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# TEAL2.0 SCOPE AND USE CASES



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This document clarifies the scope, functionality, logic, components, features and use cases of TEAL2.O. The intended audience is the key stakeholders – funders and potential user institutions.



## SCOPE OF THE SOLUTION

TEAL2.O should be developed as a comprehensive learning environment allowing for the design and delivery of courses and other forms of training in the area of Science and Technology. The TEAL2.O environment will have features similar to Learning Managements Systems such as Moodle or Canvas, and to online course platforms such as edX or Coursera. However, its capabilities will extend beyond the functionalities available in these systems. One of the drawbacks of those systems is the lack of modularity which prevents customizability to local settings in terms of programs, content development and delivery.

In contrast, TEAL2.O should enable customizability and collaborative development at all stages of the education design and delivery process – at the stage of developing programs, at the stage of developing courses and content, and during the learning process. This will make learning more relevant to institutional requirements and individual learners' needs and capabilities. It will enable effective feedback collection and assessment of learning efficiency. All of these features will be wrapped in an inbuilt evaluation and quality assurance process that will rank programmes, courses, content, teachers, and students based on peer reviews and interaction with the content.

The solution should be designed as a cloud-based, open-access collaborative teaching & learning platform. It should be open for use by any institution of higher learning.

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The TEAL2.O environment should offer:

- ☐ Access to MOOCs and other digital learning content developed around the globe
- ☐ Modularity and full customizability, allowing institutions and faculty to design programs and develop teaching content that suit local needs and constraints, including those of underrepresented learners
- ☐ Autonomous assessment and quality assurance
- ☐ Integration of open source hardware and software into the learning process to maximize learners' exposure to technology and provide access to virtual labs and experimentation
- ☐ Enhanced opportunities for collaborative learning and teaching, allowing institutions to pool available expertise and support quality
- ☐ Learner-centered education, flexible learning pathways and co-creation on the part of learners.

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# BASIC USE CASES

The basic use cases (scenarios) are as follows:

## ☐ **At the offering institution (running an instance)**

### *Learner (Student)*

- Profile (complete, update, etc.)
- Programme (search, explore, enrol, drop, etc.)
- Course (search, explore, add, drop, etc.)
- Classroom (search, explore, join, leave, interact, etc.)
- Content (search, explore, add, drop, assess, etc.)
- Feedback (give, view, etc.)

### *Classroom Manager (Teacher)*

- Profile (complete, update, etc.)
- Courses (express interest, prepare the classroom, etc.)
- Classroom (create, suggest/populate content, set timeline, offer, stop, etc.)
- Content (search, explore, add, remove, etc.)
- Student (mentor, monitor, interact, assess, etc.)
- Interactive resources such as forums (interact, etc.)
- Assessment (schedule, grade, etc.)
- Feedback and Report (prepare, collect, summarize, act, etc.)

### *Programme Creator / Manager*

- Profile (complete, update, etc.)
- Users (create, add, manage, etc.)
- Program (create, update, plan, add/manage users, etc.)
- Courses (create, search, update, etc.)
- Program Objectives/Intended Learning Outcomes (create, update, map, etc.)

## ☐ **Central System**

### *Content Creator*

- Profile (complete, update, etc.)
- Content (create, update, search, explore, add resources & assessments, etc.)
- Intended Learning Outcomes (map to content, map to assessment, etc.)

### System (Software)

- Program (rank, version control, track credits, etc.)
- Course (rank, version control, enable/track mappings, track credits, etc.)
- Classroom (rank, version control, activity log, etc.)
- Content (rank, version control, etc.)
- Assessments (track mappings, track and map marks to grades, etc.)

### Systems Admin (Super Admin)

- Manage the whole system.

See also Annex I: User Stories.

### ☐ QA and Ranking Engine Requirements

The functionality of the QA Engine is to rank courses and course content based on:

- their usage
- student performance based on actual level of attainment of Learning Outcomes
- student feedback in the form of ranking

Thus, the QA engine will have to be able to store student engagement and the level of attainment of Learning Outcomes (LOs), and then use a suitable strategy to rank the courses and the course content.

