

Meta

P1: Analyze the system description for ambiguities, incompleteness, and contradictions

- Unstructured
 - Validity: $1 - 0/6 = 1$
 - Completeness: Missing “Seamless”, “devices like”, 2 contractions. $1 - 4/6 = 0.333$
 - Consistency: “Security and Privacy” and “Scalability” not explicitly mentioned. $1 - 2/6 = 0.666$
- Structured
 - Validity: $1 - 0/6 = 1$
 - Completeness: Missing “popular”, 2 conditions. $1 - 3/6 = 0.5$
 - Consistency: “Data privacy and security” not explicitly mentioned. $1 - 1/6 = 0.833$

P2: Identify and categorize the functional and non-functional requirements of the system description

- Unstructured
 - Validity: $1 - 0 / (4 + 5) = 1$
 - Completeness: Missing interoperability. $1 - 1 / 6 = 0.833$
 - Consistency: Performance not explicitly mentioned. $1 - 1 / 10 = 0.9$
- Structured
 - Validity: “User friendliness” not FR. $1 - 1 / (7 + 5) = 0.916$
 - Completeness: $1 - 0 / 6 = 1$
 - Consistency: “Control devices remotely” not explicitly mentioned. $1 - 1 / 12 = 0.916$

P3: Create a use case model for the smart home system

- Unstructured
 - Validity: No system boundary (-0.1). Separation of primary and Secondary (supporting) actors. Additional UCs considered (extended FRs). Mismatch context for "Integrate". Incorrect actor for "Receive" (-0.1). $1-(1*0.1)/5-0.1 = 0.88$
 - Completeness: Missing integration. $1-1/3 = 0.666$
 - Consistency: "Receive Notification" not explicitly mentioned. $1-1/5 = 0.8$
- Structured
 - Validity: Clear system boundary. Separation of primary and supporting actor. Inconsistent actors in UC3 & UC4 (-0.1). $1-(2*0.1)/6 = 0.966$
 - Completeness: $1-0/3 = 1$
 - Consistency: "Monitor and Receive Notification" not explicitly mentioned. $1-1/5 = 0.8$

P4: Create use case specifications for every use case

- Unstructured
 - Validity: 5 UCs defined - Control Devices, Automate Devices, Monitor Home Status, Integrate with Voice Assistants, Receive Notifications. No actor, but Trigger (-0.1). No sequencing (-0.2), no alternative (-0.2). 1-
 $(5*0.1+5*0.2+5*0.2)/5 = 0.5$
 - Completeness: $1-0/3 = 1$
 - Consistency: $1-0/5 = 1$
- Structured
 - Validity: 5 UCs defined - Control Devices, Automate Devices, Integrate with Voice Assistant, Integrate with Smart Home Ecosystem, Monitor and Receive Notifications. $1-0/5 = 1$
 - Completeness: $1-0/3 = 1$
 - Consistency: $1-0/5 = 1$

P5: Identify domain concepts and their relationships from the created use case specifications.

- Unstructured
 - Validity: Missing multiplicities (-0.2) on 8 relationships. $1 - (8 * 0.2) / (5 + 8) = 0.876$
 - Completeness: Missing interface, voice assistant, ecosystem. $1 - 3/6 = 0.5$
 - Consistency: $1 - 0/5 = 1$
- Structured
 - Validity: $1 - 0/(7 + 7) = 1$
 - Completeness: Missing interface. $1 - 1/6 = 0.833$
 - Consistency: $1 - 0/7 = 1$

P6. Identify system operations from use case specifications of the smart home system.

- Unstructured
 - Validity: Clear operations with parameters. $1 - 0/10 = 1$
 - Completeness: Missing integration. $1 - 1/3 = 0.666$
 - Consistency: $1 - 0/10 = 1$
- Structured
 - Validity: Descriptive operations with no parameters (-0.1). $1 - (10 * 0.1)/10 = 0.9$
 - Completeness: $1 - 0/3 = 1$
 - Consistency: $1 - 0/10 = 1$

P7: Create design sequence diagrams for system operations of the smart home system.

