Real Time Operating Theatre Scheduling Information System (RTOTSIS) Software Development Project

Project Proposal
March 2018

विश्वारोग्यं हि धर्मो न :
अखिल भारतीय आयुर्विज्ञान संस्थान, ऋषिकेश
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Client Owner
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Agenda

Digital OT Management

Custom Software Development

Techinfiniti Infosolutions Pvt. Ltd.

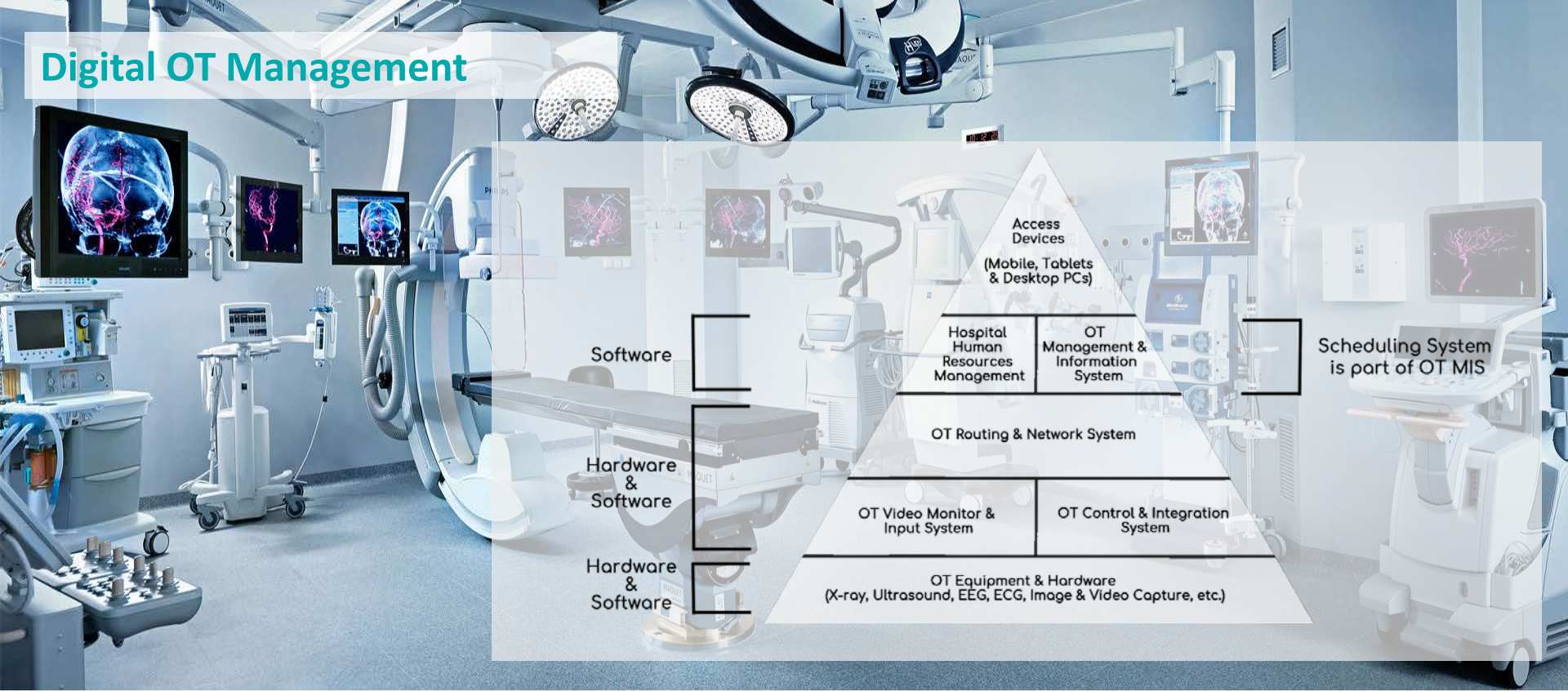
Proposed Project

Project Execution

Project Costing

Appendices

Digital OT Management



OT Management Software

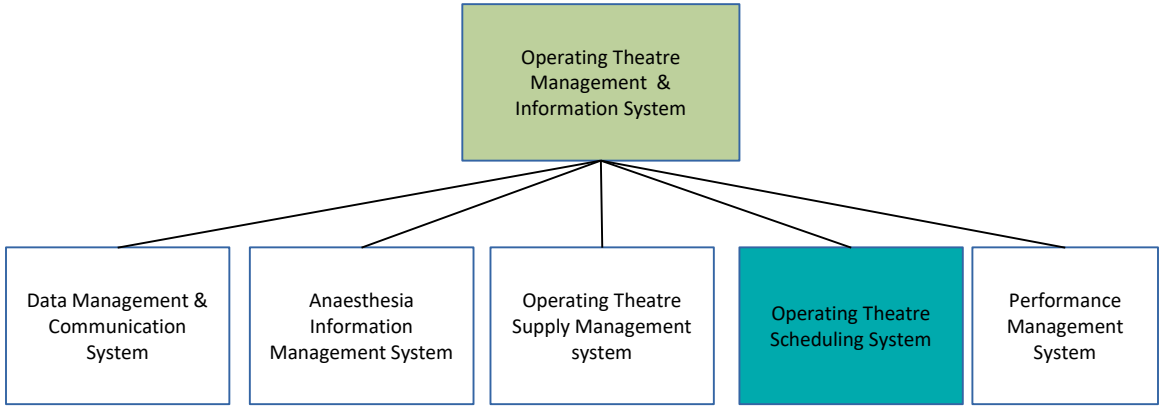
OT Scheduling Software

RTOTSIS

OT Integration

With this project we will be targeting to deploy some specific functionality of the Operating Theatre Scheduling System

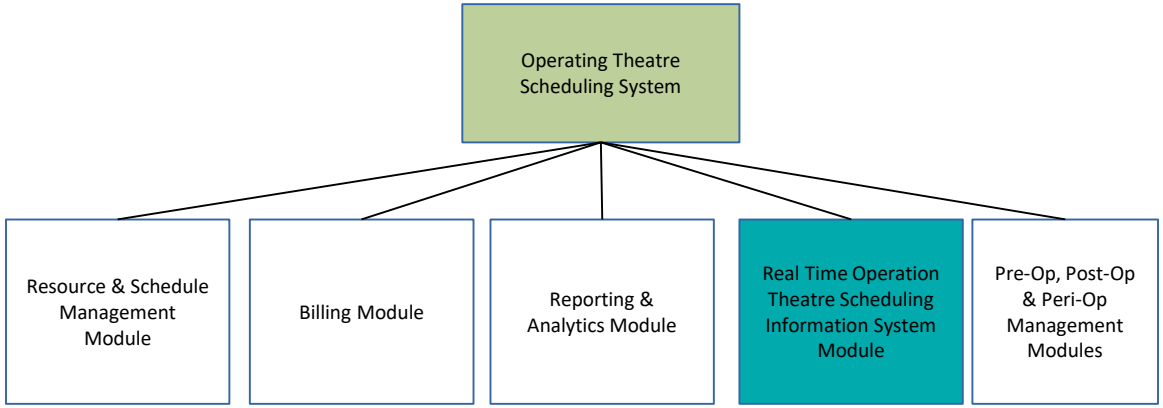
Operating Theatre Management & Information System (OTMIS)



- The operating theatre management & information system is a master software that sits on top of all the hardware (and associated software) residing within the operating theatre
- It's the penultimate step towards digitizing the operation theatre
- OT MIS, categorically comprises of 5 top level systems
- Each of these top level systems can be thought of comprising of numerous second and third level software modules and sub-modules
- With this project we intend to target some functionality of 1 of the five systems namely **"Operating Theatre Scheduling System"**

Real Time Operation Theatre Scheduling Information System (RTOTSIS) Module is the first building block of an Operating Theatre Scheduling System

Operating Theatre Scheduling System (OTSS)

