ENTER-CBL

Boosting Entrepreneurial Mindset of Students with Challenge-Based Learning

Pre-implementation Report

WP4 - ENTER-CBL Online Platform

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Contents

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**Boosting Entrepreneurial Mindset
of Students with Challenge-Based Learning**

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Introduction

This pre-implementation report presents an analysis of the requirements and recommendations for the upcoming online project platform. This pre-implementation report serves as a foundational document that sets the stage for the development phase of the online platform project.

This report is structured as follows. Section 1 provides an overview of the context, project objectives, and key requirements for the development of an online platform tailored for entrepreneurship education. This section details the identified requirements for the online project platform. The requirements outline the essential functionalities and capabilities that will drive the platform's success and to establish a clear roadmap for the development team. This section serves as the foundation for understanding the purpose, scope, and desired outcomes of the platform. Section 2 presents a review of Learning Management Systems (LMS) platforms highlighting their strategic importance in fostering educational success.

This section enables us to assess the feasibility of utilizing an off-the-shelf solution versus developing a custom LMS, ensuring that our chosen approach aligns closely with the objectives and vision of the ENTER-CBL project. Through this process, we aim to optimize educational outcomes and enhance the learning experience for educators and students. Section 3 presents the recommendations for the LMS within the ENTER-CBL project. Section 4 draw conclusions based on the evaluation of LMS and presents the rationale behind the LMS chosen for implementation.

1. Context

The development of an innovative online platform, the ENTER-CBL Platform, is aimed at enhancing teaching practices and promoting Challenge-Based Learning (CBL) methodology within entrepreneurship education across Higher Education Institutions (HEI). This platform serves as a comprehensive resource hub for teachers, methodologists, and students to exchange experiences, access teaching materials, and foster collaborative learning.

1.1. Objectives

Objectives of the ENTER-CBL Platform:

- **Exchange of Experience and Knowledge** - Create an interactive environment for teachers to share experiences, competencies, and teaching resources, including handbooks, training materials, and case studies developed within the project.

- **Information Dissemination** - Provide a platform for disseminating information on CBL methodology in teaching, enabling direct and indirect interactions among educators and learners.

- **Participatory Infrastructure** - Establish an open, participatory infrastructure that supports collaboration and communication among users, fostering a community-driven approach to learning and teaching.

- **Supporting Role in Entrepreneurship Courses** - Serve as a supporting tool for courses on Next-Gen Entrepreneurs, facilitating the implementation of CBL methodology in entrepreneurship education.

1.2. Requirements

The following sections outline both high-level functional requirements, which define capabilities and interactions within the platform, and non-functional requirements, which address aspects such as accessibility. Together, these requirements form the blueprint for designing and developing a robust, user-centric platform that empowers users to explore, create, and innovate in the context of the CBL methodology for entrepreneurship education.

1.2.1. Functional Requirements

- **Resource Repository** - Provide a centralized repository to store and organize teaching materials, handbooks, case studies, and curriculum related to CBL in entrepreneurship education.

- **Collaborative Tools** - Implement interactive features like forums, discussion boards, and online panels to facilitate knowledge sharing and collaboration among users.

- **Information Dissemination** - Enable platform-wide dissemination of project findings, research outcomes, and best practices in CBL methodology.

- **User Engagement Features** - Incorporate tools to encourage user engagement, such as interactive discussions, feedback mechanisms, and community-driven activities.

- **Customizable Interface** - Provide a user-friendly interface with drag-and-drop capabilities for easy content creation, customization, and sharing.

- **Integration with External Sources** - Ensure seamless integration with external tools and resources to enrich platform content and enhance user experience.

- **Search and Navigation Tools** - Implement advanced search and navigation functionalities to help users locate specific resources and materials efficiently.

- **Real-time Communication Channels** - Integrate real-time communication channels (e.g., chat features) to facilitate instant interactions and support collaborative learning.

- **Support for CBL Courses** - Include dedicated sections and tools to support the implementation of CBL methodology, providing frameworks and project-based learning resources.

- **Analytics and Reporting** - Incorporate analytics tools to track user engagement, content popularity, and platform performance for continuous improvement.

