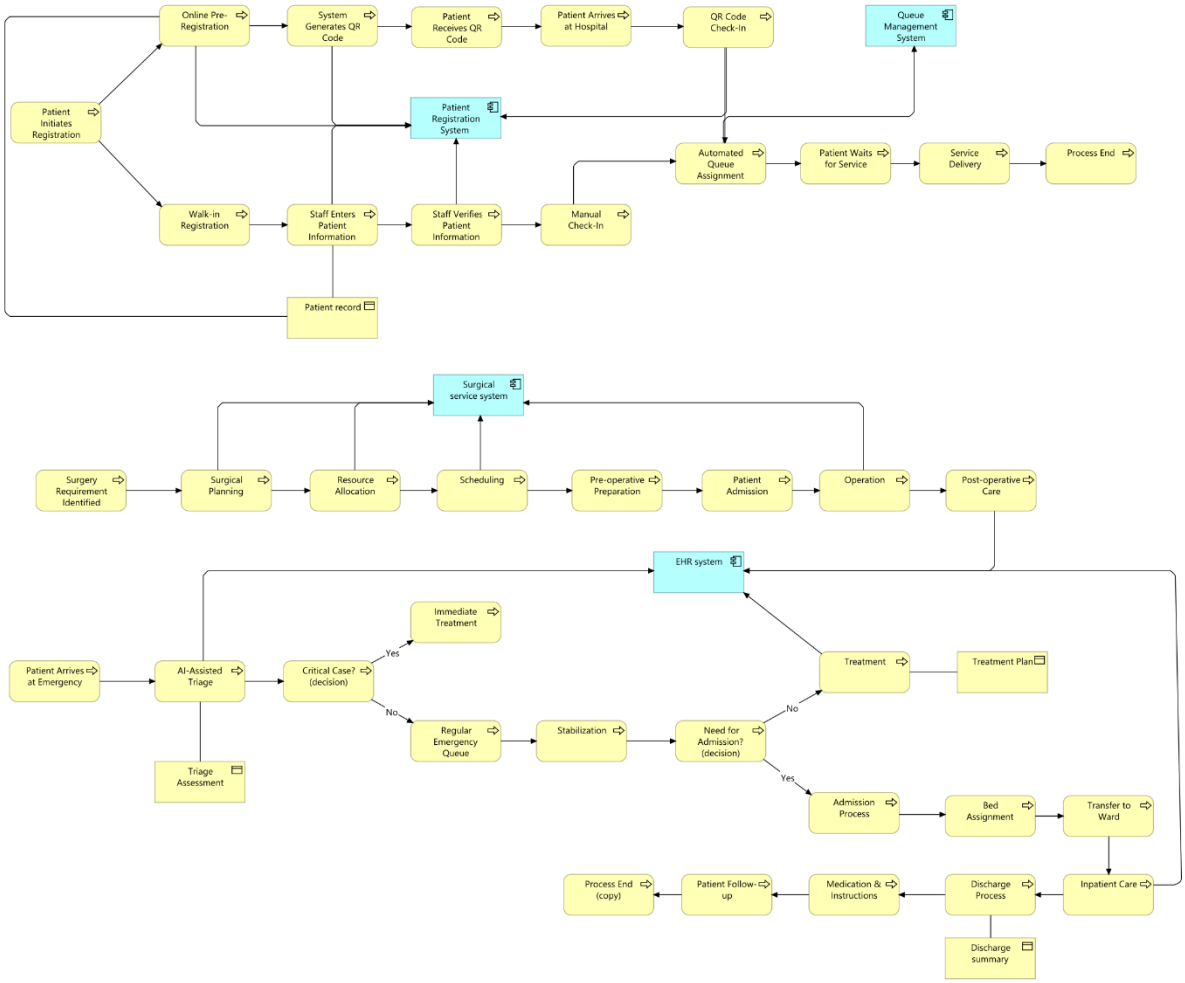
# 6.8 Use-Case Diagrams (clinical and administrative scenarios)



## 6.9 Organization Decomposition Diagram



## 6.10 Process Flow Diagram (Target State Patient Journey)




# 7. Business Architecture Catalogues

## 7.1 Organization/Actor Catalogue

This catalogue identifies all organizational units and key actors involved in delivering business services across the enterprise.

