

Student Use Case

Use Case	Description
UC-S1 Ask Academic Question	Student ask system about their courses information, schedule, deadlines and grades
UC-S2 System Notification	System notify student of deadline, updated schedule and information, and grade releases
UC-S3 Personalized Dashboard	Student learns the upcoming events and their performance from the customized dashboard
UC-S4 User Preferences	Students change notification and language preference to preferable settings.
UC-S5 Secure Authentication	The system redirect student user to the school SSO portal after clicking log in button
UC-S6 Personalized Calendar	The student exports calendar events to their personal calendars
UC-S7 Offline Cache	The system saves recent response to offline cache and retrieve the context when the application is offline
UC-S8 Accessibility Feature	Students use voice assistants or the chat interface to access the system.

Lecturers Use Case

Use Case	Description
UC-L1 Course Material Management	Lecturer publishes new course material or update existing ones
UC-L2 Announcement	Lecturer post announcement using the assistant's conversation commands
UC-L3 Class Analytics	Lecturer views the grades, attendance and engagement summary of their courses
UC-L4 Automated Reminder	Lecturer create automated reminder for section schedule, assignments and exam
UC-L5 Access Right Management	Lecturer control the accessibility of assignments and exam
UC-L6 Aggregated Statistics	Lecturer learns average GPA. grade distribution,

	attendance and assignment submission rate from the assistant's responses
UC-L7 Anomalies Detection	Lecturer receives notification from system's anomalies detection of attendance drop, average grade drop and repetitive question patterns from different student users

Administration Use Case:

Use Case	Description
UC-A1 Institutional Integration Management	The administrative imports external system
UC-A2 Global Policies Definition	The administrative set global retention, privacy and response logging rules
UC-A3 System Broadcast	The administrative broadcasts announcement via the assistant.
UC-A4 System Monitorization	The administrative monitors the system with the generated analytic report
UC-A6 Scalability Rules Configuration	The administrative manage the load balance and auto-scaling thresholds

System Maintainer Use Case:

Use Case	Description
UC-SM1 System Update	System maintainer uses continuous deployment pipelines to deploy updates
UC-SM2 Monitoring Dashboard	System maintainer view the health, latency errors of the system through dashboard
UC-SM3 AI Models Configuration	System maintainer updates the AI model version, API keys and configure the parameters
UC-SM4 Backup and Restoration	System maintainer restores user and configuration data lost
UC-SM5 Manage Role-Based Access	System maintainer defines roles and permissions for maintenance operations

Data Source Systems Use Case:

Use Case	Description
UC-D1 Synchronize Data	The data source system sends changes of course, registration and calendar data to the AIDAP
UC-D2 API access	The system query the data source systems using REST or GraphQL interface
UC-D3 Failure Recovery Handling	The data source retry data sync automatically when there is error in network connection

Quality Attributes:

ID	Quality Attribute	Scenerio	Associated Use Case
QA-1	Performance	The system should quickly allow students to access or upload course materials, ensuring responses or uploads happen within a few seconds.	UC-S1, UC-L1
QA-2	Availability	The assistant must be available 24/7 across devices and time zones, allowing students to study or query data anytime.	UC-S1, UC-S2, UC-S3
QA-3	Security	The system must meet institutional policies on privacy, data storage, and authentication using secure SSO.	UC-S5, UC-A2
QA-4	Security	Only the authenticated student should access their own courses and data no cross-access or leaks between	UC-S5, UC-L5
QA-5	Scalability / Modifiability	The platform must handle seasonal spikes in traffic by scaling cloud resources automatically.	UC-A6, UC-SM1
QA -6	Performance	The AI model should understand diverse voices and accents and return accurate, natural-language answers within 2 seconds.	UC-S1, UC-S8
QA -7	Availability	When online, the AI assistant should provide full functionality anywhere with internet access, ensuring global reach.	UC-S8
QA-8	Portability	The system must be usable on multiple platforms (web, mobile, tablet).	UC-S8
QA-9	Usability	The UI should be simple and intuitive, allowing students to easily navigate their courses and information.	UC-S3, UC-S4

QA-10	Usability	The AI model should be easy to find, activate, and interact with, even for first-time users.	UC-S8, UC-S1
QA-11	Reliability	The system should accurately follow commands and provide consistent, correct responses to all valid voice or text inputs.	UC-S1, UC-L2, UC-L6
QA-12	Maintainability	Dashboards, analytics, and monitoring systems should be easy to update or repair without service interruption.	UC-SM1, UC-SM2
QA-13	Scalability	The architecture should handle long-term growth in users and data without degradation in performance or cost efficiency.	UC-A6, UC-SM1
QA-14	Maintainability	The system should maintain up-to-date data synchronization with external university systems such as the LMS, registration, and calendar. It must detect and recover gracefully from synchronization failures to keep information accurate and consistent.	UC-D1, UC-D2, UC-D3
QA-15	Maintainability	The platform should support continuous integration and deployment pipelines, allowing updates, patches, and feature releases to occur with zero downtime while maintaining stable performance and data integrity.	UC-SM1, UC-SM2
QA-16	Reliability	The assistant should accurately interpret and respond to data retrieved from connected systems using NLP models, ensuring that the information is correct, consistent, and contextually appropriate for the user.	UC-S1, UC-L6, UC-D2
QA-17	Reliability	The assistant should provide personalized study suggestion to student based on conversation history	UC-S1
QA-18	Availability	The system automatically recover important data when the system failed	UC-S1, UC-A4, UC-SM1
QA-19	Performance	The system stores performance logging	UC-A4, UC-SM2
QA-20	Interoperability	The system should have smooth communication with any external data sources imported	UC-A1, UC-D2