- **Security and Privacy Measures** - Implement robust security measures to protect user data and ensure compliance with privacy regulations.

1.2.2. Non-Functional Requirements

- **Accessibility and Usability** - Ensure the platform is accessible to all users promoting inclusivity and usability.

- **Responsive Design** - Develop a responsive and intuitive user interface that adapts seamlessly to different devices and screen sizes for enhanced user experience.

- **Scalability and Reliability** - Utilize scalable infrastructure and reliable hosting services to accommodate varying levels of platform usage and ensure consistent performance.

- **Security and Privacy** - Implement robust security measures to safeguard user data and ensure compliance with privacy regulations and standards.

- **Integration with Advanced Technologies** - Integrate and leverage emerging technologies to enhance platform functionality and interactivity.

- **Search Engine Optimization (SEO)** - Adhere to SEO best practices to improve platform visibility and accessibility on search engines, optimizing content for discovery and reach.

- **Compliance with Standards** - Ensure adherence to relevant industry standards and guidelines (e.g., W3C) for web accessibility, usability, and technical compatibility.

- **Testing and Quality Assurance** - Conduct thorough testing and quality assurance processes to identify and address any issues related to platform functionality, performance, and user experience before launch.

- **Open-Source Adoption** - Embrace open-source technologies and licensing models to foster transparency, community collaboration, and innovation while reducing costs associated with proprietary solutions.

2. Learning Management Systems

Before embarking on the development of a new Learning Management System (LMS) for entrepreneurship education, it is essential to assess the landscape of existing LMS platforms. This review process is crucial for several reasons:

- **Understanding Current Capabilities** - By examining existing LMS solutions, we can gain insights into the features, functionalities, and technologies already available in the market. This understanding helps us evaluate whether existing platforms can meet the specific needs and requirements of our entrepreneurship education project.

- **Identifying Best Practices** - Reviewing existing LMS platforms allows us to identify industry best practices and successful implementations of digital learning technologies. We can leverage these insights to inform the design and development of our own LMS solution, incorporating proven strategies and innovations.

- **Assessing Suitability** - Evaluating the suitability of existing LMS platforms helps us determine whether a customized solution is necessary. If we find an LMS that fulfills all or most of our requirements, we can consider adopting and customizing it to align with our project goals, potentially saving time and resources.

- **Opportunities for Innovation** - The review process also presents opportunities for innovation. By analyzing gaps and limitations in existing platforms, we can identify areas where we can introduce unique features or improvements to better support entrepreneurship education.

The impact of LMS became significantly more visible during the pandemic, especially when considering their previous role primarily as document repositories for course materials [1]. The global crisis of the pandemic compelled educational institutions to swiftly transition to remote learning, pushing LMS platforms into a pivotal role (e.g., [2], [3], [4], [5]). Previously, LMS often served as static repositories where instructors uploaded syllabi, readings, and assignments. However, during the pandemic, their utility expanded dramatically. LMS platforms evolved into comprehensive virtual classrooms, facilitating live lectures, interactive discussions, and real-time collaboration among students and instructors. Such features became essential for delivering engaging and effective online education.

This shift highlighted the true potential of LMS to enhance teaching and learning in unprecedented ways. They not only provided continuity to education amidst disruptions but also fostered new modes of student engagement and personalized learning experiences. The pandemic underscored the transformative power of LMS, demonstrating that they are much more than static repositories. They have emerged as dynamic ecosystems that enable the delivery of education beyond traditional classroom boundaries, adapting to the evolving needs of modern education in a digital age.

A report published by Fortune Business Insights [6] in May 2023 revealed a significant expansion projected for the global LMS market. The COVID-19 pandemic has served as a catalyst, accelerating the adoption and advancement of learning management platforms. These platforms are now pursuing increasingly ambitious initiatives with each passing day.