| Organization Unit | Actor | Description |
|---|---|---|
| AIIMS Administration | Medical Superintendent | Oversees hospital operations, policy implementation |

| | | |
|---|---|---|
| OPD Department | Doctor, Nurse, Receptionist | Manages patient consultations and outpatient services |
| IPD/Wards | Ward Nurse, Resident Doctor | Manages admitted patient care and monitoring |
| Diagnostics (Labs, Imaging) | Lab Technicians, Radiologists | Conducts tests and uploads reports to EHR |
| Pharmacy | Pharmacists, Inventory Manager | Dispenses medication, manages stocks |
| Billing & Finance | Billing Officer, Insurance Clerk | Handles billing, insurance claims, PMJAY workflows |
| IT Department | System Admin, Data Analyst | Ensures uptime, data management, analytics, integration with NDHM |
| Telemedicine | Teleconsultant Doctor, Support Staff | Provides virtual consultations and remote care |
| Patient Support | Health Assistants, Call Centre | Assists patients with navigation, appointment booking, digital tools usage |
| Research and Academics | Researchers, Educators | Conducts clinical research, teaching, and collaboration |

## 7.2 Role Catalogue

Roles describe specific responsibilities that actors perform, abstracted from the organizational structure.

| **Role** | **Description** |
|---|---|
| Patient | Primary service recipient; interacts with services through portal, kiosk, app |
| Physician | Diagnoses, prescribes, documents clinical notes |
| Receptionist | Manages registration, appointments, billing coordination |
| Lab Technician | Collects and processes samples, uploads results |
| Pharmacist | Verifies and dispenses prescribed medications |
| Admin Officer | Manages staff schedules, operations, and escalations |

| | |
|---|---|
| IT Support Specialist | Ensures system integration, uptime, and cybersecurity |
| Claims Processing Clerk | Submits and tracks insurance and PMJAY claims |
| Data Analyst | Generates operational dashboards and healthcare insights |
| Telemedicine Consultant | Conducts virtual diagnosis and follow-up consultations |
| Health Navigator | Helps patients navigate departments, services, and digital tools |

## 7.3 Business Services Catalogue

Business services are core offerings delivered by AIIMS to fulfil its mission**.**

| **Service Name** | **Description** |
|---|---|
| Patient Registration Service | ABHA-enabled intake, demographic data capture |
| Outpatient Consultation | Doctor-patient interaction, diagnosis, prescription |
| Inpatient Care Service | Bed assignment, clinical monitoring, surgery, discharge planning |
| Diagnostic Services | Lab tests, imaging (X-ray, MRI, CT, etc.), and reporting |
| Pharmacy Dispensation | E-prescription validation and medicine issuance |
| Billing and Insurance Service | Automated billing, PMJAY/insurance claim processing |
| Telemedicine Service | Virtual consultation, follow-ups, and remote diagnostics |
| Health Records Management | Unified EHR with clinical history, test reports, prescriptions |
| Appointment Scheduling | Smart queuing and booking via web/app/kiosk |
| Patient Portal Service | Access to medical history, prescriptions, and interaction with hospital system |
| Health Analytics | Population health insights, resource optimization, outbreak prediction |
| Emergency Care Service | 24/7 triage, stabilization, and transfer |

## 7.4 Business Capabilities Catalogue

Capabilities define what AIIMS must be able to do to deliver business outcomes—independent of how it's done.

| Capability Name | Level | Description |
|---|---|---|
| Patient Intake Management | Foundational | Capturing patient info, verifying ABHA, creating EHR entry |
| Care Delivery | Core | Clinical workflows across OPD/IPD/Telemedicine |
| Diagnostic Interpretation | Core | Integration of lab/imaging with physician diagnosis |
| Medication Management | Core | E-prescriptions, stock checking, adverse reaction alerts |
| Billing and Reimbursement | Foundational | Multi-payer billing engine with claims logic |
| Digital Records Management | Foundational | Lifecycle management of EHR/EMR and patient documents |
| Workforce and HR Management | Supporting | Roster creation, staff performance tracking |
| Health Information Exchange | Enabling | ABHA-linked data sharing across NDHM/FHIR interfaces |
| Predictive Analytics | Enabling | Resource forecasting, disease pattern detection |
| Patient Engagement | Strategic | Feedback, follow-ups, chatbot support |
| Emergency Preparedness | Strategic | Protocols and triage for high-risk patients |

## 7.5 Value Stream Catalogue

Value streams represent end-to-end processes that deliver value to stakeholders (especially patients and administrators).