Constraint:

ID	Constraint
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CON-1	The system must depend on an active internet connection for AI models and services to function. Offline operation is limited to cached data only
CON-2	The system's ability to understand a user's voice may be affected by background noise or poor microphone quality.
CON-3	The amount of data the system can extract depends on the permissions and API limits of connected external data sources.
CON-4	The platform must be deployable on cloud environments and support interoperability with multiple platforms and devices.
CON-5	All integrations must use standardized APIs such as REST or GraphQL for data communication.
CON-6	The system must utilize a scalable database capable of expanding yearly as the number of students and stored data increases.
CON-7	The system must synchronize data with connected university systems quickly and efficiently so that users always receive up-to-date information. Delays in syncing should not exceed a few seconds after changes occur in external sources.
CON-8	When users send queries or requests, the system should generate and display a relevant response within 2 seconds under normal load, ensuring a smooth conversational experience.
CON-9	All institutional and user data must be securely stored and only accessible to authorized users. Access to data and model results should also be optimized to minimize waiting time and improve user experience.

Architectural Concerns

ID	Concern
CRN-1	Passwords and personal information could be leaked or lost due to system or data breaches.
CRN-2	Receiving spam or inappropriate system-generated notifications or emails in a

	school environment.
CRN-3	AI model accidentally leaking one user's data (e.g., grades or messages) to another student.
CRN-4	Submitted assignments or coursework could be exposed or copied by unauthorized users.
CRN-5	System downtime during important academic deadlines may prevent timely submissions.
CRN-6	Inability to access or grade assignments if system features fail or data is unavailable.
CRN-7	Ensuring compliance with institutional privacy, data retention, and accessibility policies.
CRN-8	Maintaining continuous uptime and ensuring deployment or update failures don't cause outages.
CRN-9	Ensuring data synchronization and API security between AIDAP and external university systems.
CRN-10	The assistant might return inaccurate or biased responses for subjective queries due to the limited size and bias of the training data.

Business Case:

Ontario Tech University also plans to make access to academic and administrative information in Ontario Tech University easier by creating a single AI-driven platform that serves all stakeholders in the institution, such as students, lecturers, and administrators. The institution is now having various standalone systems, which include the Learning Management System (LMS), course registration, email, and calendar services, and which are independent of one another. As a result of this fragmentation, there is duplication of work, failure to meet deadlines and inefficiency in inter-departmental and end user communication.

The university intends to use the AI-Powered Digital Assistant Platform (AIDAP) to overcome these problems. The system will include a conversational interface, whereby the stakeholders can get academic schedules, deadlines, announcements and analytics by querying the system using natural language. AIDAP will serve as a hub of institutional knowledge by incorporating institutional data sources of existing institutional data (registration databases, LMS server, mail/calendering systems). The platform is also imagined to provide both text and voice interaction, where a student will be able to pose questions like: When is my next exam? or: Show me my grades in CSCI 2050. It

will also allow lecturers to post course materials and announcements using voice or chat commands and administrators to track usage and place campus wide announcements. Every interaction with users will become personal based on AI models that learn on the basis of historical data (R2, RS5) without harming privacy and security (R8, RA5).

The business goal of the university is to minimize administrative overheads and enhance access to information. At present, the questions like the date of the exams or the change of the rooms have to be searched manually or by email in several systems. Automating such processes by intelligent data retrieval and context-sensitive responses in AIDAP will result in minimization of response time and human effort. The system will also be used as the basis of future AI programs like predictive performance analytics on students and adaptive academic advice. The first instance is scheduled to be a cloud-native, scalable, and at minimum, 5 000 concurrent users (RA7) with 99.5 uptime (RS11). It will incorporate university authentication using single sign-on (SSO) (RS7) and allow multi-language communication (RS4) to be accessible and inclusive. The priority areas to be considered by the organization are:

- The security of management of data in line with institutional policies (R8, RA5).
- Fast response time (average of less than 2 seconds load RS10).
- Cross platform access (web, mobile, and voice assistants RS9).
- 24/7 operation and zero-downtime deployment (RM1).

The university believes that the implementation of AIDAP will have a great impact on the efficiency of operations, the student experience, and it will also become a leader in terms of using AI technologies in higher education. When in place, the system will be an intelligent digital infrastructure of smart communication and decision support throughout the campus.