

****Hospital Management System****

Software Requirements Engineering



BSSE SOFTWARE ENGINEERING

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1.1 BACKGROUND OF HMS

- **the Background of a hospital management system (HMS)** project in software engineering typically involves identifying the challenges faced by healthcare institutions and the need for a comprehensive solution to streamline operations, improve patient care, and enhance administrative efficiency. Here's an overview of the background of such a project:
- **Challenges in Healthcare Management:**
 - Healthcare institutions, including hospitals and clinics, face numerous challenges in managing patient information, medical records, appointments, billing, and inventory.
 - Manual processes and paper-based systems often lead to inefficiencies, errors, and delays in service delivery.
 - There's a growing need for healthcare systems to adopt technology solutions to address these challenges and improve overall performance.
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- **Emergence of Healthcare Information Technology (HIT):**
 - With advancements in technology, healthcare information technology (HIT) solutions have become increasingly prevalent in the healthcare industry.
 - Electronic health records (EHR), practice management systems, and hospital management systems (HMS) are examples of HIT solutions designed to automate and streamline various aspects of healthcare management.
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- **Purpose of Hospital Management Systems:**
 - Hospital management systems (HMS) are software solutions specifically designed to address the unique needs of hospitals and healthcare institutions.
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- **Benefits of Hospital Management Systems:**
 - Improved Patient Care: HMS facilitates better coordination among healthcare professionals, ensures accurate and timely access to patient information, and enhances clinical decision-making.

1.2 Buisness Opportunity:

- The implementation of an HMS gives hospital management an opportunity which is very big for making of hospital operations better. The partial automation medical institutions can reduce errors, make a better delivery of care, and bring about efficiency in organizational processes by digitizing patient records, appointment scheduling, billing, and other administrative tasks. A Hydro-testing Management System can also operate data analytics which helps experts to make better decisions and update documentations.
- Overall, the business opportunities in hospital management system span various aspects, from software development and customization to implementation, support, training, and value-added services. With the growing emphasis on digital transformation in healthcare, investing in HMS solutions can be a promising venture for entrepreneurs and businesses.
- Developing a hospital management system (HMS) presents several business opportunities due to the increasing demand for efficient healthcare management solutions. Here are some key business opportunities associated with HMS:

Software Development and Licensing:

Licensing the software to hospitals on a subscription or one-time fee basis generates revenue streams through software sales.

Customization and Implementation Services:

Offering customization services to tailor the HMS software to the unique requirements of individual healthcare institutions can add value and attract clients.

Maintenance and Support Services:

Providing ongoing maintenance, technical support, and software updates ensures the smooth functioning of the HMS and helps build long-term relationships with clients.

Training and Education:

Providing training programs and educational resources to hospital staff on how to effectively use the HMS maximizes its utility and enhances user satisfaction.

Consulting and Advisory Services:

Offering consulting services to healthcare institutions on HMS selection, implementation strategies, workflow optimization, and regulatory compliance can be valuable.

1.3 HMS OBJECTIVES:

- The objectives of a hospital management system (HMS) revolve around improving the efficiency of hospital operations, enhancing patient care, and optimizing overall organizational performance. Here are the key objectives:
 - **Streamline Administrative Processes:**
 - Automate routine administrative tasks such as patient registration, appointment scheduling, billing, and inventory management to reduce manual efforts and minimize errors.
 - **Enhance Clinical Workflow:**
 - Facilitate efficient management of patient records, medical histories, test results, and treatment plans to enable healthcare providers to make informed decisions and deliver quality care.
 - **Improve Patient Care and Experience:**
 - Provide timely access to patient information, treatment protocols, and medication histories to enable personalized care delivery and ensure patient safety.
 - **Optimize Resource Utilization:**
 - Optimize the allocation of resources, including personnel, equipment, and facilities, to maximize operational efficiency and minimize wastage.
 - **Ensure Regulatory Compliance:**
 - Ensure compliance with healthcare regulations, standards, and accreditation requirements, such as HIPAA, GDPR, and hospital accreditation bodies, to protect patient privacy and maintain data security.

1.4 SUCCESS METRICS:

- Success metrics in a hospital management system (HMS) are key performance indicators (KPIs) used to evaluate the effectiveness, efficiency, and impact of the system on hospital operations, patient care, and overall organizational performance. Here are some essential success metrics for an HMS:
 - **Patient Satisfaction Scores:**
 - Measure patient satisfaction through surveys, feedback forms, or patient experience scores to assess the quality of care, communication with healthcare providers, and overall experience with the hospital.