| Value Stream | Trigger | End Value Delivered | Stakeholders Involved |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Patient Journey | Need for medical attention | Diagnosis, treatment, and follow-up care | Patient, Doctor, Lab Tech, Pharmacist |
| Insurance Claim Lifecycle | Discharge or service use | Reimbursement or cashless processing | Billing Clerk, Insurance Desk, Admin |
| Digital Health Record Access | Login via ABHA or patient ID | View/download clinical history, prescriptions, reports | Patient, Doctor, Support Staff |
| Remote Consultation | Rural or remote care need | Teleconsultation, medication, virtual diagnosis | Patient, Telemedicine Doctor, IT Support |
| Clinical Research Enrollment | Clinical trial requirement | Patient data for research participation and tracking | Researcher, Doctor, Patient |
| Emergency Response | Accident, critical condition | Triage, stabilization, admission | Emergency Staff, Doctor, Admin |
| Lab Testing and Result Delivery | Test request by doctor | Uploaded, interpretable report in EHR | Lab Tech, Doctor, Patient |

---

# 8. Business Architecture Matrices

## 8.1 Strategy to Capability Matrix

This matrix maps strategic goals and drivers (from Section 2) to the business capabilities required to fulfil them (from Section 6.4).

| **Strategic Driver / Goal** | **Business Capability Required** | **Description** |
|---|---|---|
| Patient-Centric Care | Patient Engagement, Digital Health Record Management | Enable patient portals, feedback loops, and self-service options |
| Digital Transformation of AIIMS | Health Information Exchange, Care Delivery | Enable real-time data flow, digital workflows, paperless operations |
| NDHM/ABHA Compliance | Health Information Exchange, EHR Management | Integration with national registries and compliance with FHIR, ABHA IDs |

| | | |
|---|---|---|
| Data-Driven Decision Making | Predictive Analytics, Digital Records Management | Use structured data from EHRs for reporting, audits, research |
| Accessible and Equitable Care (including Telemedicine) | Remote Consultation, Patient Intake Management | Bridge urban-rural gaps through telehealth and mobile intake processes |
| Cost Efficiency and Sustainable Operations | Billing & Reimbursement, Workforce Management | Reduce billing errors, optimize staff allocation |
| Enhanced Clinical Outcomes and Safety | Diagnostic Interpretation, Medication Management | Reduce errors, improve diagnosis and prescription accuracy |
| Integrated Research and Education at AIIMS | Digital Records Management, Clinical Data Repositories | Provide structured data to support clinical research and academic collaboration |

## 8.2 Capability to Organization Matrix

**This matrix maps each business capability to the AIIMS organizational units or roles responsible for its execution and governance (from Section 6.1 and 6.2).**

| **Business Capability** | **Responsible Organization/Role** | **Notes** |
|---|---|---|
| Patient Intake Management | Receptionist, Patient Support Unit | Frontline contact with patients, key for ABHA linkage |
| Care Delivery | Doctors, Nurses, IPD/OPD Units | Core clinical staff responsible for diagnosis and treatment |
| Diagnostic Interpretation | Lab Technicians, Radiologists | Critical for accurate treatment decisions |
| Medication Management | Pharmacists, Inventory Managers | Ensures prescription fulfillment and patient safety |
| Billing and Reimbursement | Billing Officers, Finance Department | Also handles PMJAY and insurance workflows |
| Digital Records Management | IT Department, Doctors, Admin Staff | Manages EHR lifecycle, consent, record archival |
| Predictive Analytics | Data Analysts, Hospital Administration | Drives decision-making and resource planning |

| | | |
|---|---|---|
| Patient Engagement | Call Centre Staff, Digital Health Assistants | Engages via portal, chatbot, feedback tools |
| Health Information Exchange | IT Team, National Health Exchange Liaison | Coordinates compliance with NDHM and ABHA standards |
| Emergency Preparedness | Emergency Dept, Hospital Command Centre | Ensures rapid, coordinated response to critical incidents |

## 8.3 Value Stream to Capability Matrix

This matrix shows how end-to-end value streams (Section 6.5) are enabled by specific business capabilities (Section 6.4). This is crucial for prioritizing capability development based on patient-impacting workflows.

| **Value Stream** | **Enabling Capabilities** | **Description** |
|---|---|---|
| Patient Journey | Patient Intake Management, Care Delivery, Medication Management | Covers the full treatment cycle from registration to discharge |
| Insurance Claim Lifecycle | Billing and Reimbursement, Digital Records Management | Ensures cashless experience and accurate documentation |
| Digital Health Record Access | Digital Records Management, Health Information Exchange | Provides secure, accessible health history via ABHA |
| Remote Consultation | Remote Consultation, Patient Engagement, EHR Management | Delivers care beyond physical boundaries |
| Clinical Research Enrolment | Digital Records Management, Predictive Analytics | Streamlines identification of research candidates |
| Emergency Response | Emergency Preparedness, Care Delivery, Patient Intake | Enables high-speed triage, alerts, and stabilization |