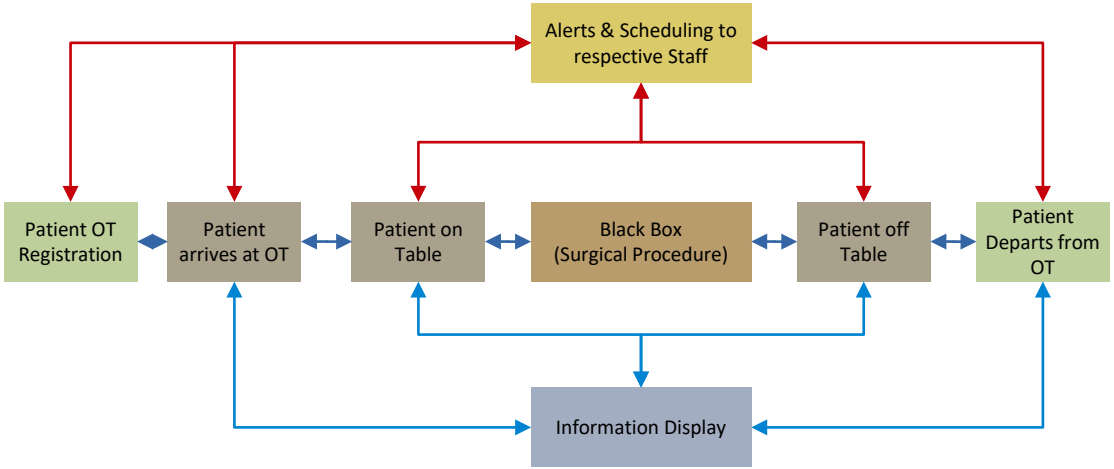


- Lot of time and essentially cost is wasted due to improper scheduling within the operation theatre
- Large part of this mismanagement is due to lack of scheduling information available with the operation theatre stakeholders
- Due to critical nature of the operation theatre it is imperative that this scheduling information is available in real time
- Real Time Operation Theatre Scheduling Information System (RTOTSIS) Module is the basic module that should be implemented in order to achieve proper scheduling within the OT

This top level vision will remain the basis of building the proposed RTOTSIS

Real Time Operation Theatre Scheduling Information System (RTOTSIS)

Top Level Project Vision

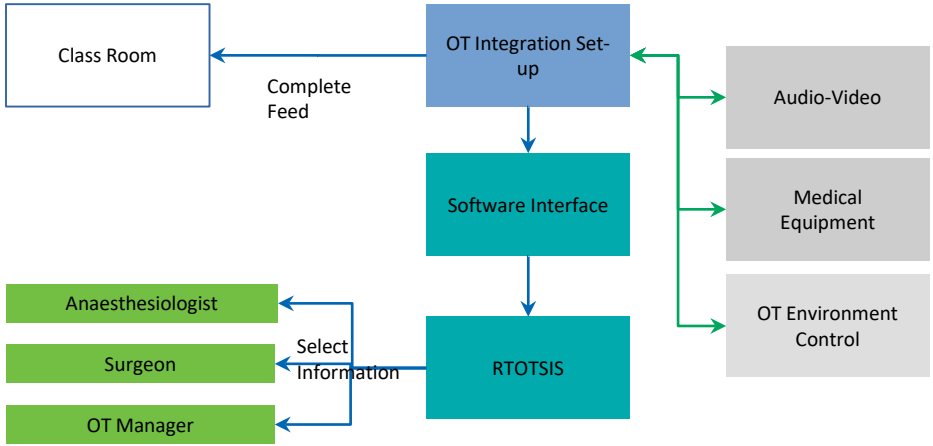


- With a focus on reducing surgeon waiting time before starting a surgery the above shown flow of alerts and information display is envisaged at the top level
- Each patient event is considered to be linearly occurring
- “Black Box” or the actual surgery is considered to be irrelevant for the proposed system

A Software Interface would be required for reading necessary information from Integration set-up and push it into RTOTSIS

	Hardware
	Hardware & Software
	Software
	User Device & Interface Screen
⟷	Control & Feed Line
⟷	Feed Line

Operation Theatre Integration



- The OT hardware manufacturers provide centralized repository (server) for collating feeds from equipment (such as x-ray, ultrasound, video and image capture systems, etc.).
- Software interfaces are provided by the hardware manufacturers that allow external 3rd party system providers (Like us) to access information stored in the centralized repository.
- The manufacturer provides Application Programming Interfaces (APIs) that is a documentation that informs 3rd party providers on how the information from the repository can be accessed.
- 3rd party providers build custom software system using the APIs to enable integration.

Custom Software Development

What is custom software development

How is custom built software different from Off-the-self-software

Difference in deployment process

Need

Associated Risks

Risk Mitigation

Role of industry experience in custom software development

Software will be build from scratch in order to address your needs precisely and thus cannot be packaged for reselling

What is custom software development

- Custom software development is the **designing of software applications <u>from scratch</u>** for a specific user or group of users within an organization
- Such software is designed **to address their needs <u>precisely</u>** as opposed to the more traditional and widespread off-the-shelf software
- Such software is typically created **just for that specific entity** by a third-party under contract or in-house group of developers and is **<u>not packaged for reselling</u>**

Major difference is as to what amount of control and flexibility does the user wants to have

How is custom built software different from off-the-shelf software

Off-the-shelf software

- User has to follow processes and systems implemented in the software
- Works on general and common needs of the user industry
- Usually its cheaper but can end up being costly
- Has very limited flexibility
- Large parts of functionality remain unused
- Difficult to integrate with isolated/ legacy systems
- One version becomes obsolete due to changes in industry

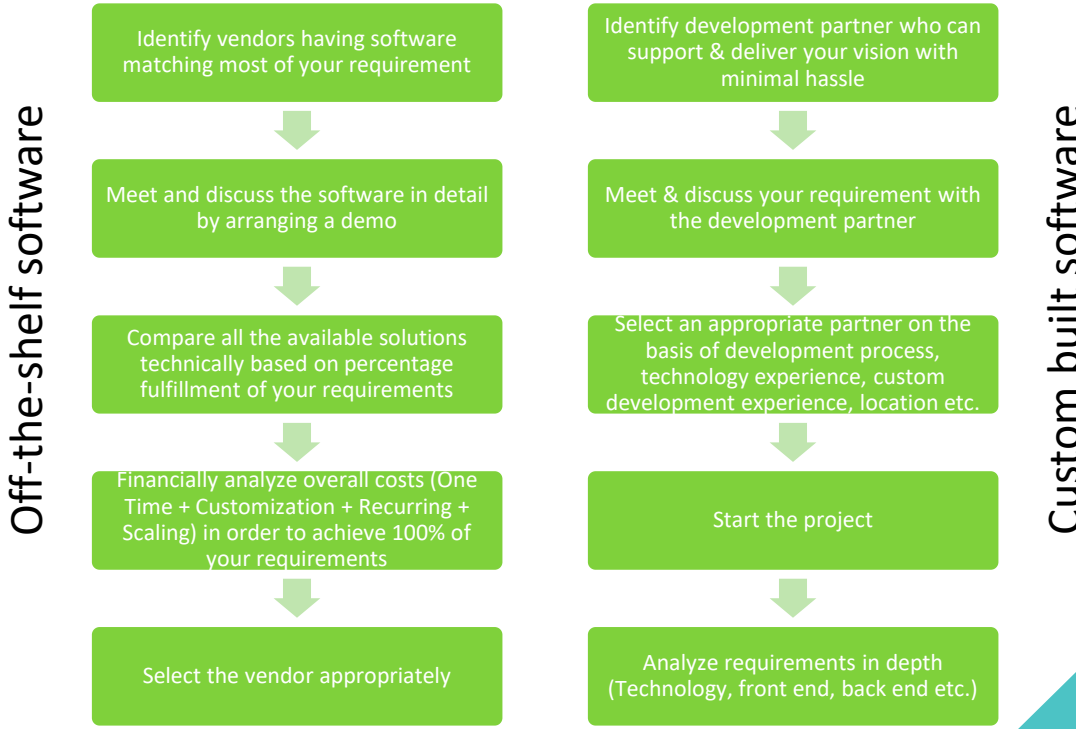
Custom Built Software

- Software follows the user's processes and systems
- Works on specific problems and objectives
- Usually requires greater investment, which can be spread overtime as per needs, thus increasing ROI and decreasing ROI realizable time
- Highest possible flexibility
- Highly scalable

