**PROJECT PROPOSAL**

**HEALTHCARE CUSTOMER RELATIONSHIP MANAGEMENT (CRM) SYSTEM**

**Quality Management**

| No. | Characteristics | Sub-Characteristics | | Definition of Done criteria |
| --- | --- | --- | --- | --- |
| **General Criteria** | | | | |
| G1 | Maintainability | Modularity | | All code is separated into modules and classes to maintain and update |
| G2 | Reusability | | Code comments, and naming convention rules are followed |
| G3 | Performance Efficiency | Resource Utilization | | The CPU utilization when running the system: < 85%  Memory consumption: < 70% |
| G4 | Capacity | | Can handle 10,000 users simultaneously without degrading the performance by more than 20% |
| G5 | Portability | Adaptability | | In case of failure, the system can be deployed on a new AWS server in < 3 days |
| G6 | Installability | | Time spent to configure and install all components for the system < 1 day |
| G7 | Replaceability | | Replace a component of the system with a new one with total migration time  < 1 week |
| G8 | Compatibility | Interoperability | | The CRM system is compatible with the following operating systems:   * Windows, Linux, macOS (Desktop app) * iOS, Android (Mobile app) |
| G9 | Co-existence | | The system can run at the same time with at least 2 other software/systems without crashing/conflicting |
| G10 | Reliability | Availability | | The CRM system is at least 99.999% available |
| G11 | Recoverability | | At least 50% of system functionalities can be restored from the backup 6 hours after the failure |
| **Sprint 1: Patient Engagement – Patient account registration & Patient communication channel** | | | | |
| 1.1 | Functionality Suitability | Functional Appropriateness | | The registration process meets all requirements specified by the stakeholders |
| 1.2 | The login/logout process functions correctly. Users will be navigated back to the Login page when they log out of their account. |
| 1.3 | The account detail pages have all fields needed to show the patient information |
| 1.4 | The registration form must be completed within a maximum of 30 minutes. Otherwise, the session will be expired. |
| 1.5 | Functional Correctness | | The registration process can pass at least 90% of all UAT test cases |
| 1.6 | The system can manage and terminate credential sessions securely when there is no interaction on the interface for 30 minutes |
| 1.7 | All information filled in the registration forms and account detail page must be validated before submitting (email format, password requirements) |
| 1.8 | Functional Completeness | | All required fields in the CRM databases must have data with  appropriate format |
| 1.9 | Besides text messages, the chatbox should support sending attachments and photos in various formats |
| 1.10 | Performance Efficiency | Time Behaviour | | The registration authentication process is finished within 30 seconds after the registration form is submitted |
| 1.11 | The response time for user interactions, including login/logout, registration is processed in less than 2 seconds |
| 1.12 | The login/logout process is done in under 5 seconds |
| 1.13 | Usability | Learnability | | The registration process is easy to understand for end-users.  At least 90% of users can complete the process in 5 minutes on the first time |
| 1.14 | The registration process is clear to learn without additional training.  After submitting the form, the system displays a confirmation message to users |
| 1.15 | Operability | | The login/logout page is clear enough to allow at least 95% of test users login/logout without any difficulties |
| 1.16 | User error protection | | Show a confirmation box when users want to modify/delete their information.  Conduct a survey and ensure at least 90% of users can understand the message |
| 1.17 | User interface aesthetics | | The color palettes, page structure, elements (icons, fonts, text size) must be compatible with the prototype design |
| 1.18 | Security | Confidentiality | | Registration data in the database is protected from authorized access by applying encryption and authentication protocols |
| 1.19 | Registration data in the database is only modified by privileged employees. No unauthorized modification is allowed |
| 1.20 | Authenticity | | User registration is validated via email, OTP code is sent via SMS messages… to ensure the identity of the patient |
| 1.21 | When users login, at least 94% of user authentication processes are successful |
| 1.22 | Accountability | | The evidence of user login/logout is recorded in the logbook for further auditing |
| 1.23 | Integrity | | 100% of data in the databases is reflected correctly on the user interface |
| 1.24 | Reliability | Operability | | There are brief text instructions shown to allow users to send attachments and photos on their first use |
| 1.25 | Fault tolerance | | The system can handle different file formats with a maximum of 25MB. If the file format is not supported or larger than 25MB, display the error message |
| 1.26 | Compatibility | Interoperability | | The voice call integrated into the chatbox can work with different devices (mobile phones, desktops, tablets) and operating systems (iOS, Android, Windows) |
| **Sprint 2: Appointment Booking Feature** | | | | |
| 2.1 | Functionality Suitability | Functional Completeness | The appointment scheduling process meets all requirements specified by the stakeholders such as view the appointment information, select available slots, reschedule the slot, cancel the slot, and set a reminder about the scheduled appointment. | |
| 2.2 | The scheduling information for a particular day is shown whenever the user hover over the said day. | |
| 2.3 | Appointment scheduling information is synchronized with healthcare employees. | |