# 9. Gap Analysis

## 9.1 Baseline vs. Target Architecture Comparison

| **Business Element** | **Baseline State (As-Is)** | **Target State (To-Be)** |
|---|---|---|

| | | |
|---|---|---|
| Patient Registration | Manual, Paper-Based Forms; Multiple Touchpoints | Digital Self-Registration via ABHA ID; Mobile Kiosk or Online Portal |
| Medical Records | Paper Files, Siloed Systems in Departments (IPD/OPD/Labs) | Unified Electronic Health Records (EHR) integrated with NDHM via ABHA ID |
| Doctor-Patient Interaction | Limited Historical Access; Redundant Questions | Real-Time Access to Patient History, Diagnostics, Medications through HMIS |
| Billing & Insurance | Manual Billing, Errors, Lack of PMJAY/Ayushman Integration | Automated Billing Linked with Insurance/PMJAY APIs; Transparent and Error-Free |
| Lab & Radiology | Delayed Results, Physical Copies Required for Pickup | Integrated Lab Information System (LIS) auto-pushes results to EHRs |
| Stakeholder Collaboration | Departmental Silos; No Unified Dashboard | Multi-stakeholder Collaboration on Shared HMIS with Role-Based Access |
| Analytics & Reporting | Manual Reports, Time Delays, No Real-Time Dashboards | Real-Time Dashboards for Operations, Outcomes, Research, and Government Reporting |
| Remote Services | Absent or Fragmented; Telemedicine not standardized | Telemedicine Integrated with Clinical Workflows and EHR |
| Compliance & Standards | Not aligned with NDHM or FHIR | Fully Compliant with NDHM, ABHA, HIPAA, and FHIR |
| Stakeholder Experience | Long Waits, Repetitive Data Entry, No Patient Portal | Digital Portal and Mobile App for Patient Interaction, Appointments, Records, Feedback |

## 9.2 Identified Business Gaps

The following key gaps hinder AIIMS' ability to achieve its desired future state:

| **Gap Category** | **Description** | **Implications** |
|---|---|---|
| Digital Infrastructure | Absence of Unified HMIS and EHR systems | Inconsistent patient records; hindered clinical decisions |

| | | |
|---|---|---|
| Interoperability | Systems are not NDHM/FHIR/ABHA compliant | Inability to share data nationally; non-aligned with Ayushman Bharat Digital Mission |
| Workflow Automation | Manual processes in registration, billing, diagnostics | High administrative burden, long patient waiting times |
| Real-Time Data Access | Delays in diagnostics and reporting | Impacts timely diagnosis and treatment |
| Stakeholder Alignment | Poor coordination between administrative, clinical, and support functions | Fragmented care delivery and resource inefficiency |
| Lack of Patient Empowerment | No patient-facing digital services or mobile engagement | Poor experience, delays, lack of ownership in health management |
| Research & Academic Gaps | No access to structured clinical data for research | Undermines AIIMS' mission of being a leader in research and education |
| Analytics & Predictive Tools | Data not structured or available for analysis | Prevents proactive planning, trend forecasting, and outbreak tracking |
| Compliance & Privacy Gaps | Manual consent management, absence of role-based access and audit trails | Legal and ethical vulnerabilities |

## 9.3 Recommendations to Bridge Gaps

| **Recommendation** | **Target Gap Addressed** | **Benefits** |
|---|---|---|
| Deploy Unified Health Management Information System (HMIS) | Fragmented Digital Infrastructure, Workflow Inefficiencies | Enables single source of truth for patient data, reduces duplication |
| Adopt NDHM-Compliant EHR Standards (FHIR, ABHA Integration) | Interoperability, Compliance | National alignment, seamless health data exchange |

| | | |
|---|---|---|
| Automate Key Workflows (Registration, Billing, Reporting) | Workflow Automation, Stakeholder Burden | Improves efficiency, reduces administrative costs, enhances satisfaction |
| Launch Patient Digital Engagement Portal and App | Patient Empowerment | Increases transparency, reduces footfall, improves experience |
| Implement Role-Based Access and Consent Management System | Privacy and Compliance | Ensures ethical data use, HIPAA/NDHM compliance |
| Develop Real-Time Dashboards and BI Tools | Data-Driven Decision-Making | Informs hospital management, enables predictive care |
| Integrate Telemedicine with EHR | Remote Services Gap | Extends reach, especially to rural patients |
| Train Staff on New Digital Systems | Stakeholder Readiness | Smooth adoption and minimal disruption |
| Create a Central Research Data Lake | Academic & Research Data Access | Empowers clinical research, AI model training, and policy analytics |
| Pilot in Select Departments Before Scale-Up | Change Management | Identifies issues early, ensures smoother full rollout |