While deploying an off-the-shelf software a demonstration of the same is possible

furthermore while deploying an off-the-shelf product decision regarding both the software as well as the vendor is possible

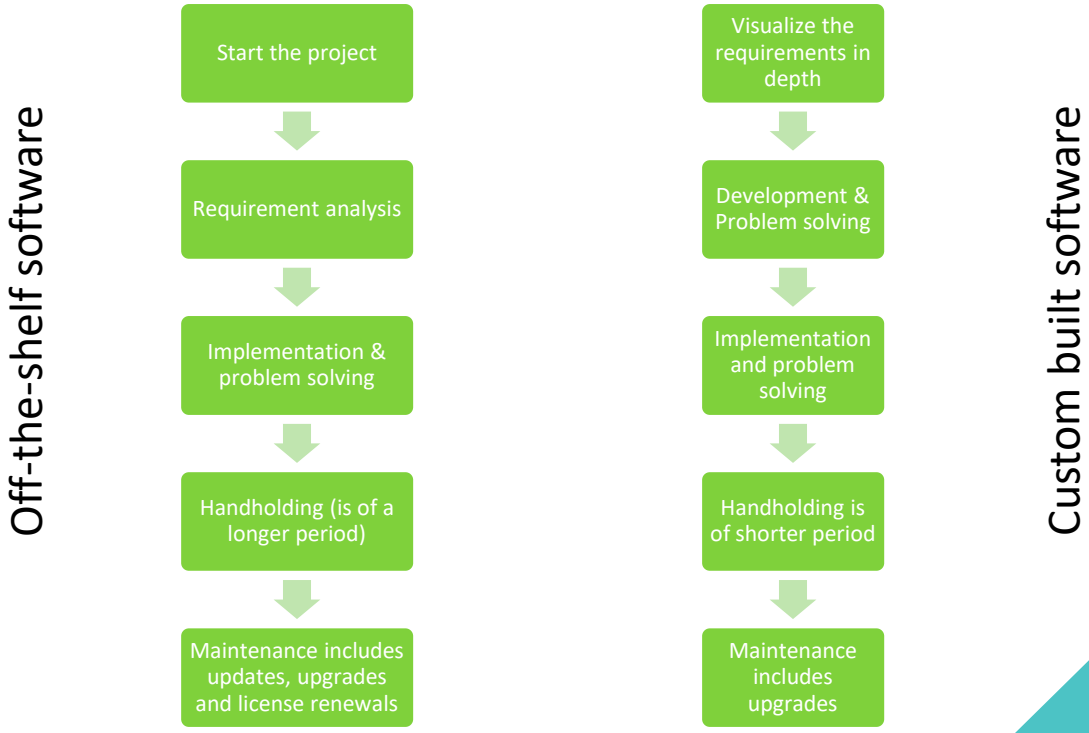
Difference in Deployment Process



In case of off-the-shelf software deployment implementation begins earlier while handholding is longer and maintenance is extensive

Difference in Deployment Process

(Continued)



Custom SW Development

Non-availability of an appropriate off-the-shelf software and associate high costs of deployment make custom development of RTOTSIS the right choice

Need for a custom software developer for Real Time OT scheduling information system

- Out of 24 Top companies that provide OT management software only 5 offer OT scheduling information applications
- High off-the-shelf software costs
- Huge cost of customization while deploying these off-the-shelf software
- Additional costs of licensing per OT/Server/nodes
- Recurring costs of updates, upgrades and license renewals
- Possibility of integrating features not available in the off-the-shelf RTOTSIS
- AIIMS already has experienced medical staff and knows best practices as it is also an academic institution. So it only needs an experienced software developer to implement its vision into reality.

Most of the risks associated with custom software development arise from not knowing the final product in full while some of the risks are common to deploying an off-the-shelf software

Risks associated with custom development

- Custom software development is often considered expensive compared to off-the-shelf solutions or products
- Cost overruns is another risk associated with custom software development
- Delays in project execution
- Most of custom development projects start with ideas and the final outcome is not fully known, thereby introducing a risk of building a software that is far from the desired
- Another risk associated with custom software development projects is that the user starts with an existing off-the-shelf software and tries to mimic its features which results in a loss of focus
- Technical issues consist of integration with legacy or propriety technologies etc.
- Last and mostly overlooked risk is of adaptability to change and acceptance of a new system within the organization

Success of any software deployment project lies in careful planning and extensive execution leadership

Risk Mitigation

- Off-the-shelf software often comes with lot of functionality which is not used, thus focusing on what will actually be used custom software development can be highly cost effective
- Cost overruns can be prevented by:
  - New requirements that are identified during project execution are kept for next phase of development as a new project
  - Appointing a project owner and a project leader in client organization for managing internal and external stakeholders affected by the custom software development project
- Delays in project execution can be managed by:
  - Appointing a project executive in client organization who enables day to day activities of the project and manages ground level executions
  - Appointing a project liaison in client organization who can effectively liaison with vendors on behalf of the client and development partner at one side

Also, it is important to spend both time and money in studying the requirement at all levels of software deployment early into the process

Risk Mitigation

(Continued)

- In order to overcome risks associated with unknown full picture of the software it is important to invest more time and money on analyzing requirements at all functional levels of the software, thus reducing the number of false assumptions
- To bring in focus to the project and have options of course corrections or even project abandonment by only spending a fraction of the final project cost, it is important to have a “minimal viable product” which essentially consists of least expensive useful set of features that can go live. Or, breaking down the entire project into small viable phases
- To reduce technical risks it is important for your development partner to study technical aspects of your requirements early on and understanding if these challenges are indeed solvable and how
- Every stakeholder or at least every category of stakeholder should be engaged early on in the project so that their concerns and feedbacks are appropriately addressed

In most of the novel custom software development projects clients bring in industry domain expertise while the development partner brings in technological expertise, thus resulting in both efficient as well as cost effective solutions

Role of Industry knowledge/experience in Custom Software Development

- When implementing any kind of software it is good to have an understanding of that industry
- However, while developing a software for an institution like AIIMS, the industry experience comes with its staff
- Therefore, is a case like this the development partner is just there to develop the software according to client specifications

TECHINFINITI
technology to infinity

TechInfiniti InfoSolutions Private Limited

TechInfiniti

Dehradun based , professionally run Company with Fourteen years of diverse software management experience across technologies and challenges