In [7] a comparison of LMS for higher education is presented. This research article presents a comparison of 45 LMS for HEI. The evaluation criteria used in the study are based on software quality and teaching-learning tools. The literature review of this article reveals a consistent trend in fa-

vor of Moodle as the preferred option among various LMS platforms. Studies consistently highlight Moodle's superiority, attributing it to its versatility, scalability, security features, and comprehensive suite of academic tools. However, despite differences among LMS platforms, research suggests that they generally share similar capabilities in facilitating learning, communication, and productivity, underscoring the fundamental similarities in their functionalities despite variances in specific features. The methodology employed in this study involved an initial collection of 108 LMS, which were subsequently filtered based on criteria such as their suitability for academic purposes, focus on higher education, and availability of relevant information. Following this filtering process, 45 LMS remained eligible for inclusion in the final comparison. The evaluation of these LMSs was conducted using a set of criteria known as Software Quality and Teaching-Learning tools (SQTL), which comprises six key aspects: interoperability, accessibility, communication tools, productivity tools, learning tools, and security and certifications. This comprehensive evaluation framework allowed for a thorough and systematic assessment of each LMS's capabilities and suitability for academic settings, facilitating an informed comparison among the selected platforms. According to the evaluation criteria utilized in this study, Paradiso and Moodle emerged as the top performing LMS.

Additionally, Appendix A presents a list of LMS comparison, each offering valuable insights into the various platforms available. Across these comparisons, a consistent trend emerges, with most assessments highlighting Moodle as the top choice for LMS solutions. Its versatility, scalability, security features, and extensive range of academic tools consistently earn it praise in comparison to other platforms. These findings underscore Moodle's prominence in the educational technology landscape and its widespread recognition as a preferred option for educators and institutions seeking an effective LMS solution.

2.1. Paradiso

Paradiso LMS [8] is a LMS designed with a focus on simplicity and functionality. It offers an improved user interface aimed at facilitating easy navigation. The platform features advanced reporting tools for real-time analytics. One of its notable aspects is its seamless integration with premium software portals, which streamlines workflow for users. Paradiso LMS also provides on-demand technical support and customizable hosting plans to ensure smooth operation. With eCommerce integration, users can sell courses online through platforms like Shopify, PayPal, WooCommerce, Magento, and others. Multi-Tenancy functionality allows customization of LMS instances for different departments or partner organizations. Performance Management tools track learner progress and facilitate continuous evaluation. 360° Feedback enables administrators to gather structured feedback from peers to assess progress comprehensively. Gamification features aim to increase learner engagement through game-based learning scenarios. Learning Paths allow administrators to create customized learning journeys for individuals or groups. The platform includes an Authoring Tool, Paradiso Composer, for creating Sharable Content Object Reference Model (SCORM) compliant e-learning courses. Social Learning components encourage learning through social interactions and discussions. Paradiso LMS integrates with popular CRMs, eCommerce platforms, productivity tools, and collaborative platforms, expanding its functionality.

2.2. Moodle

Moodle has been widely successful in education, used in many different cases. It's popular because it's easy to use and works well. Teachers and schools like it because it helps make learning interactive and engaging for students of all ages. From elementary schools to universities and even in corporate training, Moodle has proven itself as a reliable and flexible tool for managing learning. Moodle has achieved extensive success within the sphere of education, finding applications across diverse educational contexts (e.g., [9], [10], [11], [12], [13]). Its popularity comes from its user-friendly interface and robust functionality. Moodle's consistent performance underscores its reputation as a dependable and adaptable platform for managing learning initiatives.

Moodle's latest iteration, Moodle 4, brings a significant advancement in the sphere of digital education, promising an enhanced user experience for its global user base [14]. This major update introduces a host of new features and improvements designed to streamline the platform's functionality and elevate the overall learning experience. Moodle 4.0 prioritizes user experience and functionality. While previous versions of Moodle excelled in functionality, the focus has now shifted towards enhancing design aesthetics to complement its extensive features. Drawing upon user feedback and insights, Moodle 4.0 boasts a refined user interface, improved navigation, and streamlined course experiences. Furthermore, Moodle 4.0 introduces significant updates to the course page and dashboard, enhancing usability and providing learners with greater visibility of their courses. The introduction of an in-built virtual classroom (powered by BigBlueButton[1]) simplifies video conferencing and enhances collaboration in online learning environments. Additionally, Moodle remains committed to accessibility, aligning development practices with Web Content Accessibility Guidelines[2] (WCAG) to ensure inclusivity for all users. Beyond these key enhancements, Moodle 4.0 brings multiple other improvements, including enhanced security measures (see [15]) and comprehensive reporting functionality. The SCORM activity feature empowers educators to seamlessly upload any SCORM or AICC package directly into a course.