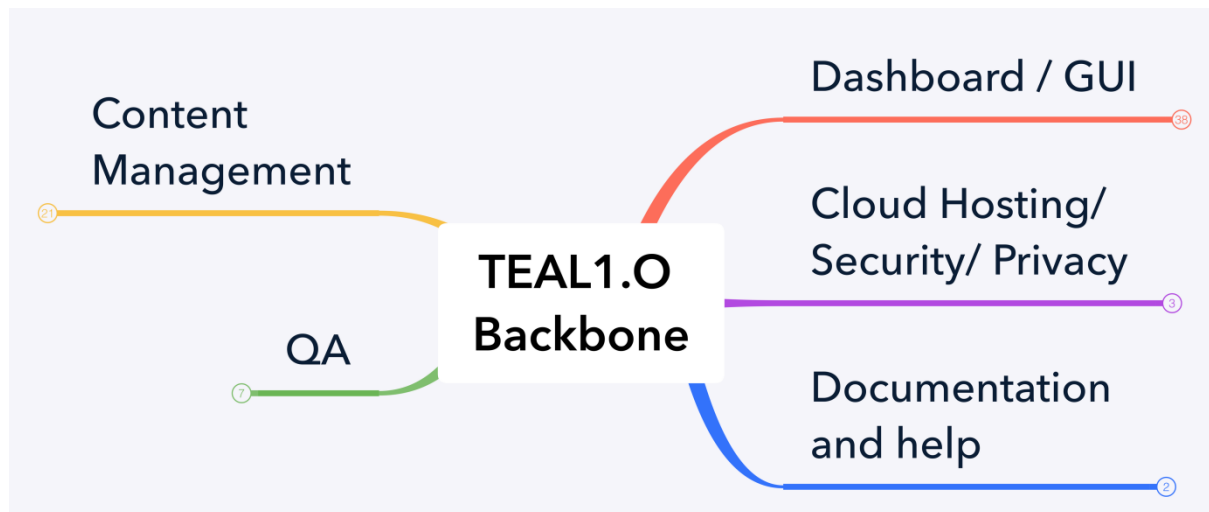
The QA and Ranking Engine thus needs to perform the following functionalities:

- Create and manage actions that the system offers
- Monitor and log each action
- Rank courses and contents based on usage, students' performance and feedback (anonymous)
- Handle version control
- Track mappings of course LOs to course content and assessments
- Track mappings of student attainment of course LOs through performance (assessments)
- Evaluate the effectiveness of classroom design and delivery based on user statistics and LO attainment
- Store, analyse and evaluate feedback provided by students
- Track credit load of Program with contents followed by a student.

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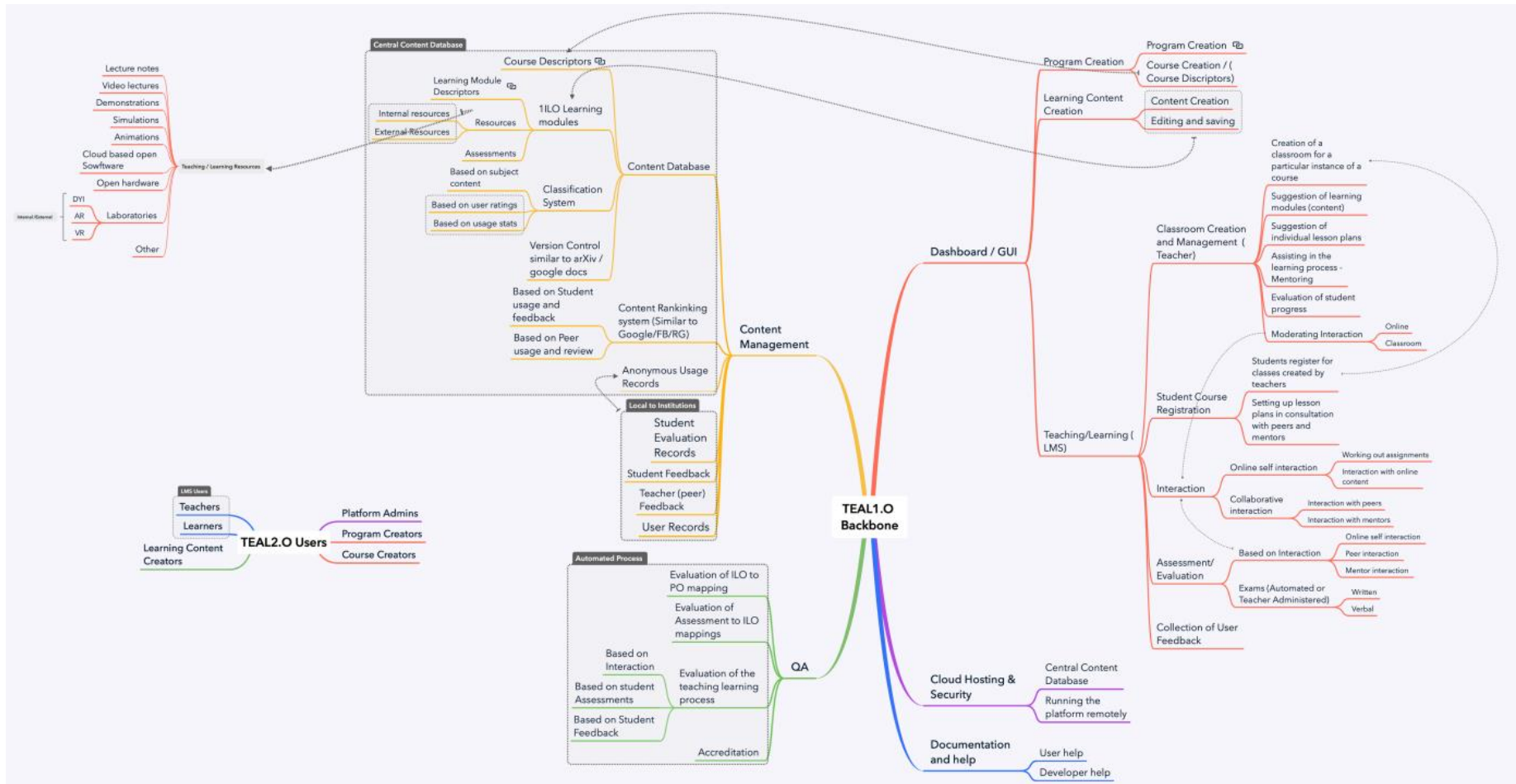
The development of TEAL2.O will start by developing the backbone structure that we have named TEAL1.O. This backbone has five main components, each of which has individual business value, i.e. serves a separate delineated function while contributing to overall system performance.