TechInfiniti – Brief Profile

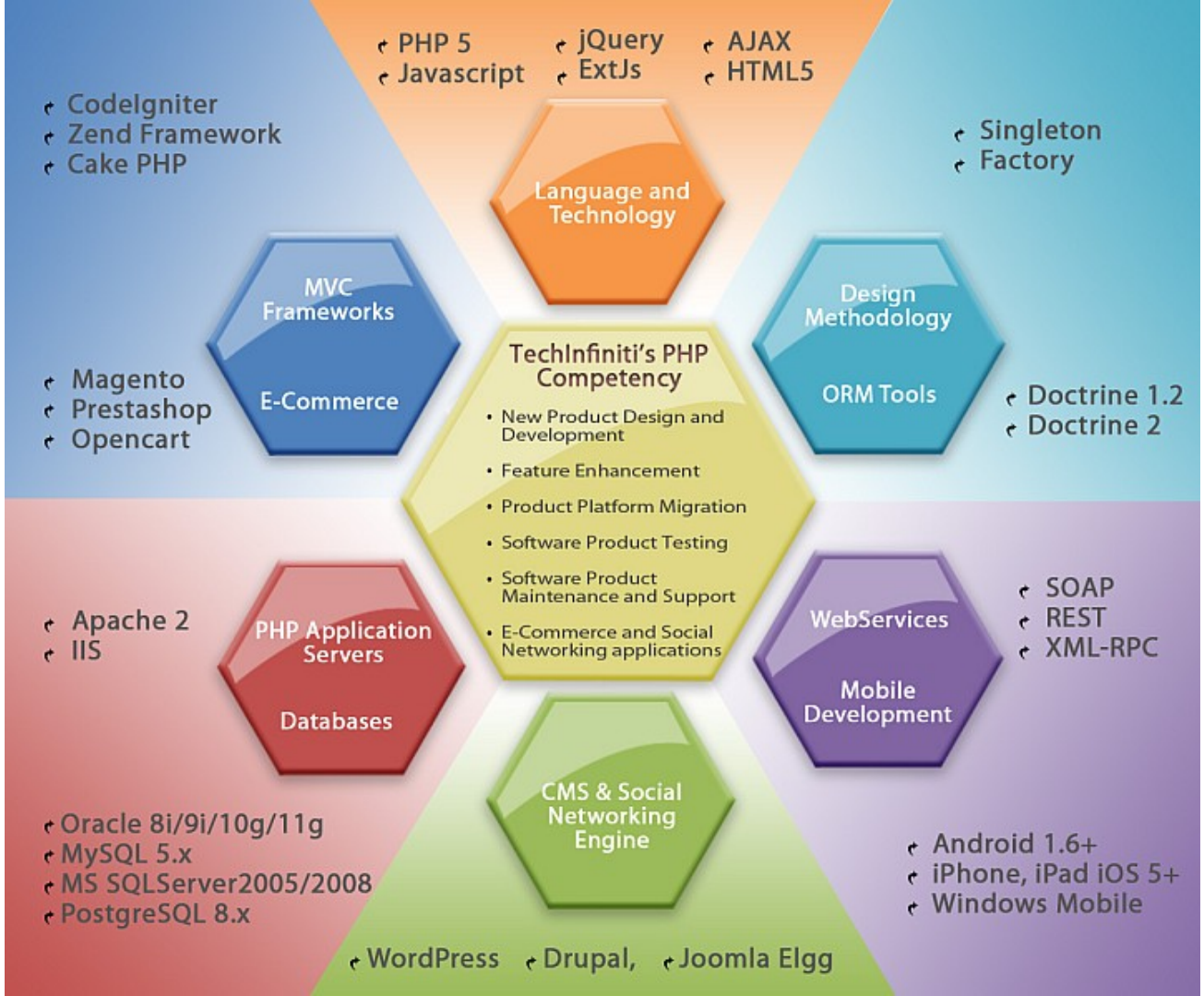
- Experience of working with US based software companies in sectors like education, advertising, technology, & travel and evolving their products from scratch.
- Building and Operating a commodity exchange for Nepal (from 2010 to 2012)
- Providing night-time US support to Fortune 1000 companies from our India office.
- Amongst the latest implementations, TechInfiniti architected and implemented a solution for Bengaluru based startup that works in area of payment solutions for NGOs. Currently the solution is hosting in more than 600 NGOs on the platform.
- TechInfiniti has worked with Uttarakhand Forest Development Corporation and implemented Minor Mineral (Khannan) Management System across the state. It has also implemented Logging and Sales Management System for them

A 25+ people company with an average experience of 7 years and a cumulative experience of 175+ years in software development

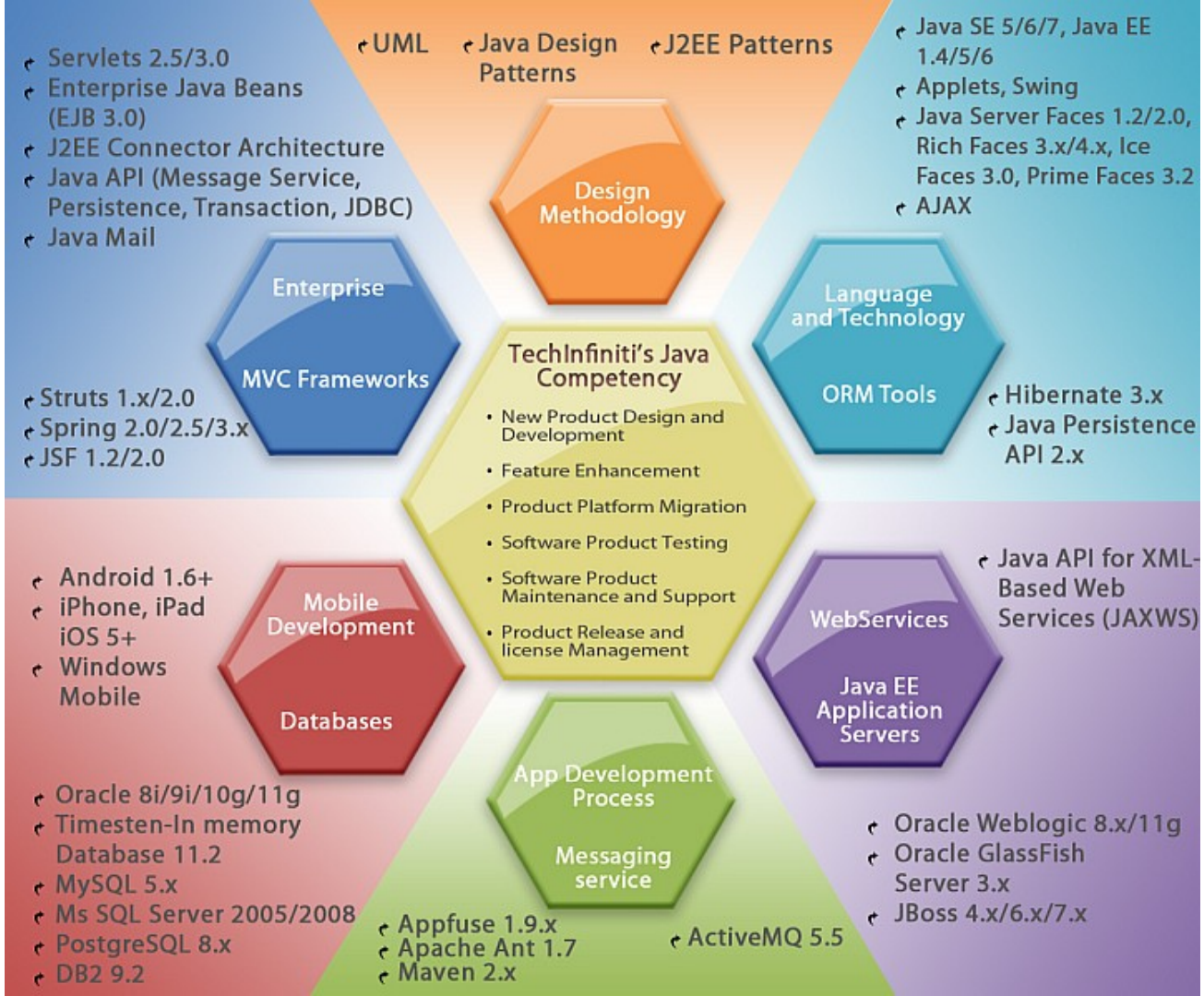
TechInfiniti

TechInfiniti – Team Profile

- We are a 25+ people company with an average experience of 7 years and a cumulative experience of more than 175 years in entire gamut of software development landscape that is given in subsequent slides.
- As a development standard we employ Agile development strategy to deliver quick Sprint in most projects. Our regular development team comprises of resources with minimum of 2 years experience with at least BS or masters degree in Computer Science. Team constitution is as follows:
  - **Project Manager** - responsible for overall delivery, designs and architects the solution and corresponds with client both over email and phone (skype), is in charge of Quality. Conducts weekly status review calls. Conducts daily Scrum review.
  - **Project Lead** - carries our coding of core architectural pieces, creates database as per design and is overall owner of data model through execution of the project. Oversees developer and allocates work to them on daily basis. Does sprint review and planning.
  - **Developers** - carries out the coding as per task allocated to them.
  - **QA** - responsible for testing developed code and release code for Customer Testing.