- **Patient Wait Times:**
- Track and monitor average wait times for appointments, emergency room visits, and procedures to ensure timely access to care and minimize patient waiting.
- **Clinical Outcomes:**
- Monitor clinical outcomes such as mortality rates, complication rates, readmission rates, and infection rates to assess the effectiveness of treatment protocols and patient safety initiatives.
- **Operational Efficiency:**
- Measure operational efficiency metrics such as patient throughput, bed occupancy rates, and resource utilization to optimize hospital resources and reduce bottlenecks.
- **Revenue and Financial Performance:**
- Track revenue generation metrics including total revenue, reimbursements, and collections, as well as financial performance indicators such as profit margins, operating costs, and revenue per patient.
- **Appointment Attendance Rates:**
- Monitor appointment attendance rates to assess patient adherence to scheduled appointments and identify opportunities for improving appointment scheduling processes.
- **Resource Utilization:**
- Evaluate the utilization of hospital resources including staff, equipment, and facilities to identify inefficiencies, allocate resources effectively, and reduce waste.

1.5 VISION STATEMENT:

“To revolutionize healthcare management through our Hospital Management System, empowering hospitals with seamless integration, data-driven insights, and patient-centric care, ultimately enhancing efficiency, quality, and accessibility in healthcare delivery by using these techniques:

- **Patient Management**
- **Clinical Workflow Optimization**
- **Administrative Automation**
- **Electronic Health Records (EHR)**
- **Appointment Scheduling**
- **Billing and Revenue Cycle Management**
- **Inventory and Resource Management**

1.6 Business Risks:

Data Security Breaches:

Risk of unauthorized access, data breaches, or cyberattacks compromising sensitive patient information stored in the HMS, leading to privacy violations, legal liabilities, and reputational damage.

System Downtime and Outages:

Risk of system failures, technical glitches, or infrastructure issues causing downtime or disruptions in service, impacting patient care, operational efficiency, and revenue generation.

Integration Challenges:

Risk of integration complexities and interoperability issues when integrating the HMS with existing systems, such as electronic health records (EHR), laboratory information systems (LIS), or billing systems, leading to data inconsistencies and workflow disruptions.

Scalability and Performance:

Risk of scalability limitations and performance bottlenecks as the volume of data and user load increases over time, potentially impacting system responsiveness, throughput, and user experience.

Vendor Dependence and Support:

Risk of vendor lock-in and dependency on HMS vendors for software updates, maintenance, and technical support, with inadequate vendor responsiveness or service levels affecting system reliability and support availability.

Patient Safety and Quality of Care:

Risk of errors or oversights in clinical decision-making, treatment plans, or medication administration resulting from reliance on HMS data or functionality, potentially compromising patient safety and healthcare outcomes.

1.7 BUSINESS ASSUMPTIONS AND DEPENDENCIES:

Assumptions:

Availability of Infrastructure:

Assuming the availability of necessary infrastructure such as hardware, servers, networking equipment, and internet connectivity to support the HMS deployment and operation.

User Training and Adoption:

Assuming that hospital staff will receive adequate training on how to use the HMS effectively and will adopt the system as part of their daily workflows.

Data Accuracy and Integrity:

Assuming that the data entered into the HMS, including patient information, medical records, and administrative data, will be accurate, complete, and up-to-date.

Regulatory Compliance:

Assuming that the HMS will comply with relevant healthcare regulations, standards, and accreditation requirements, such as HIPAA, GDPR, and industry guidelines, to protect patient privacy and data security.

Dependencies:

Vendor Relationships:

Dependency on HMS vendors for software updates, patches, technical support, and maintenance services, requiring a strong partnership and effective communication between the hospital and the vendor.

Availability of Resources:

Dependency on the availability of skilled IT personnel, project managers, and healthcare professionals to support HMS implementation, customization, training, and ongoing operation.

Data Migration and Conversion:

Dependency on the successful migration and conversion of data from legacy systems or paper-based records to the HMS format, requiring careful planning, validation, and quality assurance.

User Acceptance Testing (UAT):

Dependency on conducting thorough user acceptance testing (UAT) to validate the functionality, usability, and performance of the HMS before deployment, ensuring that it meets user requirements and expectations.

Change Management:

Dependency on effective change management processes to manage resistance to change, address user concerns, and facilitate the adoption of the HMS within the hospital organization.