TEAL1.O has the following component structure:



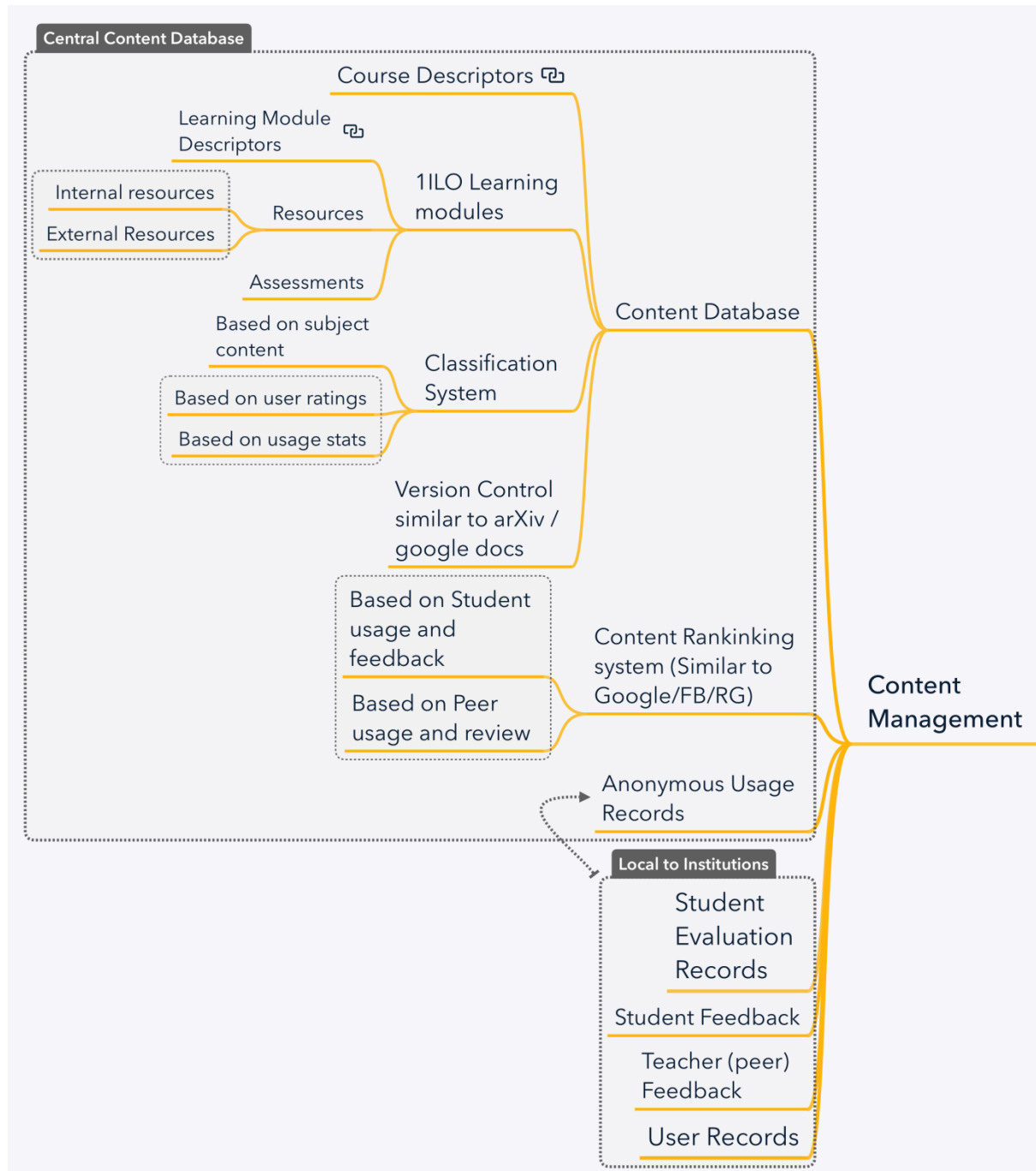
Within the components, there are numerous modules that cannot function as stand-alone systems but nevertheless allow for decomposition of the development work.