3. Recommendation for the ENTER-CBL LMS

When considering between the two top options, i.e., Paradiso and Moodle, the latter stands out as the preferred choice, particularly due to one crucial requirement: being open source[3]. This characteristic holds significant weight in educational settings, as it ensures flexibility, adaptability, and long-term sustainability. Open-source platforms like Moodle provide users with the freedom to customize and tailor the system according to their specific needs, fostering innovation and collaboration within the educational community. Therefore, in the decision-making process, the open-source nature of Moodle positions it as the optimal solution, aligning seamlessly with the principles of transparency, accessibility, and community-driven development that underpins the educational landscape.

Moodle stands as a comprehensive solution that effortlessly serves to diverse educational needs, seamlessly meeting the requirements previously presented (see section Requirements):

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1   https://moodle.com/certified-integrations/bigbluebutton

2   https://www.w3.org/WAI/standards-guidelines/wcag

3   https://github.com/moodle/moodle

- **Resource Repository** - With Moodle, users can conveniently store, manage, and access learning materials within its resource repository, ensuring easy availability and organization (see [16]).

- **Collaborative Tools** - Facilitating seamless collaboration, Moodle offers an extensive suite of tools that enable discussions and collaboration between learners and educators (see [17]).

- **Information Dissemination** - Moodle serves as an efficient platform for disseminating information, allowing educators to effortlessly share course materials, announcements, and updates with learners (see [18]).

- **User Engagement Features** - By integrating interactive elements such as quizzes, forums, and multimedia content, Moodle fosters high levels of user engagement, enhancing the learning experience (see [19]).

- **Customizable Interface** - Moodle's flexible architecture empowers administrators to customize the platform's interface according to their specific requirements and branding guidelines (see [20]).

- **Integration with External Sources** - Moodle seamlessly integrates with external sources, allowing for the incorporation of third-party applications, content repositories, and learning tools (see [21]).

- **Search and Navigation Tools** - With robust search and navigation capabilities, Moodle enables users to efficiently locate relevant resources and navigate through course materials with ease (see [22]).

- **Real-time Communication Channels** - Moodle offers real-time communication channels such as chat, messaging, and video conferencing, facilitating instant interaction between learners and instructors (see [23]).

- **Support for CBL Courses** - Moodle provides comprehensive support for CBL courses, enabling educators to design and deliver personalized learning pathways aligned with individual learner competencies (see [24], [25]).

- **Analytics and Reporting** - Through its sophisticated analytics and reporting features, Moodle empowers administrators and educators to gain valuable insights into learner progress, engagement, and performance (see [26]).

- **Security and Privacy Measures** - Moodle prioritizes security and privacy, implementing robust measures to safeguard user data and ensure compliance with relevant regulations and standards (see [15]).

- **Accessibility and Usability** - With a focus on accessibility and usability, Moodle offers a user-friendly interface and adheres to accessibility standards, ensuring equitable access for all learners (see [27].

- **Responsive Design** - Moodle's responsive design ensures optimal performance across devices, allowing learners to access course materials seamlessly from desktops, laptops, tablets, and smartphones (see [28]).

- **Scalability and Reliability** - Built to scale, Moodle can accommodate the needs of organizations of all sizes, offering reliable performance even under high loads and peak usage periods (see [29]).

- **Integration with Advanced Technologies** - Moodle stays ahead of the curve by integrating advanced technologies such as AI, machine learning, and augmented reality, enhancing the learning experience and driving innovation (see [30]).

- **Search Engine Optimization (SEO)** - Moodle supports search engine optimization best practices, enabling courses and learning materials to rank effectively in search engine results, thereby enhancing discoverability (see [31]).

