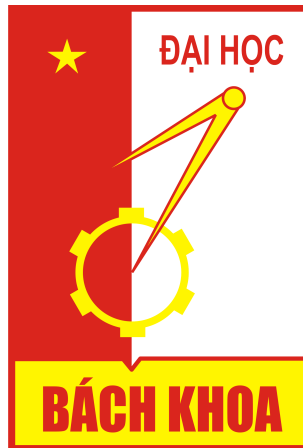


HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY  
SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY



**MANAGEMENT OF SOFTWARE DEVELOPMENT - IT4542E**

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**FEASIBILITY REPORT: CornHub - An online learning platform**

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Ha Noi, October - 2023



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# 1 Executive Summary

In an era characterized by rapid technological advancements, the world of education is undergoing a significant transformation. As educational institutions strive to meet the diverse needs of learners and adapt to the evolving landscape, the further development of such e-learning system has emerged as a strategic essential. This feasibility report aims to evaluate the viability, various aspects such as process, potential benefits and risks of our online learning platform development for an organization, so called “CornHub”.

The primary users of this platform will be learners who are seeking high-quality education. These learners will have the opportunity to access rich educational resources that meet their demands. The client our project is aimed at is X, a newly developing educational institution. Their vision is to provide a comprehensive and easily accessible learning experience to learners—an ideal solution for the changing trends in education.

CornHub’s goal is to bring flexibility, affordability, and relevance to individuals worldwide. It facilitates course delivery, allowing learners to access instructional content effortlessly. Moreover, it supports teachers and mentors with assessment tools and progress tracking. This platform provides interactive environments, catering to diverse styles and needs, thereby enhancing the educational experience.

After a successful release, CornHub’s long-term orientation is multifaceted. Firstly, it aims to position X organization as a leader in online education. Secondly, it seeks to provide a comprehensive and engaging learning experience to global learners. Achieving revenue growth through course sales and enrollments is a tangible objective, ensuring the sustainability of educational endeavors. Equally important is the commitment to legal and regulatory compliance, ensuring that the platform adheres to applicable laws and regulations.

## 2 Preliminary requirements analysis

### 2.1 Overview

**Targets:** The project objectives are multifaceted. First of all, we aim to enhance educational accessibility, provide learners with diverse, high-quality educational resources. Our second objective is to extend the popularity of X organization by offering a wide range of courses and educational materials that help the learners from diverse backgrounds. In addition, we want to improve learning outcomes by create an interactive learning experience. Last but not least, our team intends to establish a sustainable revenue stream for X organization by monetizing course sales, subscriptions, and premium features.

**Business goals:** The goal that we want to mention is increasing the number of users. This can be achieved by offering users a 7-day free trial for each course they register for, thus attracting learners to join our courses. Furthermore, we plan to design a concise but informative introduction about the course on the registration page. For example, this could include elements like photos, a table of contents, a quick review by users who have completed the course, or a guaranteed badge upon course completion, which may be useful in addition to plain English introduction. Regarding learning experience, we provide standard and advanced documents relating diverse topics such as Computer Science, Finance, Administration, Psychology, etc... and textbooks for further reading recommendations. These materials may not be visible to some users and organizations but are summarized and distributed over our platform. Additionally,

we can create some interactive quizzes and exercises to support learners on revising lessons throughout each course. After 7 days of free trial, users will be required to pay for the course to earn the completion certificate. By enhancing the quality of learning as mentioned above, users are more likely to make a purchase decision, having experienced all features provided in each course. This is our ultimate goal, as a partner of X organization, which is generating revenue.

**Interaction with other systems:** The system will be built from scratch using standardized web packages. Additionally, there is no interaction with any other system.

**Product deploying consideration:** The website will release features in stages, each stage separated by two months. In each stage, the website will be able to operate the features of the previous stage with newly updated features.

## 2.2 Functional requirements

The system needs to meet the following basic functional requirements:

- User Interface:
  - Authentication: log in, log out, sign up.
  - Dashboard display: clickable then display the corresponding feature (courses list, searching, filtering, calendar, etc.).
  - Settings: change account password, edit profile, delete account, display mode (light/dark mode).
  - Notification: list of notifications.
  - Profile: avatar, basic information, registered courses shortcut and list.
  - Course and user managements.
- Database
- Rest APIs: CRUD operations for user and course management, etc.  
*NOTE:* changes may occur due to the needs of the project
- Deployment
  - Separated Dockerfiles to set up different components of the whole system separately (for Database, for front-end, web, for back-end API)
  - Mounting data volumes to actual disk space for saving user's as well as system's data
  - One single Docker compose file for boosting up the whole project at once.
  - Potentially setting up CI/CD with Github Action for autonomously deploy the system if there is a new push on the remote repository.

### User capabilities:

- Normal users: All users, including learners and teachers, can create an account by signing up and then log into the website. Further modification for user's profile is also included. The platform provides a calendar feature that allows users to schedule and manage their

course-related events. Users receive notifications and reminders for upcoming course sessions, assignments. For learners, they can search for courses based on various criteria such as subject, level, instructor, or keyword. They can also filter and sort search results to find courses that match their preferences. They can also enroll in courses they are interested in. Depending on the platform's policy, they may also have the option to cancel a course if needed. When participating a course, they can use the documents and materials related to that course. For each course, they can submit assignments, quizzes through the course's submission. Additionally, students have the ability to provide feedback on courses, instructors, and the overall learning experience. This feedback can be in the form of ratings, reviews, comments, or even access a section of frequently asked questions to find quick answers to common queries related to course navigation, platform usage, and policies. On the other hand, Teachers also play a pivotal role with a range of capabilities to effectively manage and deliver courses. They have the authority to create, modify, and remove courses, offering them full control over their educational content. Lecture management is simplified, allowing teachers to organize course materials, assignments, and resources. Furthermore, teachers have access to a student list for each of their courses, enabling them to monitor learners progress, review submitted assignments from students through the platform.