A more detailed graphical representation of the TEAL1.O backbone is presented in the following model:

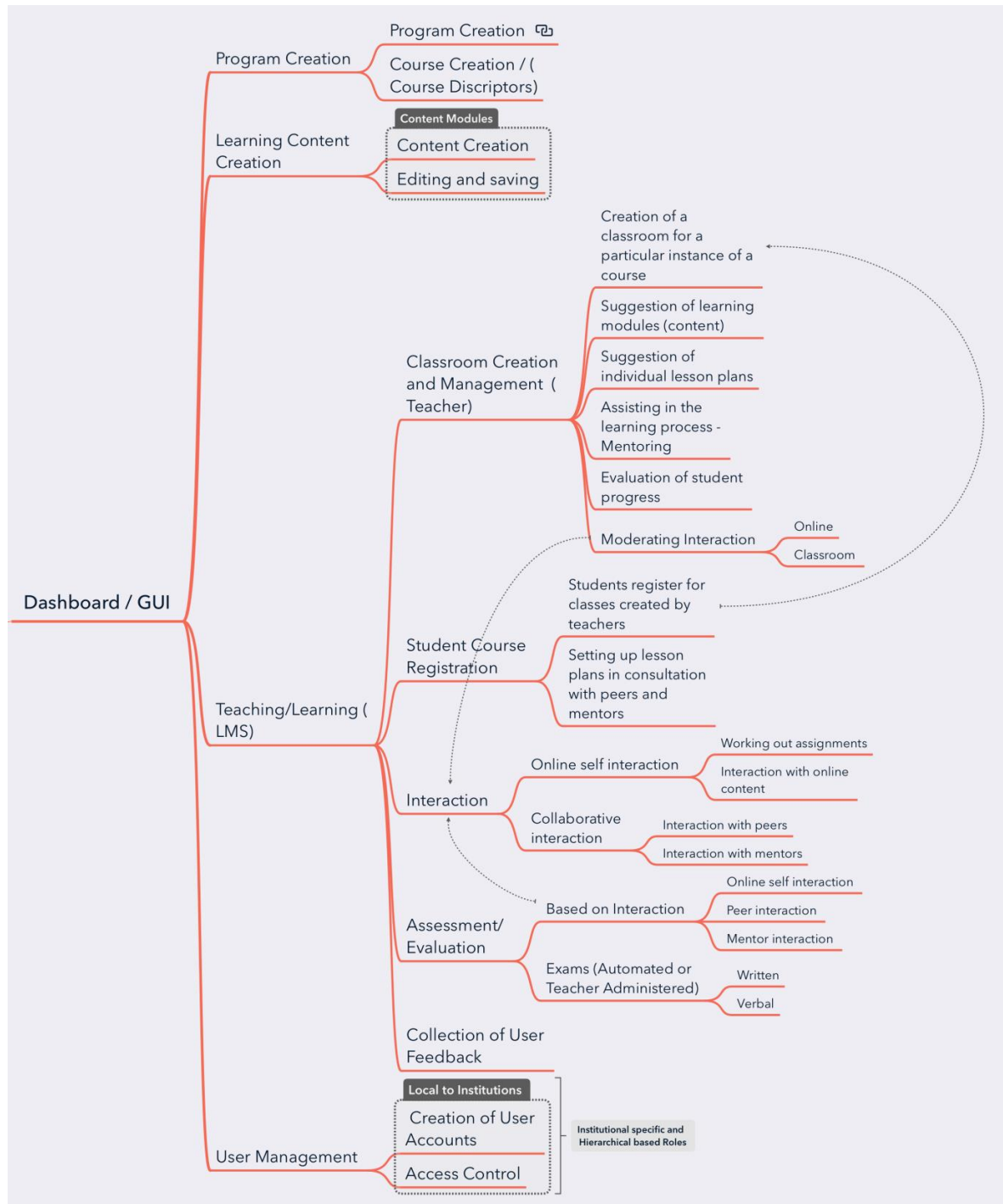


Below, we present a more detailed view of each component:

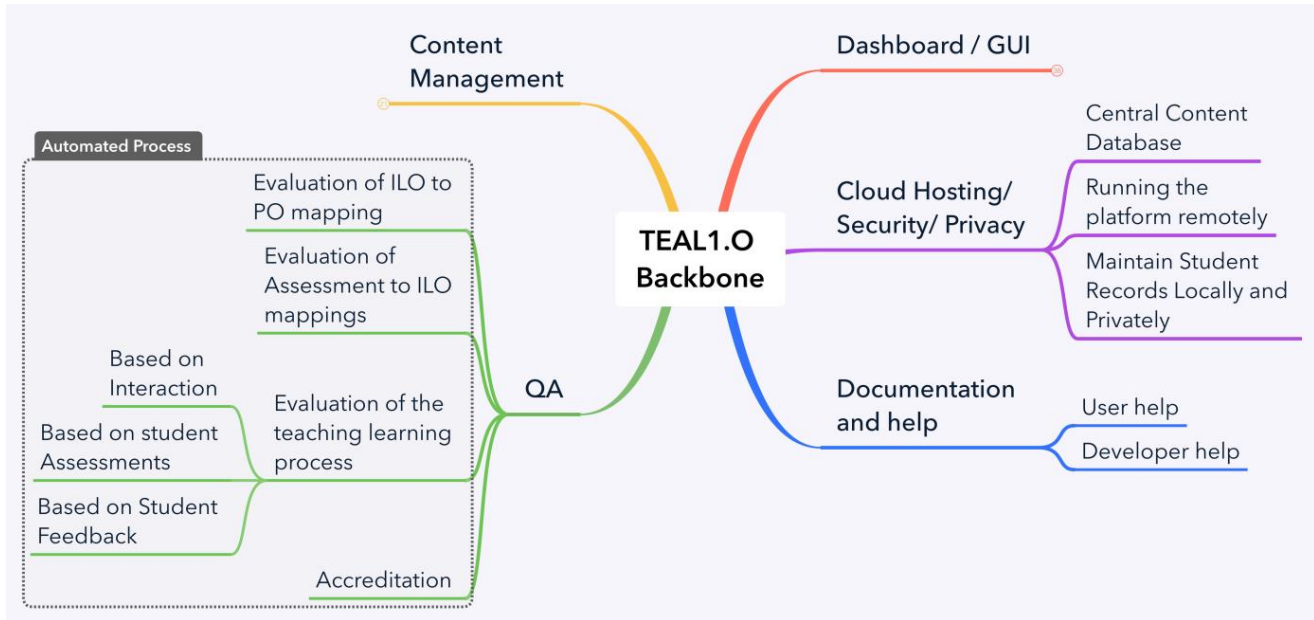
## Content Management System



## GUI/Dashboard

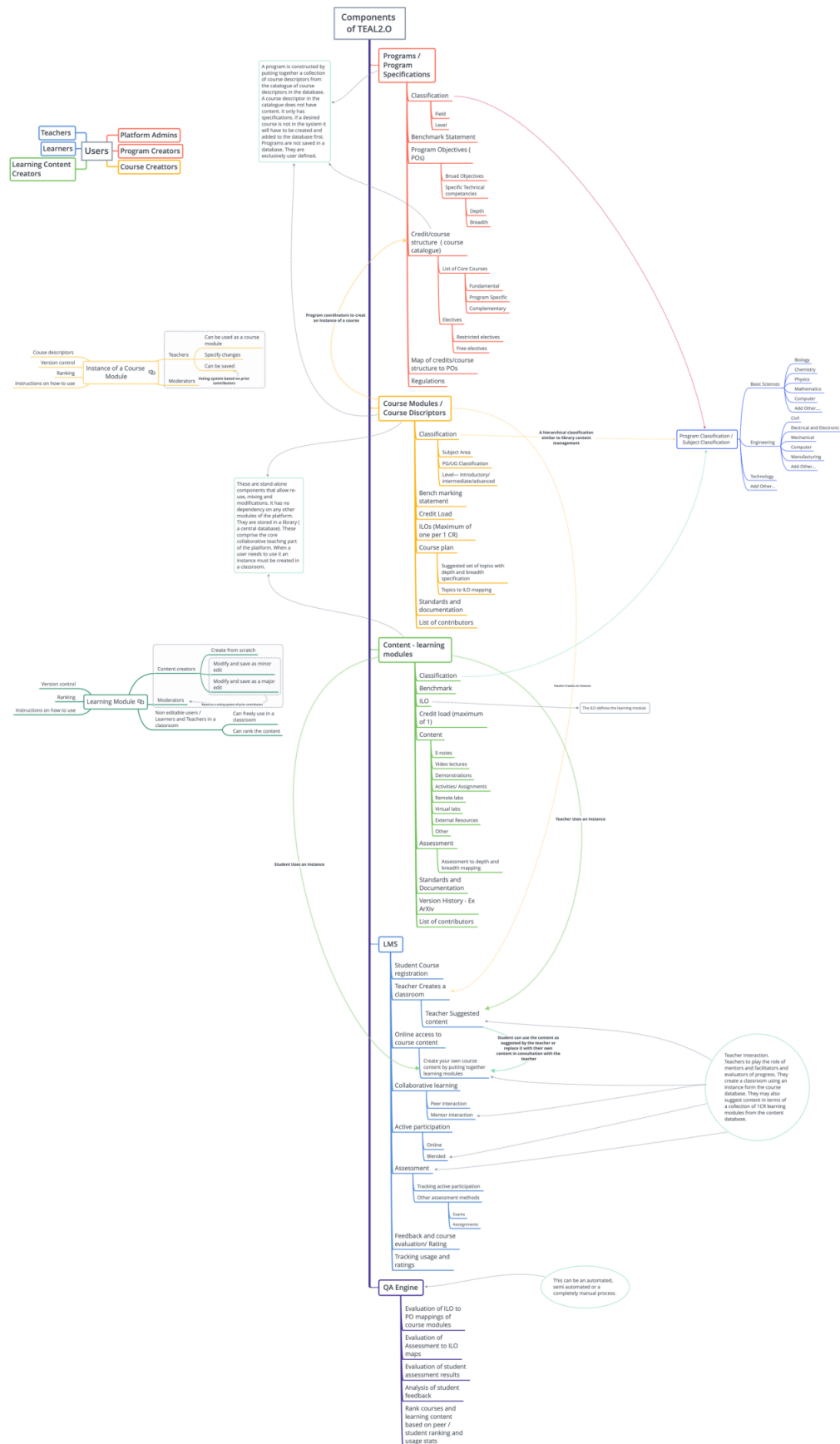


## QA and Ranking Engine/ Hosting/ Documentation



The graph below presents the overall system:





In order to meet the user requirements, the following **specific features** will be included in the TEAL2.O platform:

- User account management
- Access management
- Personalized dashboard
- Collaborative tools and activities
- All-in-one calendar
- Convenient file management
- Text editor
- Notifications & Task progress
- Customizable site design and layout
- Multilingual capability
- Open standards
- High interoperability
- Regular security updates
- Detailed reporting and logs
- Embedding external resources
- Multimedia integration
- Marking workflow
- Peer and self-assessment
- Integrated badges
- Audience management
- Program creation
- Course creation
- Learning content creation
- Course description classification, management and version control
- Learning content classification, management and version control
- Search for courses and suggest courses
- Search for content and suggest content

- LO to PO mapping
- Content to LO mapping
- Assessments to LO mapping
- Classroom creation with customizable content and customizable lesson planning
- Classroom Plans, schedule
- Customized enrolment (Competence-based, learning-plan based)
- Audience based dashboards
- Custom report builder
- Graphical reporting
- Ranking courses, learning content based on user ranking and actual student attainment
- Interface to incorporate software-based third party open learning resources
- Interface to incorporate hardware-based third party open learning resources
- Interface to incorporate other third party open learning resources
- Hierarchical access management
- Custom certificates
- Customized notifications
- Team management
- Customizable learning catalogue
- Record of Prior Learning
- QA Engine
  - Student assessment performance monitoring and tracking of LO attainment
  - Monitoring student attainment of POs
  - Monitoring student interaction with content
  - Monitoring student interaction with teacher
  - Monitoring student interaction with peers
  - Other QA functionalities.

Type of User	User Story
<b>Account Holder</b>	As an unregistered student user, I want to be able to register in the system using my Google, Microsoft, or Facebook account, so that I don't have to manage another account
	As Unregistered teacher, I can request user account from the Program creator/ super admin
	As Unregistered teacher, I need to fill teacher application, so that I can become a verified teacher in the system
	As Unregistered Program creator, I can request user account from the super admin, so that I can manage my institution
	As a registered user I want to be able to log in and out of the system using my Google, Microsoft, Facebook, or Moodle account
	As a forgetful user, I can view a password hint, so that I can recall my password
	As a forgetful user, I can request to reset the password, so that I can create a new password
	As an Program creator, I can create teacher/ instructor accounts, so that new teachers/ instructors can be added to the system under the institution
	As a super admin, I can create user accounts, so that new users can be added to the system
	As a super admin, I can control user accounts, so that new users can be added to the system
	As a super admin, I can review account requests, so that I can accept or decline them
	As a user, I want to be able to access the system through my web browser
	As a user, I want to be able to access frequently asked questions and additional documentation
	As a user, I want to be able to store user configuration settings such as language settings, theme, etc.
<b>Student</b>	As a student, I want to find programs, so that I can explore program outcomes, structure, future careers, and areas of studying
	As a student, I want to read program reviews and ranking from others, so that I can decide which course will best suit me
	As a student, I want to register for a program
	As a student, I want to leave a program, so that I can get rid of boring stuff
	As a student, I want to select courses that are prescribed for my program, so that I can get to know about the course structure, outcomes, and workload
	As a student, I want to register for a course, so that I can learn and complete my program
	As a student, I want to drop a course
	As a student, I want to find classes that most interest me
	As a student, I want to enrol for a class that I am able to take online so that I would not need to travel
	As a student, I want to leave a class that I selected and select another class instead
	As a student, I want to find contents to add to the class, so that I can find the most suitable and popular contents for my course
	As a student, I want to read content reviews and ranking from others, so that I can decide which content will best suit me
	As a student, I want to add content
	As a student, I want to drop content
	As a student, I want to create my own lesson plan in consultation with the teacher
	As a student, I want to see which programs I have enrolled
	As a student, I want to go to registered programs, so that I can see enrolled courses
	As a student, I want to see which courses I have enrolled in a program