Summary:
This gap analysis provides a strategic bridge from the current fragmented and paper-based model to a digital, patient-first ecosystem aligned with national and international healthcare IT standards.

## 10. Risks and Mitigation Strategies

This section identifies potential **business architecture-related risks** in transitioning from the baseline to the target architecture and outlines **proactive measures** to mitigate them. These risks span organizational, cultural, technological, and strategic domains.

## 10.1 Business Architecture Risks

| Risk Category | Description | Impact Area |
|---|---|---|
| **Change Resistance** | Healthcare staff, especially senior personnel, may resist new digital workflows and roles. | User Adoption, Workflow Disruption |
| **Cultural Misalignment** | Existing culture prioritizes hierarchical decisions over collaborative digital platforms. | Engagement, Decision Making |
| **Training Deficit** | Lack of digital literacy among staff may result in poor usage of new systems. | System Effectiveness, Staff Morale |
| **Data Migration Risks** | Potential loss or corruption of legacy records during migration to EHR/HMIS. | Clinical Continuity, Legal Compliance |
| **Interoperability Failure** | Integration of ABHA/FHIR/NDHM-compliant systems with legacy infrastructure may not work as expected. | National Health Grid Alignment, Data Sharing |
| **Budget Overruns** | Unforeseen implementation costs or scope creep during the transformation process. | Financial Sustainability |
| **Project Fatigue** | Long rollout periods may result in decreased enthusiasm, commitment, and stakeholder momentum. | Implementation Timeline, Morale |

| | | |
|---|---|---|
| **Misalignment with Strategy** | If business goals are not continually revalidated, IT projects may deviate from healthcare mission objectives. | Strategic Direction, Return on Investment |
| **Inadequate Stakeholder Buy-In** | Not all departments or stakeholder groups are aligned with the transformation vision. | Fragmented Participation, Inconsistent Execution |
| **Privacy & Security Risks** | EHRs and digital records can be exposed to cyber threats or internal misuse. | Patient Trust, Legal Consequences |
| **Scalability Risks** | Initial systems may not scale with national-level integration or AIIMS' growing patient load. | Performance Bottlenecks, Future-Proofing |

## 10.2 Mitigation Measures

| Risk Addressed | Mitigation Strategy | Stakeholders Involved |
|---|---|---|
| **Change Resistance** | Implement **Change Management Program**: early stakeholder engagement, workshops, involvement in design decisions. | Leadership, HR, Department Heads |
| **Training Deficit** | Conduct **Digital Health Literacy Programs** and ongoing skill training (role-specific modules and certifications). | IT Dept, HR, External Partners |

| | | |
|---|---|---|
| **Cultural Misalignment** | Promote **Digital-First Culture** through leadership sponsorship, communication campaigns, and incentives for adoption. | Directors, Departmental Chiefs |
| **Data Migration Risks** | Employ **Data Audit & Validation Teams** before and after migration; run parallel systems for a limited time for fallback. | IT, Medical Records, QA Teams |
| **Interoperability Failures** | Choose vendors/systems that are **NDHM/FHIR-certified**; run **sandbox tests and pilots** before live deployment. | Procurement, IT Integration Team |
| **Budget Overruns** | Maintain a **strict program management office (PMO)** with gated budgeting, scope checks, and contingency buffers. | Finance, CIO, Project Managers |
| **Project Fatigue** | Roll out in **phases with visible wins** (e.g., lab integration first), communicate success stories, and create feedback loops. | PMO, HR, Comms |
| **Strategic Misalignment** | Embed **Enterprise Architecture Governance** with regular strategy validation checkpoints in alignment with TOGAF ADM. | EA Team, CIO, Strategy Office |
| **Stakeholder Buy-In Deficit** | Create a **Stakeholder Alignment Map**, identify key influencers, and involve | Stakeholder Engagement Team, HR |

| | | |
|---|---|---|
| | them in communication and co-creation. | |
| **Privacy & Security Concerns** | Implement **Role-Based Access Controls (RBAC)**, encryption, audit trails, and periodic security audits aligned with HIPAA and NDHM. | CISO, IT Security Team, Legal |
| **Scalability Risks** | Design systems using **modular, cloud-native architectures**; use load testing to plan for future patient and data growth. | IT Architects, Cloud Vendors |