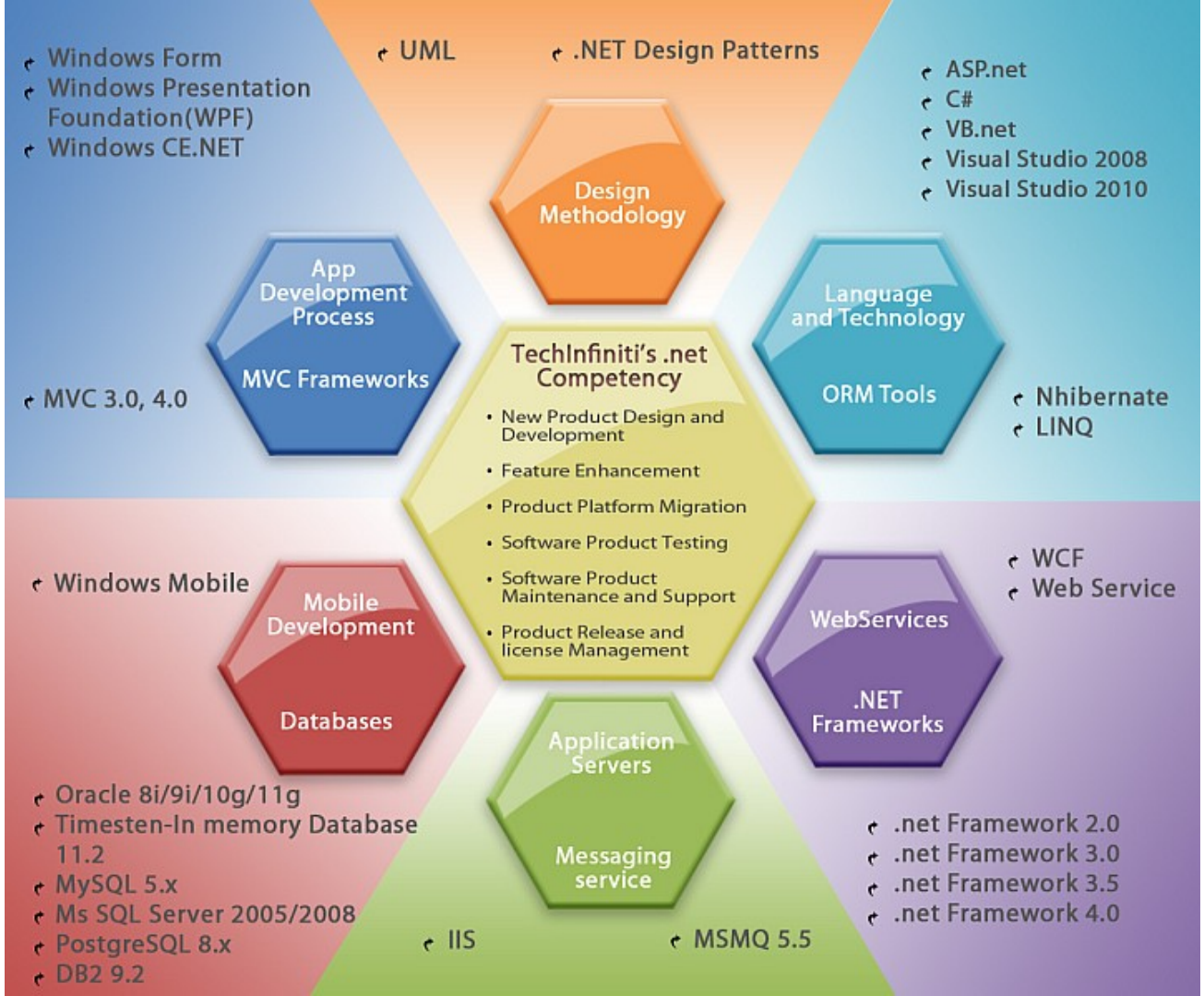
Our PHP Competency



Our Java Competency

TechInfiniti

Our .net Competency



TechInfiniti

Has global experience and is currently working with clients in US, Canada and Singapore. It has wide experience of working with Indian Central & State Government organizations as well.

TechInfiniti – Reach | Key Projects | Key Government Clients

- Reach
  - Majority of our Business is from US and Canada
  - Have worked with Major State Government Departments
  - Working with companies in Silicon Valley of India
- Key Projects
  - Developed and Operated a privately owned National Commodity Exchange in Nepal
  - Worked with a major software company of Turkey to evolve a digital signing solution for documents submitted online on GST Portal of Turkey
  - Developed and maintained an Uber / Ola like taxi hailing service for a Silicon Valley, California based taxi service.
- Key Government Clients
  - Uttarakhand Forest Development Corporation (UFDC)
  - Tehri Hydroelectric Development Corporation (THDC)
  - Uttarakhand Power Corporation Limited (UPCL)
  - Uttarakhand Electricity Regulatory Commision (UERC)

TechInfiniti

Techinfiniti – Other key clients

- Key Clients
  - TSR App – Developed and currently maintaining official app of Chief Minister of Uttarakhand, Shri Trivendra Singh Rawat.
  - Danamojo – Developed and currently doing technical maintenance for NGO payment platform for Danamojo that has more than 600 NGO on the platform currently.
  - Danamojo is Winner of NASSCOM Social Innovation Forum 2018
  - Ultimate Leather Inc. – A Product Manufacturer in the US
  - Nvone.ca – IT Services Provider in Canada

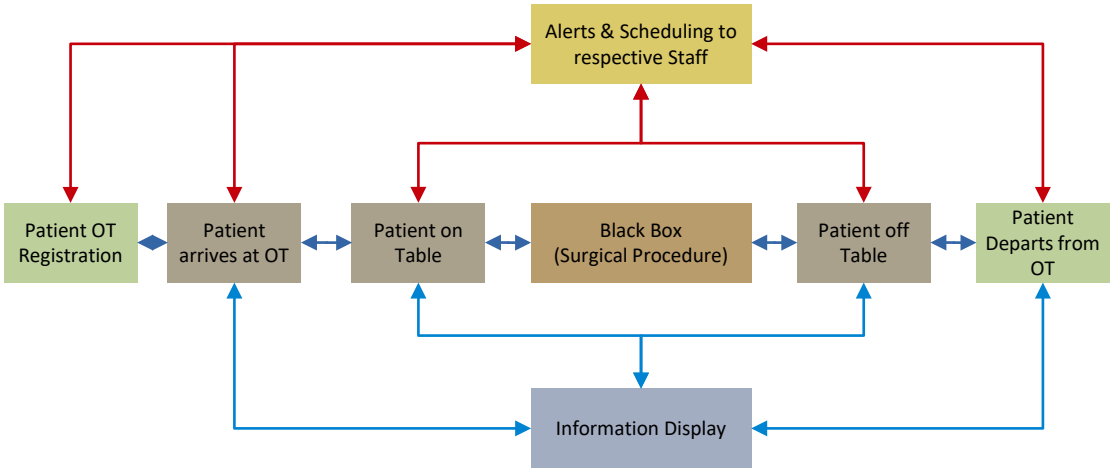
Some of our latest work.