- **Compliance with Standards** - Committed to compliance, Moodle adheres to industry standards and regulations, ensuring compatibility and interoperability with other systems and platforms (see [32]).

- **Testing and Quality Assurance** - Prioritizing quality, Moodle undergoes rigorous testing and quality assurance processes to deliver a stable and reliable learning environment for users (see [33]).

Additionally, the familiarity of the project partners with Moodle adds significant weight to its selection. The expertise and experience of the team in working with Moodle not only streamlines implementation and maintenance processes but also ensures a deep understanding of the platform's capabilities and potential. This familiarity facilitates smoother integration with existing systems, efficient troubleshooting, and effective utilization of Moodle's features to meet specific educational objectives. Moreover, the team's knowledge of Moodle's roadmap and future developments enables proactive planning and strategic alignment with the platform's evolution. Consequently, the team's familiarity with Moodle enhances confidence in its selection as the preferred choice for supporting educational initiatives.

Instead of embarking on the implementation of a new solution, a more efficient and cost-effective approach would be to focus on hosting Moodle and optimizing its performance and security measures. By harnessing the robust capabilities of Moodle and configuring it to meet specific performance and security requirements, the project can ensure a stable and reliable learning environment for their users.

Moreover, investing resources in configuring Moodle and developing a comprehensive set of best practices and guidelines for creating and delivering courses based on CBL using Moodle's features can yield significant benefits. This approach allows to leverage Moodle's rich feature set to its fullest potential [25], maximizing the effectiveness of online learning experiences while adhering to established best practices in course design and delivery. Ultimately, by harnessing the power of Moodle and tailoring it to their needs, the project can achieve its educational goals more efficiently and effectively.

By establishing a well-defined set of best practices and guidelines to create and facilitate CBL activities using Moodle, educators will have the opportunity to leverage this methodology and focus their attention on the course content itself rather than the intricacies of its structure. Moodle's versatile platform offers robust features that can be tailored to support CBL methodology, providing educators with the tools they need to create engaging and interactive learning experiences. With a clearly defined course structure in place, educators can devote their energy to designing challenging and thought-provoking learning activities that align with the principles of CBL, rather than getting bogged down in the organization and management of the course materials. This streamlined approach empowers educators to deliver high-quality, student-centered instruction that fosters crit-

ical thinking, problem-solving, and collaboration, ultimately enhancing the overall learning experience for students.

4. Conclusions

While no LMS can perfectly suit every need, Moodle is widely recognized as one of the leading Learning Management System (LMS) globally, and consistently outperforms paid and other open-source LMS platforms in comparative assessments due to its robust feature set and strong support framework. This superiority can be attributed to Moodle's active community of developers and contributors, who ensure continuous improvement and innovation.

As an open-source platform, Moodle continuously evolves, with its fourth version introducing significant enhancements that address previous limitations and enhance usability. The strength of Moodle lies in its flexibility, scalability, and extensive feature set, catering to diverse educational and organizational needs. Its open-source nature not only fosters innovation but also ensures cost-effectiveness and customization options that are often unavailable with proprietary LMS solutions.

In addition to its feature richness and strong community support, another key advantage of Moodle is its familiarity among project partners. Since Moodle is, in most cases, their institutional chosen LMS, familiarity with the platform becomes a critical factor in ensuring successful implementation and usage. Project partners already familiar with Moodle can leverage their existing knowledge and skills, leading to quicker adoption and effective utilization of the LMS for project goals. This familiarity not only contributes to smoother implementation but also fosters confidence and enthusiasm among project members. As a result, Moodle becomes more than just a software choice; it becomes a strategic asset that aligns with the project's objectives and supports the team's expertise and experience.

The solution of utilizing Moodle instead of implementing a new LMS offers several compelling advantages:

- **Cost-Effectiveness** - Implementing a new LMS can be costly, involving expenses for licensing, setup, customization, and training. By leveraging Moodle, which is open source and free to use, significant cost savings can be achieved, allowing resources to be allocated more efficiently towards other project needs.