	As a student, I want to see which classes I have enrolled in
	As a student, I want to see which contents I have enrolled under a class, along with who teaches, number of credits and the description
	As a student, I want to access contents that I have chosen for a class so that I can study there
	As a student, I want to see announcements/news, so that I am aware of what is happening
	As a student, I want to find other peers who have enrolled in the class, so that I can interact with them
	As a student, I want to interact with peer and teachers in the class
	As a student, I want to use a forum in the class, so that I can post problems, share my knowledge with other peers and share my suggestion
	As a student, I want to access all types of resources provided in the content
	As a student, I want to get notified of upcoming class activities through email, so that I do not miss any of those
	As a student, I want to be able to complete all the assessments
	As a student, I want to be able to view the feedback, and assessments from the teacher
	As a student, I want to give feedback on the content, class, and the system
	As a student, I want to contact the admin using a help forum, so that I can solve problems occurring in the system
	As a student, I want to search information in system using search bar, so that I can get what I want easily
	As a student, I want to see the calendar, so that I am aware of future events
	As a student, I want to manage notification, so that I can arrange important reminders
	As a student, I want to manage my profile
<b>Teacher (leading a class)</b>	As a teacher, I want to find programs, so that I can explore programs which I can contribute to
	As a teacher, I want to search contents, so that I can see what others offer
	As a teacher, I want to create a classroom, so that I can teach students
	As a teacher, I want to create a timeline for a classroom
	As a teacher, I want to terminate a classroom
	As a teacher, I want to accept/ reject students who enrol for the classroom
	As a teacher, I want to suggest contents from the content database to be used in the classroom
	As a teacher, I can moderate content selection by students
	As a teacher, I want to enable/ disable offering of classes, so that I can get students enrolled or prevent them from enrolling
	As a teacher, I want to help students to create their own lesson plan
	As a teacher, I want to make announcements, so that I can inform things to students
	As a teacher, I want to create discussion forums, so that I can discuss things with students online
	As a teacher, I want to reply to forums created by students, so that I can answer their questions and address their problems
	As a teacher, I can monitor student progress
	As a teacher, I can view the forum post count of each student, so that I can identify the activity level of this student in the forum
	As a teacher, I can view user statistics
	As a teacher, I want to see all students' submissions/ performance
	As a teacher, I want to see logged information about submissions
	As a teacher, I want to schedule all the assessments according to ILOs & lesson plan
	As a teacher, I want to grade all the assessments that require manual grading

	As a teacher, I want to be able to give students feedback on their progress
	As a teacher, I want to contact the admin using a help form/ chat/ email
	As a teacher, I want to interact with students
	As a teacher, I want to obtain feedback from students
	As a teacher, I want to see other teachers' profiles
	As a teacher, I want to see student profiles
	as a teacher, I want to get student login records, so that I can monitor their participation
	As a teacher, I want to search information in the system using a search bar, so that I can get what I want easily
	As a teacher, I want to add reminders to the calendar
	As a teacher, I want to integrate third party calendars to the system
	As a teacher, I want to manage notification, so that I can arrange important reminders
	As a teacher, I want to generate student reports, so that I can easily evaluate students
	As a teacher, I want to limit the number of students enrolled in a class
	As a teacher, I want to manage my profile
<b>Content creator</b>	As a content creator, I want to create contents with its description, outcomes (ILOs), credits, and all information necessary for classification
	As a content creator, I want to search, list and access existing content modules
	As a content creator, I want to update existing contents of a content module, so that I can create a different content module (the system has to take care of version control automatically)
	As a content creator, I want to add resources such as e-notes, videos, demos, virtual labs, etc. to the content module
	As a content creator, I want to be able to create assessments such as quizzes/ exams/ assignments
<b>System</b>	As a system, I want to monitor all activities and log data
	As a system, I want to rank programs/ courses/ contents based on usage, student performance and feedback, so that I can sort popular and effective ones
	As a system, I want to handle version control of the resources, so that I can provide different versions based on user edits
	As a system, I want to map course ILOs to classroom content ILOs, so that students have flexibility to select appropriate content
	As a system, I want to track ILOs coverage by a student through assessments such as assignments, quizzes etc. and therefore, the overall PO coverage
	As a system, I want to analyze and evaluate feedback, so that I can improve system performance
	As a system, I want to track credit load for programs and courses, so that I can restrict students within a range
<b>Program Creator</b>	As a creator, I want to manage users under my institution
	As a creator, I want to manage institution notifications
	As a creator, I want to manage teachers and students for a program
	As a program creator, I want to create programs with classification, benchmark, program outcomes, credit, program structure, map credit/ course structure to program outcomes
	As a program creator, I want to search, list and access existing programs
	As a program creator, I want to update existing program, so that I can create a different program
	As a program creator, I want to create courses with classification, benchmarking, credit load, ILOs, course plan, standards, and documentations
	As a program creator, I want to search, list and access existing courses
	As a program creator, I want to update existing courses, so that I can create a different course

	As a program creator, want to plan program delivery such as scheduling, assigning teachers to courses, etc.
<b>Super Admin</b>	As a super admin, I want to do whatever system can do

Key User Type	Tasks
Teacher	Create e-notes
	Video lectures
	Demonstrations
	Activity/assignments/ exams/ quizzes
	Labs
	Resources
	Feedback forums
	Track student involvement
	Create classroom
	Add contents to the classroom
	Add students to the classroom
	Create a course along with ILOs
	Create content along with defined ILOs
	Add chat to contents/courses with scheduling
	See program, courses, contents, teachers, student ranking
Student	Register in the system
	Register for a program
	Select courses
	Select contents (based on interaction with a teacher if desired)
	Download resources in a content
	Face for exams/quizzes
Teacher	Complete assignments/ activities
	Collaborate with other peers
	Use forums to ask/ answer questions
	Use feedback forums to evaluate course, content, teachers, programs, institutions
	Use chats to interact with peers/ teachers (private)
	Rank courses, contents, classrooms, institutions
	Log in using Google, Microsoft, Facebook account
System	Evaluate programs, courses, contents, teachers, students
	Rank programs, courses, contents, teachers
	Store user records
	Exercise version control of resources
	Map program ILOs to courses / contents / classrooms
	Save new program, course, content after changes of ILOs
	Track ILOs coverage by assignments, exams, quizzes, labs for a course
	Analyze and evaluate feedback

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## Usability requirements and considerations

The main concerns when developing the TEAL2.O product requirements were security, performance and usability. Maximizing quality in this regard was of paramount concern and it dictated all technological choices.