| 2.4 | Functional Correctness | The scheduling process can pass at least 90% of all UAT test cases | |
| 2.5 | The CRM feature must ensure that CRUD actions performed by the user are recorded correctly to avoid negative effects on concurrent access of other users. | |
| 2.6 | Performance Efficiency | Time Behaviour | The status of CRUD actions performed by the user should be completed within 10 seconds. In case of delays, a pop-up should be shown to promote interactivity. | |
| 2.7 | Usability | Learnability | The scheduling process is easy to understand for end-users.  At least 90% of users can complete the process in 5 minutes on the first time | |
| 2.8 | The feature’s front-end must appear as a calendar to provide convenience for the user. | |
| 2.9 | The front-end must also show the scheduled appointment of the user with an overlay on the calendar’s date. | |
| 2.10 | Operability | The appointment scheduling process is clear enough to allow at least 95% of test users to schedule an appointment without any difficulties. | |
| 2.11 | The feature’s front-end must present all currently available CRUD actions, including make the appointment, reschedule appointment, cancel appointment, set reminder at a particular appointment, when the user clicks on a particular day. | |
| 2.12 | User error protection | The feature must display an error message when inappropriate CRUD actions are performed (schedule an appointment at a time which has been selected), or not allow the action to be performed at all (do not allow appointment scheduling on Saturday and Sunday). | |
| 2.13 | User interface aesthetics | The colour palettes, page structure, elements (icons, fonts, text size) must be compatible with the prototype design and is cross-device compatible. | |
| 2.14 | Security | Confidentiality | The feature only allows for appointment scheduling after authentication using a token. | |
| 2.15 | Scheduling information of the user must be shared to the appropriate personnel responsible for the patient. | |
| 2.16 | Integrity | The feature must implement security measures such as access control, data validation, or checksum to prevent scheduling data from being modified. | |
| 2.17 | 100% of data in the databases is reflected correctly on the user interface | |
| 2.18 | Accountability | The feature must implement audit logs and digital signatures to provide a trail of evidence. | |
| 2.19 | Reliability | Maturity | The feature must undergo SIT and UAT to operate reliably and consistently, and various scheduling scenarios must be tested to handle unexpected issues or failures. | |
| 2.20 | Availability | The feature should be accessible and responsive, downtime and unavailability must be significantly minimized to ensure 99.999% of availability. | |
| 2.21 | Fault Tolerance | The feature’s database must be replicated across at least 2 regions, scaling on demand must be implemented to handle any potential failures in the application server. | |
| **Sprint 3: Health Information Sharing** | | | | |
| 3.1 | Functionality Suitability | Functional Completeness | The appointment scheduling process meets all requirements specified by the stakeholders such as uploading health records and other documents to the system, sharing health records with healthcare employees | |
| 3.2 | The patients should be able to upload health documents, videos, and images. | |
| 3.3 | Allow the patients to customize access to their health records and limit access to specified doctors. | |
| 3.4 | Functional Correctness | The information sharing process can pass at least 90% of all UAT test cases | |
| 3.5 | All uploaded health records are stored in the CRM system database | |
| 3.6 | Restricted the allowed document to text files, videos and images. | |
| 3.7 | Maximum capacity allowed for uploaded documents is under 100 MB. | |
| 3.8 | Functional Appropriateness | A pop-up is displayed to ask for the patient's consent before sharing the documents. | |
| 3.9 | Performance Efficiency | Time Behaviour | The uploading status should be completed in under 5 minutes. | |
| 3.10 | If the uploading process spans beyond the limited time, an error is display prompting for a reupload from the patient. | |
| 3.11 | Usability | Learnability | The sharing process is easy to understand for end-users.  At least 90% of users can complete the process in 5 minutes on the first time | |
| 3.12 | Operability | The sharing process is clear enough to allow at least 95% of test users to share a document without any difficulties. | |
| 3.13 | Instructions on how to use this feature are displayed the first time the patient uses this feature, additional help can be requested via email. | |
| 3.14 | User error protection | The feature must display an error message when the patient uploads an unsupported format. | |
| 3.15 | User interface aesthetics | The colour palettes, page structure, elements (icons, fonts, text size) must be compatible with the prototype design and is cross-device compatible. | |
| 3.16 | Security | Confidentiality | The feature only allows for information sharing after authentication using a token | |
| 3.17 | Patient’s health records are protected in transit using appropriate protocols such as SSL/TLS, and are protected at rest using appropriate encryption algorithms such as AES-256. | |
| 3.18 | Patient’s consent to share records can be viewed, edited, or revoked by the patient only. | |
| 3.19 | Integrity | The feature must implement security measures such as access control, data validation, or checksum to prevent a patient's health record from being modified. | |
| 3.20 | Accountability | The feature must implement audit logs and digital signatures whenever the patient uploads health information. | |