Proposed Project

Proposed Project

Project Vision

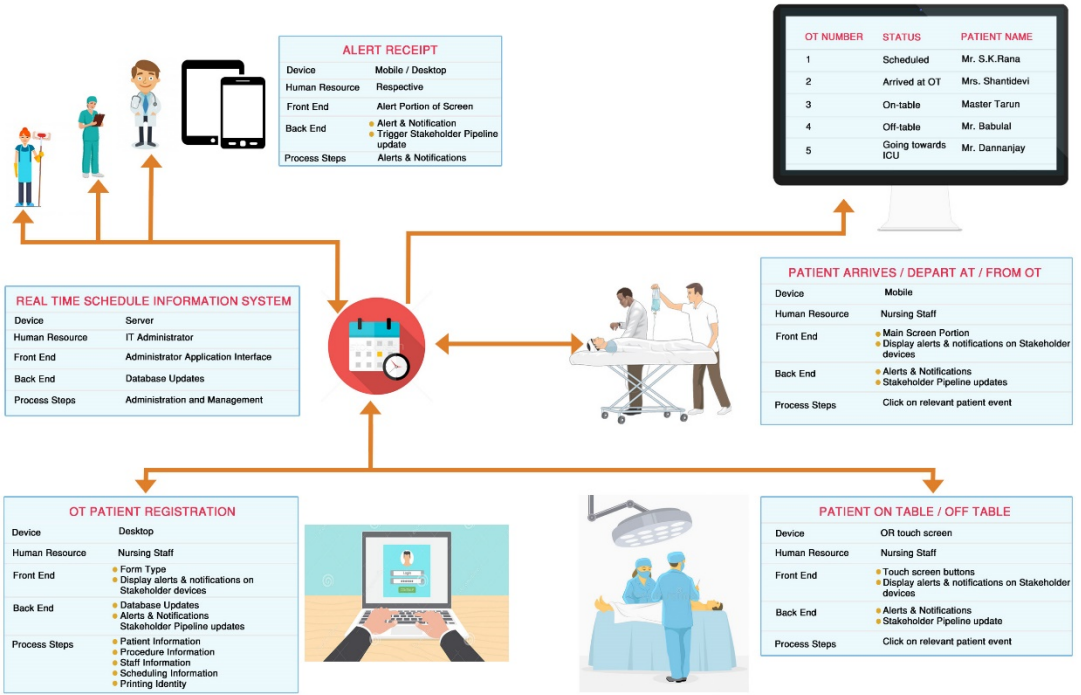
The high level vision as discussed in the initial slides. The solution is developed around *this* basic concept.



Proposed Project

Functional Architecture

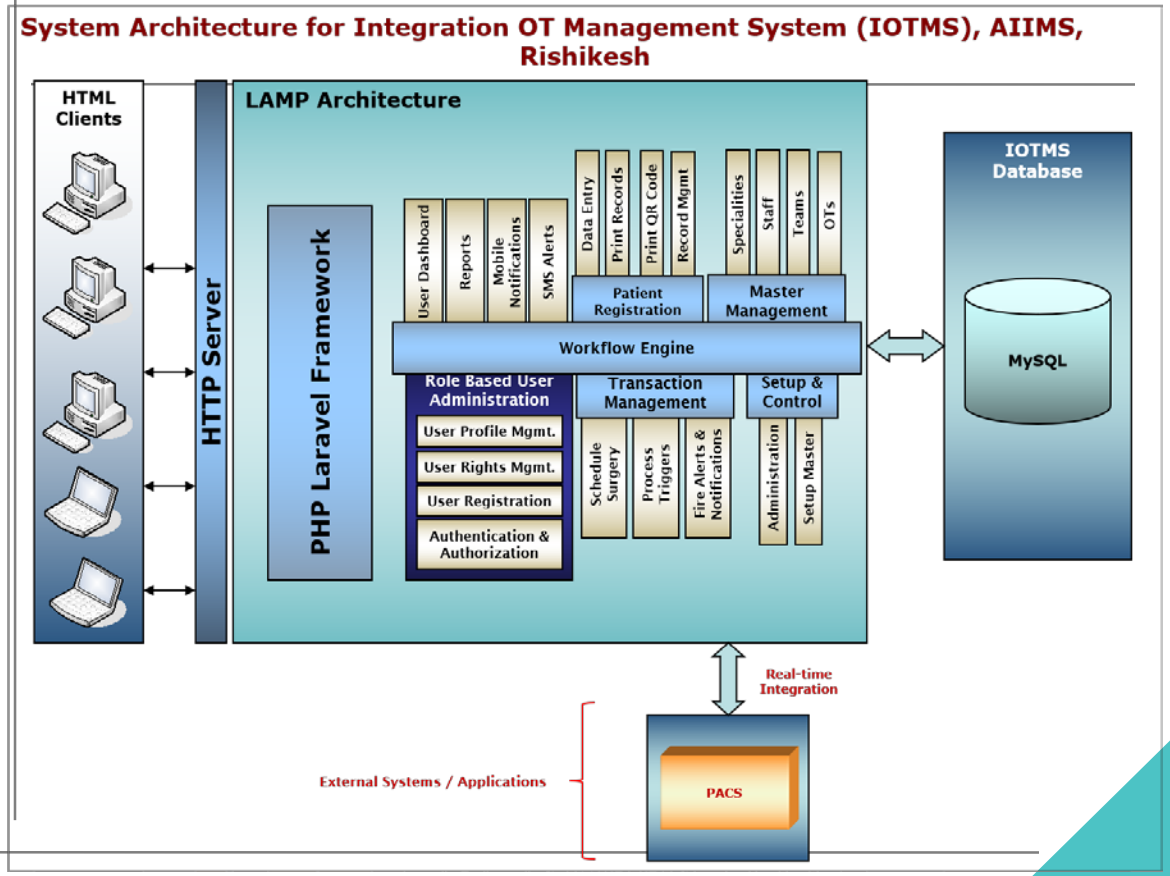
This is a birds-eye view of the system purely from Technical standpoint. You can see stakeholders interaction with the system and how their actions drive the whole system.



Proposed Project

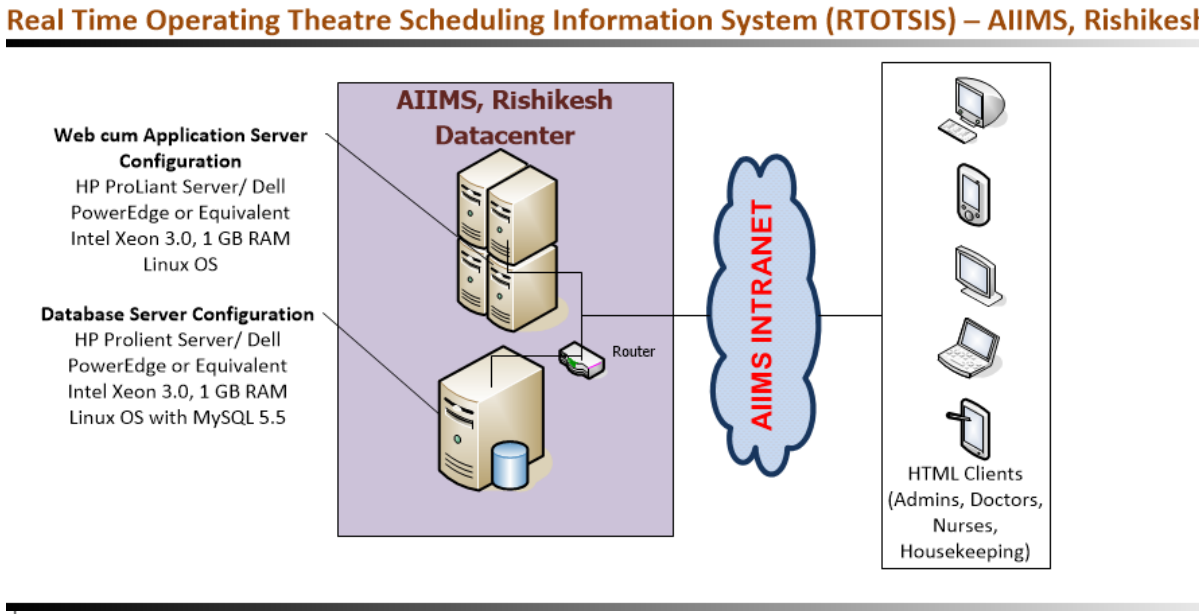
System Architecture

This is a birds-eye view of the system purely from Technical standpoint. This also brings out the development stack (technologies used) of the system.