User feedback was taken into account. User concerns mostly indicated general apprehension towards new and complex systems that would entail a steep learning curve. The situation is compounded by the Covid-19 pandemic which pushed all educational activities into online mode. The TEAL2.O platform was initially envisaged as a platform *supporting* Science and Technology education and thus mostly targeted at technology-savvy and enthusiastic users. In the new situation, the platform is viewed by users and target institutions as a form of *replacement* of classroom learning. As a result, the size and diversity of the user community has grown exponentially. This community now encompasses also users that are less comfortable with habit-breaking tech solutions. It could be expected that within 1-2 years the situation would normalize but there are strong indicators that there will be no full return to the pre-Covid status quo. Rather, online-based course design and delivery will remain a strong alternative to traditional modes of education and will be increasingly integrated into university development plans, in effect creating a truly *blended* course design and delivery process. For the TEAL2.O to be able to serve its new purpose, we need to address the main user concerns – namely an aversion to radically new and complex learning environments – and to avoid creating a backbone, and consequently a learning environment, that requires a long investment of time and effort on the part of both lecturers and students.

This basic requirement has prompted the team to look for ways to develop the backbone in full conformity with, and within the broader technological framework, of existing Learning Management Systems (LMS) that are widely used and already accepted by users. This would preserve the habitual user interface that users are already comfortable with, while adding new functionalities and features. The approach would also facilitate the process of involving users in co-creating and further developing the TEAL2.O network through the development of new functionalities and content. The chances of co-creation increase exponentially as familiarity with the framework increases.

At the same time, TEAL2.O is more than a traditional LMS. In addition to creating content, online classrooms and courses, it will also facilitate active collaborative teaching and learning – a feature that is novel compared to any of the existing LMSs. It will incorporate outcome-based education by evaluating progress by measuring the attainment of the outcomes, as well as rank content and processes based on actual student engagement and student attainment of the expected outcomes. There exists no platform that accommodates all of these requirements. TEAL2.O will develop such features. However, the basic elements of the backbone should be grounded in existing LMS frameworks.

The currently available open LMS development platforms that users have grown accustomed to and largely comfortable with are:

- [Moodle](#)
- [Totara](#)
- [Canvas](#)

- [Open EdeX](#)

Our survey of the capabilities of the above open-source platforms indicated that Totara is the one that contains the highest number of required features of TEAL2.O. Of course, major features are missing in it, including mapping activities/assessments/content to LOs, collaborative learning content creation, enabling collaborative learning and customization of learning content, ranking of learning content based on attainment of LOs, and quality assurance. Yet it looked like a good starting point. Initially, therefore, we considered modelling the TEAL2.O platform on Totara. Unfortunately, further investigation has shown that even though Totara is Moodle-based and open-source, the source code is only available to Totara partners or direct subscribers. Integration with a source that is not freely accessible to potential user institutions would derail the usability and accessibility of the TEAL2.O platform. Since Totara is itself based on Moodle, the next best available option for us was to base TEAL2.O on – and integrate it with – Moodle.

Moodle is a free and open-source learning management system written in PHP. It is the world's most popular LMS, with over 160 million current users and over 100 thousand active sites. With an equally large variety of use-cases across those sites, the Moodle LMS is the go-to for anybody looking to run a general/ traditional e-Learning program. Moodle delivers a powerful set of learner-centric tools and collaborative learning environments that empower both teaching and learning. Because of its flexibility and scalability, Moodle has been adapted for use across education, business, non-profit, government, and many other community systems of all sizes. Moodle is freely available for all users. It can be self-hosted. Moodle will be accepted by educators and learners as it will be easy to use. Apart from being fairly familiar already, it boasts a simple and flexible user interface and well-documented resources. It is web-based and features a mobile-compatible interface, making it accessible from anywhere in the world across different web browsers or devices. It has been translated into more than 120 languages and is designed to comply with open and accessibility standards. Because Moodle is *the* big open-source player in the LMS space, it is supported by a massive and active community with many plugins and options to customize it to the required specifications. It also benefits from a lot of online documentation for help with development, support issues or questions.

All in all, the features of the TEAL1.O backbone can be developed by adopting a Moodle-based structure. This will guarantee wider user acceptance, fairly good usability, full accessibility and a great degree of security. Integration of the many TEAL2.O elements can be achieved by developing them as plugins to the fully Moodle-based and Moodle-compatible skeleton.

This technology choice will impose key non-functional requirements – namely using PHP as the Programming language for Development, and building on Moodle source code.

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