- Unstructured

- Validity: 7 DSDs defined - TurnOnDevice, TurnOffDevice, CreateAutomationRule, GetDeviceState, GetHomeStatus, ProcessVoiceCommand, SendNotification. $1 - 0/7 = 1$
- Completeness: Missing integration (ProcessVoiceCommand not integration). $1 - 1/3 = 0.666$
- Consistency: Missing 3 operations. $1 - 3/(7+3) = 0.7$

- Structured

- Validity: The last two steps in all 10 SDs are invalid. (-0.2) $1 - (10 * 0.2)/10 = 0.8$
- Completeness: $1 - 0/3 = 1$
- Consistency: $1 - 0/10 = 1$

P8: Create design class diagrams based on the domain model and sequence diagrams of the smart home system.

- Unstructured
 - Validity: Missing data types (-0.1). Missing navigability (-0.1). 9 classes implemented - User, Device, AutomationRule, Sensor, Notification, SmartHomeSystem, DeviceRepository, AutomationRuleRepository, NotificationService. No visibility. $1 - (9 \times 0.1 + 7 \times 0.1) / (9 + 7) = 0.9$
 - Completeness: Missing Interface, VoiceAssistant, Ecosystem. $1 - 3/6 = 0.5$
 - Consistency: Missing 5 MCD classes - AuthenticationToken, DeviceState; DeviceControlService, AutomationService, NotificationService. Inconsistent operations with 6/7 DSD (mostly with SmartHomeSystem and Device) except SendNotification. DeviceRepository not used in SDs. $1 - (5 + 6 + 1) / (9 + 7 + 1) = 0.294$
- Structured
 - Validity: 16 classes defined. SystemActor, UserAuthenticator, DeviceManager, AutomationManager, VoiceAssistantManager, EcosystemManager, NotificationManager, SystemStatusManager, SystemSettingsManager, Device, Light, Thermostat, Lock, Rule, TemperatureRule, LightRule. Missing relationships (-0.3). No visibility. $(1 - 0/16) - 0.3 = 0.7$
 - Completeness: Missing Interface. $1 - 1/6 = 0.833$
 - Consistency: All 7 MCD classes defined (slight name mismatches). Operations in all 10 DSD properly defined in DCD - AuthenticateUser, AddDevice, ControlDevice, DefineAutomationRule, ExecuteAutomationRule, IntegrateVoiceAssistant, IntegrateSmartHomeEcosystem, SendNotification, GetSystemStatus, UpdateSystemSetting. UserManager in AuthenticateUser not defined (1). Several operations (3 operations) in DSD have mismatching name in DCD. $1 - 1 / (9 + 10 + 1) = 0.95$

P9. Develop a Java implementation for the system as specified in the class diagram and sequence diagrams.

- Unstructured
 - Validity: Missing operations other than setters and getters in 4 classes (-0.7). Driver implemented. $1 - 4/5 = 0.2$
 - Completeness: Missing voice assistant and ecosystem. $1 - 2/6 = 1$
 - Consistency: Missing 5 classes. Missing 4 DSDs. Only 1 DSD implemented. 2 DSDs are empty. $1 - (5 + 4 + 0.9 * 2) / (5 + 5 + 7) = 0.364$
- Structured
 - Validity: All operations other than setters and getters not defined in 10 classes (-0.7). Driver implemented. $1 - 7/11 = 0.363$
 - Completeness: $1 - 0/6 = 1$
 - Consistency: Name mismatch for 7 manager classes (-0.1). Missing 6 classes. All 10 DSDs considered, but all empty (-0.9). $1 - (0.7 + 6 + 0.9 * 10) / (11 + 6 + 10) = 0.418$

Prompt 10: Develop tests including unit tests, integration tests, and system tests for the implementation of the smart home system.

- Unstructured
 - Validity: No test code & no description (-0.9) for each. $1 - (0.9 \times 21) / 21 = 0.1$
 - Completeness: Missing 2 classes. $1 - 2 / (4 + 2 + 3) = 0.777$
 - Consistency: $1 - 0 / 4 = 1$
- Structured
 - Validity: No test code & no description (-0.9) for each. $1 - (0.9 \times 24) / 24 = 0.1$
 - Completeness: Missing User, Interface. $1 - 2 / (6 + 3) = 0.777$
 - Consistency: Missing 3 classes excluding the driver. $1 - 3 / (7 + 3) = 0.7$