| 3.21 | Reliability | Maturity | The feature must undergo SIT and UAT to operate reliably and consistently, and various test cases must be made to handle unexpected issues or failures. | |
| 3.22 | Availability | The feature should be accessible and responsive, downtime and unavailability must be significantly minimized to ensure 99.999% of availability. | |
| 3.23 | Fault Tolerance | The feature’s database must be replicated across at least 2 regions, scaling on demand must be implemented to handle any potential failures in the application server. | |
| **Sprint 4: Feedback Mechanism** | | | | |
| 4.1 | Functionality Suitability | Functional Completeness | The feedback form is developed with components such as textboxes, multiple-choice questions, and other relevant input fields as specified by the client. | |
| 4.2 | The feedback is recorded in the CRM system's database and can be filtered based on various criteria. | |
| 4.3 | Healthcare employees can view the full feedback and respond to it. | |
| 4.4 | Confirmation and response messages are sent to the patient. | |
| 4.5 | Functional Appropriateness | The form includes an option for anonymous feedback. | |
| 4.6 | Performance Efficiency | Time Behaviour | The system is designed to handle the feedback submission and retrieval process efficiently, ensuring a smooth user experience. | |
| 4.7 | Compatibility | Interoperability | The CRM system is compatible with the database and other necessary components to ensure seamless integration and functionality. | |
| 4.8 | Usability | Appropriateness recognisability | The user interface of the CRM system is modified based on the agreed color palette, themes, and structure. | |
| 4.9 | User interface aesthetics | User interface provides an intuitive and visually appealing experience for both patients and healthcare employees. | |
| 4.10 | Reliability | Maturity | The system is reliable in terms of recording feedback accurately, maintaining data integrity, and providing timely notifications to healthcare employees. | |
| 4.11 | Security | Confidentiality | Appropriate security measures are implemented to protect patient information and feedback. | |
| 4.12 | Patient data is encrypted, access controls are in place, and compliance with privacy regulations is ensured. | |
| 4.13 | Maintainability | Modifiability | The system is designed to be easily maintainable, allowing for future updates, enhancements, and bug fixes. | |
| 4.14 | Portability | Installability | The system is designed to be portable, allowing for deployment on different platforms or environments if required. | |
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| **Sprint 5: Data Analytics and Reporting** | | | | |
| 5.1 | Functionality Suitability | Functional Completeness | Mechanisms are developed to collect patient data, such as patient outcomes, satisfaction level, and popular appointment booking time. | |
| 5.2 | The collected data is stored adequately in the CRM system's database. | |
| 5.3 | Algorithms are implemented to identify trends and patterns from the collected data. | |
| 5.4 | Data visualization tools are integrated to create visualizations that illustrate business trends. | |
| 5.5 | The CRM system can generate a report in .pdf format summarizing metrics related to patient information and healthcare clinic operation. | |
| 5.6 | The patient feedback mechanism is integrated with the data analysis tool. | |
| 5.7 | Text mining techniques are applied to extract meaningful words from patient feedback. | |
| 5.8 | Performance Efficiency | Capacity | The CRM system is designed to handle increasing data volume, update data in real-time, and provide real-time data analysis. | |
| 5.9 | Resource Utilization | Dashboards are integrated to provide system administrators and healthcare staff with insights into business trends. | |
| 5.10 | Usability | Appropriateness recognisability | The CRM system integrates data visualization tools and dashboards to provide user-friendly and intuitive interfaces for system administrators and healthcare staff to access and understand the collected data. | |
| 5.11 | Reliability | Maturity | The mechanisms for collecting patient data, storing it in the CRM system's database, and analyzing it through algorithms and data processing pipelines are implemented correctly, ensuring the reliability of the system. | |
| 5.12 | Maintainability | Modifiability | The CRM system is designed to automatically scale to handle increasing data volume and includes a scheduled daily backup to prevent data loss. | |
| **Sprint 6: Security and Compliance – Data Migration – Further Support** | | | | |
| 6.1 | Functionality Suitability | Functional Completeness | The security and compliance aspects of the software meets all requirements specified by the stakeholders such as encryption in transit for uploading data, encryption at rest for data on database, asking for consent for uploading data to adhere to data privacy regulations and security regulations. | |
| 6.2 | Data migration is carried out for all legacy systems. | |
| 6.3 | Training materials, manuals, and guidelines are prepared for smooth transition. | |
| 6.4 | Maintenance plan and staff allocation to the new system are made to further support the initial operation of the new CRM system. | |
| 6.5 | Functional Correctness | Penetration testing and internal audit are done periodically to ensure regulation and security compliance. | |
| 6.7 | Migrated data is reconciled, validated to check for completeness. | |
| 6.8 | Usability | Learnability | Training materials regarding security procedures, new CRM operations are logically structured for all staff. | |
| 6.9 | Practical drills are performed annually with at least 75% satisfaction among all criteria. | |