Budget and Funding:

Dependency on securing adequate budgetary allocations and funding for HMS implementation, including software licenses, hardware procurement, training expenses, and ongoing operational costs.

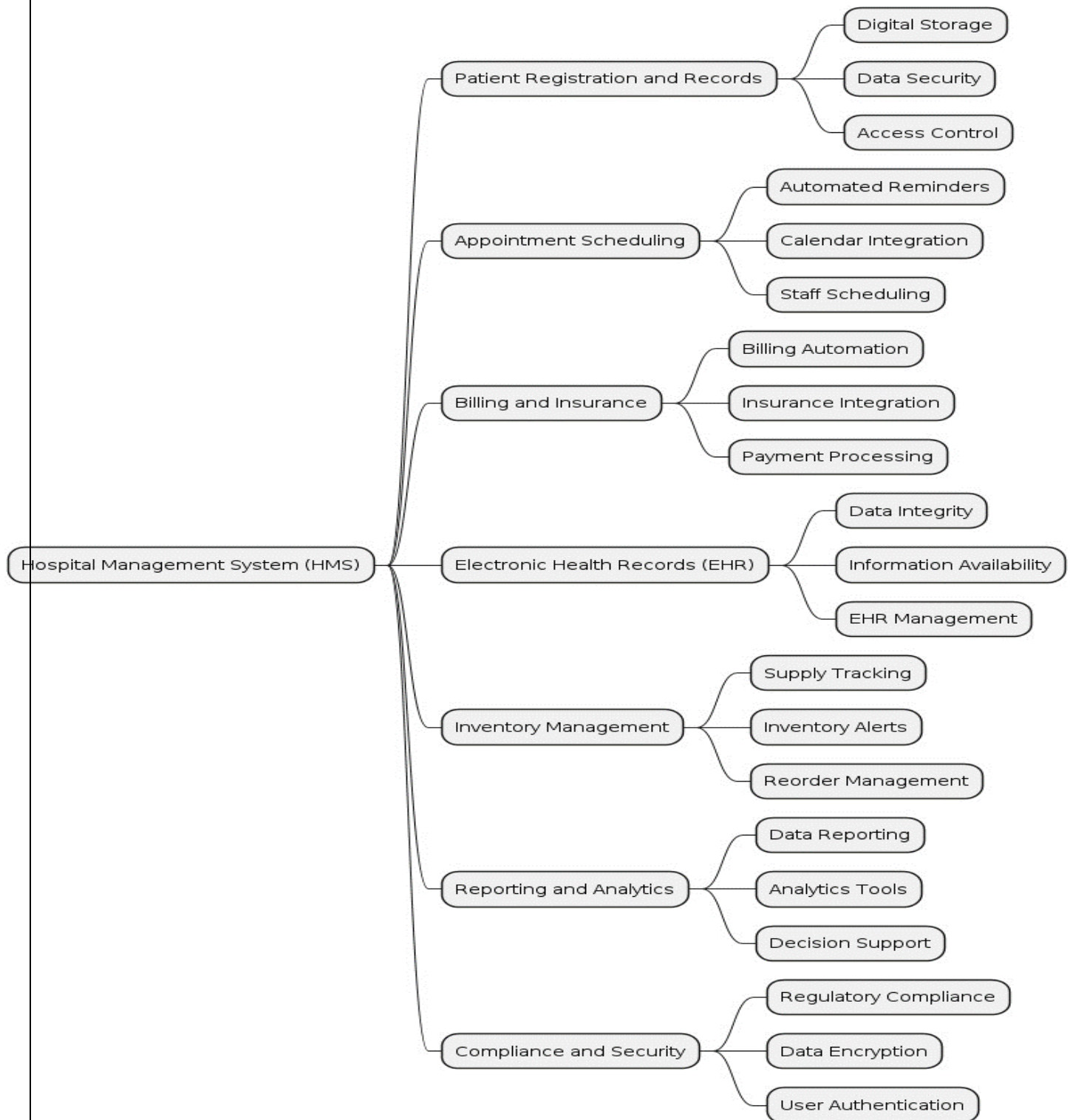
Scope And Limitations:

2.1 Major features:

S.No.	MODULE NAME	APPLICABLE ROLES	DESCRIPTION
1.	LOGIN	PATIENT DOCTOR ADMIN	PATIENT: Can login using unique Id and Password after this system shall show his/her profile. DOCTOR: Can login using unique Id and Password after this system shall show his/her profile. ADMIN: Can login using unique Id and Password after this system shall show a profile with links to maintain the website.
2.	REGISTRATION	PATIENT	PATIENT: Can Register by filling all the required details, after this the system will verify the details and check if already registered or not.
3.	MAKE APPT.	PATIENT	PATIENT: Can Select doctor, date time and make an appointment request after this system shall show a confirmation for appointment request.
4.	CANCL APPT.	PATIENT DOCTOR	PATIENT : Can Cancel appointment if want to by just one click after this system shall ask for re-schedule or refund of payment. DOCTOR : Can Cancel appointment if want to by just one click after this system shall send a message to the patient.
5.	PAYMENT	PATIENT	PATIENT : Enter payment details and make payment after this system shall show the generated bill by the hospital.

6.	DOCTOR MODULE	ADMIN	<p>ADMIN : Can add a new doctor by filling all the details after this system shall show a confirmation message.</p> <p>Can Remove a doctor by just one click after this system shall show confirmation message.</p>
7.	PATIENT MODULE	PATIENT	<p>PATIENT : Can view payment history or can search for a particular bill also after this system shall show a bill or history.</p> <p>Can also See or search for a doctor by entering dept. name or doctor id if known after this system will check for the doctor if found shall show doctor's profile.</p> <p>Can also update details after this system shall ask for re-enter password and after verifying password shall update details.</p>
8.	ADD PRESCRIPTION	DOCTOR	<p>DOCTOR : Enter Patient Id and after this all the treatment details and medicine, remark and advice for the patient after this system shall show a message for update.</p>

TREE DIAGRAM EXAMPLE OF HOSPITAL MANAGEMENT SYSTEM



2.2 Scope of Initial Release:

The scope of the initial release of a hospital management system (HMS) typically focuses on delivering essential features that address immediate needs while laying the foundation for future enhancements. Here's a comprehensive scope for the initial release:

Patient Management:

Registration: Capture basic patient information such as name, age, gender, contact details, and medical history.

Appointment Scheduling: Allow staff to schedule appointments for patients with doctors and other healthcare professionals.

Admission/Discharge: Manage the process of admitting patients to the hospital and discharging them after treatment.

Doctor and Staff Management:

Doctor Profiles: Maintain profiles for doctors including their specialization, contact information, and schedule.

Staff Management: Keep track of other hospital staff such as nurses, administrative staff, and technicians.

Medical Records Management:

Electronic Health Records (EHR): Store and manage patient medical records including diagnosis, treatment history, medications, and test results.

Prescription Management: Enable doctors to prescribe medications electronically and maintain a record of prescribed drugs.

Billing and Finance:

Billing and Invoicing: Generate bills for services provided to patients including consultations, procedures, medications, and room charges.

Payment Processing: Record payments made by patients or insurance companies and manage outstanding balances.

Inventory Management:

Medication Inventory: Track medications and medical supplies, manage stock levels, and generate alerts for low stock items.

Equipment Management: Maintain a list of medical equipment, track usage, and schedule maintenance.

Reporting and Analytics:

Generate standard reports such as patient demographics, appointment schedules, revenue summaries, and inventory levels.

Provide basic analytics to identify trends, resource utilization, and areas for improvement.

2.3 Scope of subsequent Release:

- **Advanced Features:** Improved reporting tools, inventory management and other third-party integrations such as accounting software. Implementing such types of systems can help grow and scale a business too.
- **Mobile Support:** Development of mobile applications for patients and staff: a solution available to healthcare facilities.
- **Enhanced Analytics:** Data analytics capabilities powered by sophisticated technology in the field of advanced analytics and predictive modeling.
- **User Feedback:** User feedback inclusion being part of ongoing process of improvement

2.4 Limitations and Exclusions:

Specialized Medical Practices:

Some HMS solutions may not fully cater to specialized medical practices or departments with unique workflows, such as oncology, cardiology, or radiology, requiring additional customization or integration with specialized software.

Resource Constraints:

Limited resources, including budgetary constraints, time constraints, and availability of skilled personnel, may restrict the extent of customization, implementation, and ongoing support for the HMS.

Scalability Challenges:

HMS solutions may face scalability challenges in handling large volumes of data, user concurrency, or increased system complexity as the hospital grows or expands its operations, requiring upgrades or architectural changes.