# 11. Impact on Existing Architecture

This section identifies how the transformation toward a patient-centric, digitally integrated healthcare system will impact AIIMS' current operational, technical, and organizational architecture. It outlines key dependencies, constraints, transition implications, and organizational changes to guide stakeholders through a safe, phased evolution.

## 11.1 Dependencies and Constraints

**A. Internal Dependencies**

| Dependency | Explanation | Implication |
|---|---|---|
| Legacy Systems (OPD, IPD, Billing) | Depend on paper-based or semi-digital processes that are deeply entrenched. | Requires phased integration or sunset strategy. |
| Staff Readiness | Operational efficiency relies heavily on availability of | Mandates comprehensive change management and training. |

| | | |
|---|---|---|
| | trained medical and non-medical staff. | |
| Clinical Workflows | Must continue uninterrupted during implementation. | Phased rollout and parallel systems required. |
| Hospital Policy & Governance | Institutional policies may need amendments for digital workflows. | Requires policy reengineering and legal approvals. |
| Data Governance | Lack of unified governance structure over data standards, access, and compliance. | New data stewardship frameworks must be defined. |

**B. External Constraints**

| Constraint | Explanation | Implication |
|---|---|---|
| NDHM/ABHA/FHIR Compliance | Must align all systems with national health data standards. | Technology choices are limited by standard mandates. |
| Funding and Budget Cycles | Government budget releases are cyclical and regulated. | May delay procurement, rollout timelines. |
| Vendor Ecosystem | Quality of solutions depends on market maturity of NDHM-compliant vendors. | Careful vendor assessment and management needed. |

| | | |
|---|---|---|
| Legal & Regulatory | Compliance with patient privacy laws (e.g., HIPAA, DISHA) must be ensured. | Legal vetting of all systems and workflows. |

## 11.2 Transition Considerations

**A. Phased Rollout Strategy**

| Phase | Scope | Rationale |
|---|---|---|
| **Pilot Phase** | E.g., Outpatient Registration + Labs | Low risk, high visibility; allows early learnings. |
| **Core Rollout** | IPD, EMR, Pharmacy, Imaging | Core systems with major impact, to follow stable pilots. |
| **Integration Phase** | ABHA/NDHM/FHIR APIs, Real-time Dashboards | Aligns with national health interoperability. |
| **Optimization** | AI/ML, Genomics Integration, Digital Twin Models | Introduce advanced analytics post stabilization. |

**B. Transition Risks**

- Temporary dual workflows (manual + digital) may cause confusion.
- Integration errors during API rollouts could disrupt continuity.
- Clinical staff may need to work overtime during cutovers.

**C. Legacy System Co-Existence**

• Systems like current HMIS modules, diagnostic lab records, or radiology archives may need:

• **API wrappers**

• **Data archival solutions**

• **Sunset timelines with governance controls**

## 11.3 Potential Organizational Impact

**A. Roles & Responsibilities**

| Role | Impact |
|---|---|
| Doctors & Clinicians | Shift to digital documentation, clinical decision support systems (CDSS). |
| Nurses & Support Staff | Use of mobile devices for real-time patient monitoring and documentation. |
| Administrative Staff | Automation of billing, admissions, scheduling—reduction in manual workload. |
| IT Department | From infrastructure support to enterprise platform management and data governance. |
| Management | Real-time dashboards and KPIs to support proactive governance. |
| Patients | Self-service kiosks, ABHA integration, access to personal health records (PHR). |

**B. Governance & Culture**

• Need to establish **Digital Health Governance Board**.

• Promote **cross-functional collaboration** between clinical, IT, and administration teams.

• Redefine **performance KPIs** and **appraisal systems** to reward digital adoption.

**C. Facilities & Infrastructure**

• New architecture may require:

• Additional **network bandwidth and failover systems**.

• Redundant **data centres or cloud architecture**.

• Smart wards and beds for patient monitoring.

**D. Training & Capability Building**

• Significant investment in:

• Digital upskilling of staff.

• Cybersecurity awareness.

• Workflow simulation and gamified training.