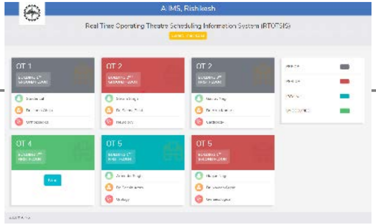
Network Architecture

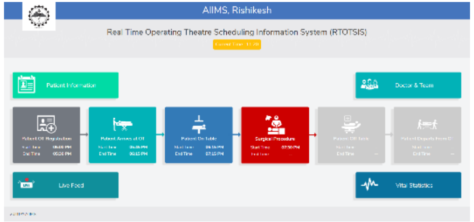
This diagram gives an understanding of networking aspect of the system. i.e. how and where the information flows and is accessed within AIIMS premises.

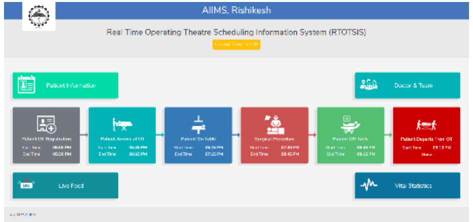


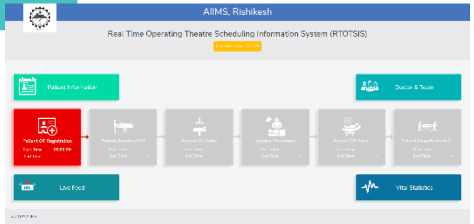
Proposed Project

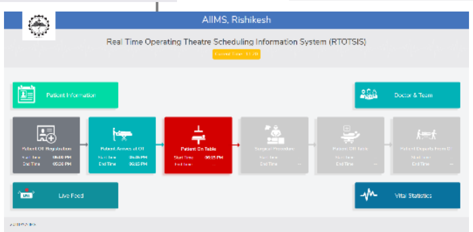
OT Manager Screen

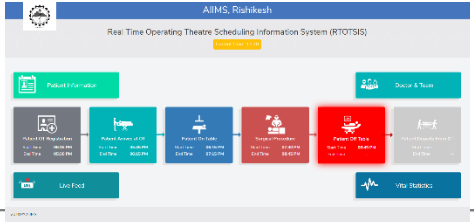








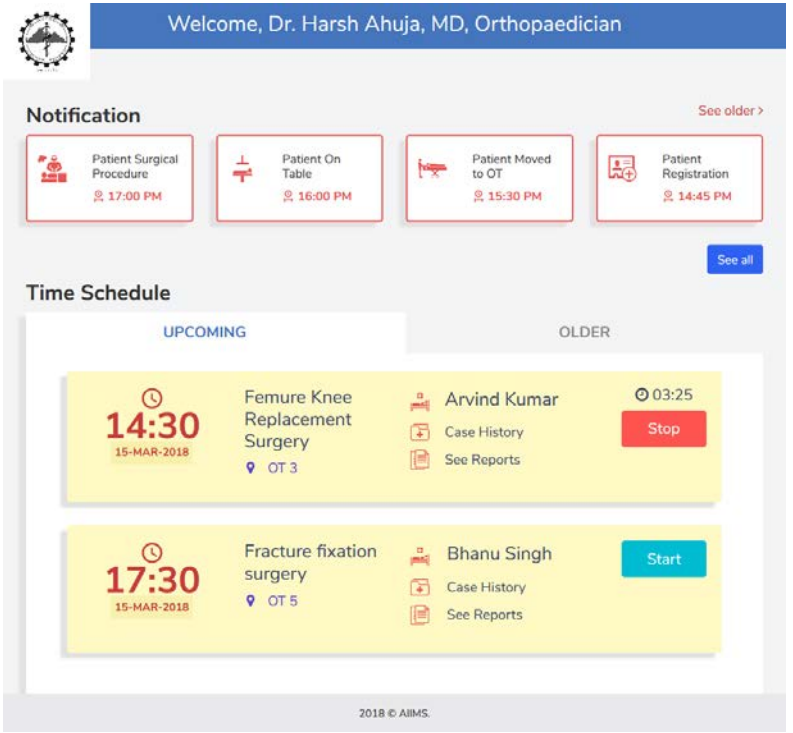




Proposed Project

Surgeon Screen

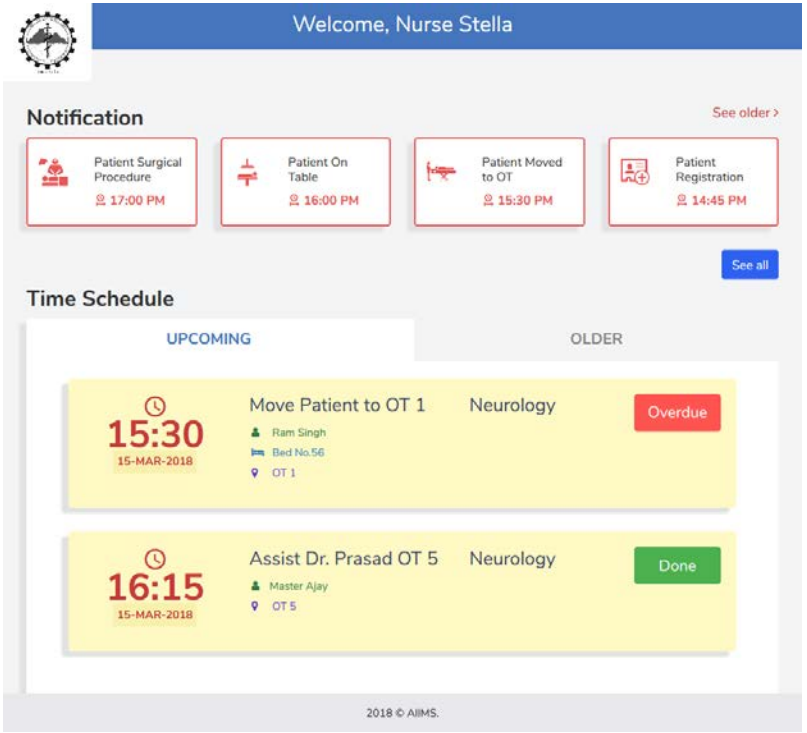
A tablet view of the screen for a surgeon of the hospital. Notification area updates in near real-time and shows most relevant information for this stakeholder. The queue at the bottom shows stakeholder's schedule and appropriate action they can take.



Proposed Project

Nursing / Stakeholder Screen

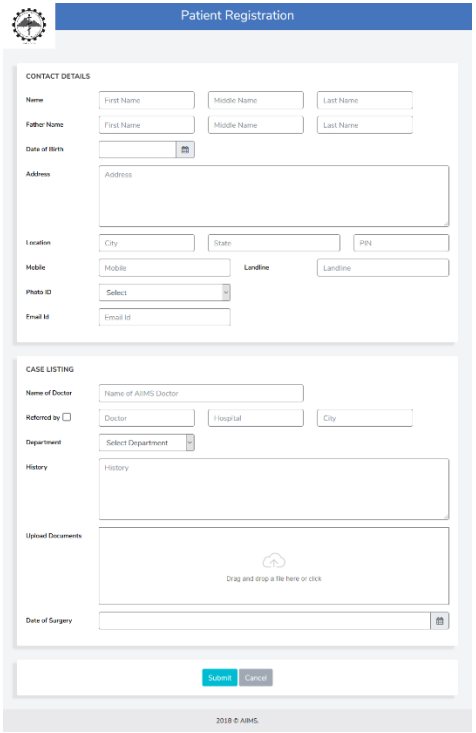
The interface for other stakeholders such as nurses and janitorial staff have similar interfaces on their mobile devices. It is important to understand that the system is ‘self driven’ post registration depending on the actions taken by stakeholders in their queues.



Proposed Project

Patient OT Registration Screen

The OT Registration Screen for the patient. This is a sample. Exact fields will be decided during Requirement study.