Data Privacy and Security Risks:

Despite robust security measures, HMS solutions may still be vulnerable to data breaches, cyberattacks, or insider threats, necessitating continuous monitoring, risk assessment, and security enhancements.

Patient Engagement and Empowerment:

While HMS solutions facilitate efficient hospital operations, they may not fully address patient engagement and empowerment initiatives, such as patient education, self-management tools, or remote monitoring capabilities.

Legacy System Integration:

Integrating with legacy systems or outdated technology infrastructure may pose challenges due to compatibility issues, data format disparities, or lack of standardized interfaces, limiting the scope of integration.

Geographic or Cultural Limitations:

HMS solutions developed for specific geographic regions or cultural contexts may not be easily adaptable to other regions or cultures, requiring localization efforts or customization to address local requirements and preferences.

Buisness Context

3.1 Stakeholder's Profile:

- **Patients:** The system will be based on interactions with end users who need to make new appointments and access health records.
- **Doctors:** As the system designed to facilitate users merely for the usage of patients details including their treatment records.
- **Nurses and Medical Staff:** Patients along with their relatives or attendants who will be doing some work within the system and keeping records.
- **Administrative Staff:** Users or personnel who will hand accountability and responsibilities for scheduling, billing, and administration.
- **IT Department:** Parish of the technical operations and the technical maintenance of the HMS.
- **Hospital Management:** Ensuring adherence to objectives and the organization's strategy, and using data for informed decision-making.
- **Healthcare Providers:** Physicians, nurses, surgeons healthcare professionals are primary stakeholders who use the HMS to manage patient care, access medical records, schedule appointments, and collaborate with colleagues., specialists, and other

Stakeholder	Major Value	Attitudes	Major Interests	Constraints
Executives	Improved operational efficiency	See product as a key factor in achieving strategic goals	High-quality patient care; streamlined operations; robust data analytics	Maximum budget = \$1.4M
Doctors	Enhanced patient care	Supportive if it improves patient care and reduces administrative burden	Accurate patient records; ease of use; integration with existing medical tools	Limited time for system training
Medical Staff	Improved workflow efficiency	Receptive to changes that make their job easier	User-friendly interface; reliable and quick access to patient information	Must be intuitive and require minimal training
IT Department	Simplified system management	Neutral; concerned with technical feasibility and maintenance	Secure and scalable system; ease of maintenance; integration capabilities	Must integrate with existing IT infrastructure
Patients	Better care and service	Generally positive if it leads to better care and service	Easy appointment scheduling; access to their health records; data privacy	Must comply with data privacy regulations (HIPAA)
Management	Strategic decision support	Highly supportive if it aligns with organizational goals	Comprehensive reporting and analytics; compliance with regulations	Must provide ROI within 2 years

3.2 Project Priorities

•High Priority:

Checking in, scheduling appointments, billing and EHR recording.

•Medium Priority:

Publication of data and simple analysis.

•Low Priority:

Advertising level up and its mobile interface in the follow-up releases. ▬

Dimension	Driver (state objective)	Constraint (state limits)	Degree of Freedom (state allowable range)
Schedule	Release 1.0 to be available by 10/1, release 1.1 by 12/1	Deadlines must be met	Minor delays acceptable if they do not impact overall project timeline
Features	70-80% of high priority features must be included in release 1.0	Must include critical features	Some medium priority features can be deferred to later releases
Quality	90-95% of user acceptance tests must pass for release 1.0, 95-98% for release 1.1	Must meet specified acceptance criteria	Minor issues can be deferred if they do not affect critical functionality or user experience
Staff		Maximum team size is 6 developers + 4 testers	Temporary contractors can be hired for non-core tasks if needed
Cost		Budget overrun up to 15% acceptable without executive review	Additional funding can be requested with executive approval

3.3 Deployment Considerations

- **Phased Deployment:** Embed pilot project to control risks and ascertain the transition process.
- **Training Programs:** Whole staff trained to enable their seeing the need adopting and getting a hang of them.
- **Technical Support:** Continuing technical support and hardening maintenance post-deployment.
- **Data Migration:** Prepare and set up the patients' data safely and accurately to make the process successful.
- These Vision and Scope documentation is designed for the purpose of the HMS project. It will give a bright picture of the project and will help in the step wise process of development which in the end will be applied to the program.

ADDITIONAL DIAGRAMS

USE CASE DIAGRAM OF HOSPITAL MANAGEMENT SYSTEM