- **Familiarity and Reduced Learning Curve** - Project partners already familiar with Moodle will require less time and effort to adapt compared to learning a completely new LMS. This familiarity translates to quicker adoption, smoother integration into existing workflows, and reduced training overheads, ultimately leading to faster and more effective utilization of the LMS for project objectives.

- **Robust Feature Set** - Moodle is a feature-rich platform with extensive capabilities for course management, content delivery, collaboration, assessment, and reporting. Leveraging Moodle means benefiting from a mature and comprehensive LMS solution that has been refined and improved over years of development, providing a solid foundation for meeting diverse project requirements.

- **Strong Community Support and Ecosystem** - Moodle enjoys a large and active user community worldwide, contributing to ongoing development, support, and the availability of third-party

plugins and integrations. This ecosystem ensures continuous improvement, compatibility with emerging technologies, and access to a wealth of resources that can enhance the functionality and extend the capabilities of the LMS to suit specific project needs.

- **Scalability and Customizability** - Moodle is highly scalable and customizable, allowing for tailored configurations and extensions to accommodate evolving project demands. Whether the project requires integration with existing systems, specific branding, or specialized features, Moodle can be adapted and scaled accordingly without the constraints often associated with proprietary LMS solutions.

Choosing Moodle over implementing a new LMS offers a pragmatic and advantageous approach, leveraging familiarity, cost-effectiveness, robust features, community support, and scalability to drive project success efficiently and effectively.

In addition to the mentioned advantages, security is another crucial benefit of choosing Moodle over implementing a new LMS:

- **Established Security Practices** - Moodle has a proven track record of prioritizing security. Being a widely used open-source platform, Moodle benefits from continuous security audits, bug fixes, and updates contributed by its active community. This ongoing attention to security helps mitigate vulnerabilities and ensures a more robust and secure LMS environment.

- **Regular Security Updates** - Moodle releases regular updates to address security vulnerabilities and issues promptly. By utilizing Moodle, project partners can leverage these updates to keep their LMS environment secure and protected against emerging threats without incurring additional costs associated with proprietary solutions that may charge for security patches.

- **Community Vigilance** - The large and engaged Moodle community contributes to identifying and reporting security issues. This collective vigilance helps in quickly addressing potential threats and sharing best practices for securing Moodle installations, ensuring that project partners benefit from a collaborative effort to maintain a secure LMS ecosystem.

- **Customizable Security Configurations** - Moodle offers flexibility in configuring security settings to align with specific project requirements and compliance standards. Project partners can implement authentication mechanisms, access controls, encryption protocols, and other security measures tailored to their needs, enhancing the overall security posture of the LMS deployment.

- **Data Protection and Privacy** - Moodle supports data protection and privacy standards, allowing project partners to manage user data securely and in compliance with relevant regulations (such as GDPR[4]). Features like role-based access control, encrypted communication, and data retention policies contribute to safeguarding sensitive information within the LMS environment.

Moodle's commitment to security, combined with regular updates, community vigilance, customizable configurations, and data protection features, provides project partners with a reliable and secure LMS solution that can be confidently deployed to support project objectives while minimizing security risks and vulnerabilities.

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Appendix

A. LMS Comparative Studies List

Next, we provide links[5] that compare different Learning Management System platforms. These comparisons offer insights into the features and suitability of each option.

- 10 Best Open Source Learning Management Systems (LMS) in 2024 | Research.com

- 14 Open-source Self-hosted Learning Management Systems (LMS) (medevel.com)

- Moodle vs. Other Learning Management Systems: Which one is Right for You? | by Edward Wilson | Medium

- Moodle vs Other Popular LMS Platforms | ScalaHosting Blog

- Top 5 Learning Management Systems in 2023 (moodle.com)

- Open-Source LMS: The Definitive 2024 Guide You Need (edmingle.com)

- Comparing the Best 3 Open Source LMS Platforms For 2023, Moodle Vs. Open edX Vs. Canvas - Katalis App

- Top 10 Free and Open Source LMS Software to try in 2024 - SaaSworthy Blog

- Choosing an LMS: Canvas vs Moodle vs Blackboard vs LMS365 - Overt Software

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