At a very high level RTOTSIS database is organized into these major tables

Databases

- Masters
  - Doctor
  - Nurses
  - OT
  - Specialties
  - Team
  - Patient
  - User
- Transactions
  - Scheduling
  - Patient arrives/ departs from OT
  - Patient On/ Off the table
- Notifications

Project Execution

Top level Development Process

The development will follow the most widely used ‘waterfall’ model as defined in the Software Development Life Cycle (SDLC) process

- Requirement Study
- Design
- Construction
- User Acceptance Testing (UAT)
- Golive Implementation

A description of the different steps involved in construction of RTOTSIS and for its successful delivery process.

Explain each step in the development process

- Requirement Study
  - Use Case Models to help capturing Requirements
  - Pilots / Proof of Concept
  - Identification of external interfaces
  - Identification of Hardware required
  - Identification of packaged Software (licensed software, etc.)
  - HTML Prototype Preparation
  - Data Definition Document Preparation
  - Sign off on Hardware and Software requirements, Prototype and DDD.
- Design
  - Specifications of the N-tier architecture for modularity and expandability
  - Identification of processes and standards to be followed
  - Identification of third party tools
  - Identification of Technical risks involved
  - Schema finalization

Explain each step in the development process

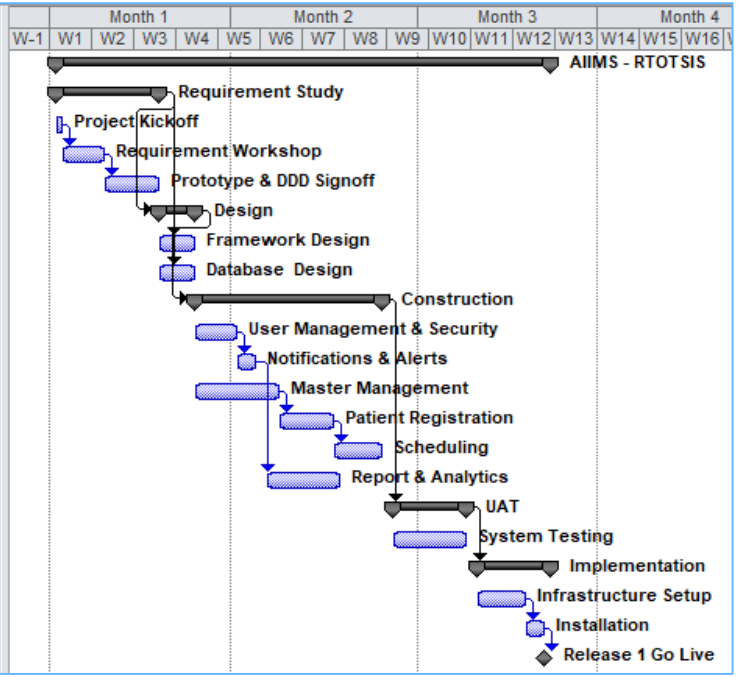
A description of the different steps involved in construction of RTOTSIS and for its successful delivery process.

- Construction
  - Low-level Design
  - Unit Test Plans
  - Coding
  - Code Walkthroughs by team leaders
  - Unit Testing by developer
- User Acceptance Testing (UAT) also called Customer Acceptance Testing
  - Constructed Software is deployed on production systems
  - Customer Team for testing each user role is identified
  - Training Testing Team by the Development Team
  - Testing Team performs testing and reports issue to Development Team via emails
- Golive Implementation
  - Cut-over for Go live on production system

Project timelines

The high level project plan from inception to delivery of RTOTSIS. Payment milestones and correlated with it.

	Task Name
1	AIIMS - RTOTSIS
2	Requirement Study
3	Project Kickoff
4	Requirement Workshop
5	Prototype & DDD Signoff
6	Design
7	Framework Design
8	Database Design
9	Construction
10	User Management & Security
11	Notifications & Alerts
12	Master Management
13	Patient Registration
14	Scheduling
15	Report & Analytics
16	UAT
17	System Testing
18	Implementation
19	Infrastructure Setup
20	Installation
21	Release 1 Go Live



- Payment Milestones
  - 10% at project initiation
  - 25% at Prototype & DDD Signoff
  - 35% at start of UAT
  - 30% on Go Live

The most direct and effective way to delivering a successful project is to keep key deliverable precise and useful.

Key deliverables within timeline

- Prototype & Data Definition Document (DDD) Signoff within 3 weeks of project initiation. Sample DDD is attached below
- Customer Acceptance Testing (UAT) starts within 9 weeks of project initiation

Microsoft Excel Worksheet

This is important from your perspective. This clearly maps your responsibilities as a client and our responsibilities as a developer to deliver a successful system.

Responsibilities of the client

- Provide requirements in Requirement Study phase
- Make all project related and technical decisions
- Approve technical documentation, test plans, test procedures and other project deliverables
- Participate in weekly teleconferences to resolve any issues and assess the project status
- Check and confirm all the deliverables from TechInfiniti
- Provide licensed software and hardware whenever and wherever needed

This is important from your perspective. This clearly maps your responsibilities as a client and our responsibilities as a developer to deliver a successful system.

Responsibilities of the developer

- Development of prototypes
- Preparing themes for the webpage
- Interact with users and Subject Matter Experts to obtain clarifications
- Establish the required development team and infrastructure
- Participate in weekly meetings with customer
- Provide overall technical guidance to the Development Team
- Low level Design
- Coding
- Testing and Documentation
- Bug fixes during UAT
- Implementation – preparation of production systems and deployment of custom application for UAT and Golive.

Project Costing

The overall scope of a real-time OT management system is much wide as discussed in first few slides. The cost of the proposed system is drawn on certain assumptions without which the cost will much higher than anticipated by management.

Project costing assumptions

- Cost estimated as per MVP
- “Mobile App” not envisaged for current implementation. Only web application with all-device compatibility planned.
- The scope of the system is only “information system” as envisaged in Slide 5 and Slide 6
- System design incorporates facility to limitless scalability theoretically although in practical scenario no IT systems is designed to last indefinitely.
- That said, it is envisaged that the initial phase of the RTOTSIS is a “proof of concept” for AIIMS and conceptualized for quick and easy acceptance from all stakeholders.
- Complex system have limited acceptability in general.
- A product roadmap is presented at the end of the presentation that can be followed by AIIMS and is subject to hospital wide implementation of initial phase of RTOTSIS

Project costing option 1

- Basic: this option includes

Description	Cost (₹)
• Cost of software development in the proposed timelines that includes requirement study, design, construction, UAT and Go live. • Also includes 3 training sessions to the stakeholders • Milestone based payment as described in Slide 40	5,00,000 /-
Monthly support : • Only software support • On call or email • Response time within 24 hrs • Bug fixes via remote session (no functional enhancements)	10,000 /-

Project costing option 2

- Regular: this option includes

Description	Cost (₹)
• Cost of software development in the proposed timelines that includes requirement study, design, construction, UAT and Go live. • Also includes 3 training sessions to the stakeholders • Milestone based payment as described in Slide 40	5,00,000 /- (one time)

Monthly support :
• On premise support engineer who handles:
  • Software and Hardware (only RTOTSIS related) support
  • Response time within 4 hrs
  • Bug fixes coordinated with Development Team
(no functional enhancements)
	25,000 /- (monthly)

Report and Analytics • Provides near real-time process validation • Suggest process improvements	20,000 /- (monthly)

Project costing option 3

- Premium: this option includes

Description	Cost (₹)
• Cost of software development in the proposed timelines that includes requirement study, design, construction, UAT and Go live. • Also includes 3 training sessions to the stakeholders • Milestone based payment as described in Slide 40	5,00,000 /- (one time)

Monthly support :
• On premise support engineer who handles:
  • Software and Hardware (only RTOTSIS related) support
  • Response time within 4 hrs
  • Bug fixes coordinated with Development Team
(no functional enhancements)
	25,000 /- (monthly)

Consulting	(monthly)

Roadmap

Thank You

Appendices

Disclaimer

- All the points made in this presentation are based on initial discussions only
- Actual implementation may vary based on a detailed requirement analysis