- **Administrator:** Administrators are the backbone of our online learning platform, responsible for overseeing and maintaining its operations. One of the key capabilities of administrator is user management, allowing them to create, modify, or deactivate user accounts as needed, ensuring the platform's integrity and security. Additionally, Admins have a central role in course management, granting them the authority to create, organize, and manage courses, instructors, and learners. Furthermore, with analytics and reporting capabilities, admins are able to gain insights into platform usage, track learner progress, and generate comprehensive reports for assessment and improvement.

**Security:** This is of utmost importance to protect user data, ensure the integrity of content, and maintain the trust of learners and educators. The system will be well secured by encrypting passwords, resisting NoSQL Injection/HTML Injection attacks, and cookie security to keep the user information confidential. Regularly updating and adapting security practices is essential to staying ahead of emerging threats.

**Usability:** issues such as operation speed for the user interface and efficiency of workflow processes through automation, and data concurrency will be taken into considerations.

**Scope:** For the purposes of this project we are solely concerned about the social website and application with an intuitive UI. Development to the extent called out in the above requirements section is all that is planned. The end product will run on a social web-server and will be viewable through all standard web-browsers or applications.

### 3 Software development process

With this project, the team has opted for an Agile approach to deliver a solution that satisfies closely with the client's evolving requirements. We decide to start with creating an overview of the user interface, then gradually developing functions along with receiving feedback from customers and iterating until the all requirements are met. Agile promotes flexibility, frequent client collaboration, and iterative development. The reason for selecting this model is that customers

wish to view the initial user interface design, allowing them to provide feedback and make adjustments or further developments to functional groups. The web interface must have the theme that the platform requires, as well as be simple so that users can check the information of each course. The administrator version is used to manage users and courses. Once the interface is complete, the team will develop the aforementioned functions. This method is particularly suitable for achieving an intuitive and user-friendly interface while accommodating changes based on continuous feedback. The project will be divided into iterations, typically in 2-4 week cycles (sprints), with each sprint delivering increments of functionality.

**Process Outline:**

- Planning and Mockups creation(Sprint 1: 11/10/2023):
  - The project team will create a comprehensive formal document that meticulously outlines the client’s software requirements. To ensure a clear understanding of priorities, the client will classify these requirements into three distinct categories: “mandatory”, “preferred”, and “optional” features. Once the client approves the detailed requirements document, the team will proceed to craft the initial user interface for client evaluation.
  - To ensure the interface designs align precisely with the client’s specifications, the team will create two distinct levels of interfaces: a user-level and an administrative-level interface. These interfaces will incorporate all the essential data entry fields as outlined in the client’s requirements, but at this stage, they will remain non-functional. And we will gather user’s feedback for the next improvements.
- Integration and Infrastructure Development (Sprint 2: 11/11/2023)
  - To streamline our approach, we will begin by refining the mock interface based on invaluable client feedback. Simultaneously, we will embark on implementing the website’s core features. Additionally, we’ll initiate the design phase for the Central data repository and establish the necessary connections to ensure seamless data management. This concurrent approach ensures that both the user interface and essential back-end infrastructure progress efficiently, setting the stage for a well-integrated and robust solution.
  - As part of our commitment to transparency and project alignment, the team will conduct a comprehensive progress report presentation lasting approximately forty-five minutes for the client. During this presentation, we will provide updates on the project’s status, achievements, and upcoming milestones. Furthermore, we will revise and fine-tune our task schedules to guarantee that the system will be successfully completed by the conclusion of the final sprint. This proactive approach ensures that our project remains on track to meet all objectives and deadlines as set forth in the project plan.
- Final Testing and Deployment Readiness (Sprint 3: 12/12/2023)
  - The team plans to schedule a final presentation two weeks in advance, allowing the client to test the product in its intended environment with real users and data. By this point, all functional requirements will have been met, and any subsequent changes will only involve minor details, such as aspects of the user interface. This

approach ensures that the project remains on track and that the client can experience the product in its full context, helping us address any last-minute adjustments or refinements effectively.

- The final system will encompass all the features that the team and the client have agreed upon. Based on the development progress thus far, the final system may also include any functionalities that the client has identified as desired or optional.

## **4 Suggested deliverables**

To satisfy the client's need for a digital and (semi-) automated solution to their current system, the following set of work-products will be delivered to the client:

### **4.1 Periodic status reports**

We provide monthly reports to the clients which summarizes information about changes in task status throughout the software development process. Based on the monthly presentation, tasks are generated and each week, we either work on assigned tasks and optimize previous ones which can lead to significant improvements in system performance and meet the client's needs. These will be written documents that are presented to the client and any other individuals the client identifies

### **4.2 Periodic presentations**

We provide a monthly presentation where we show to the client the current state of the sprint we are working on, and the demonstration provides client with the knowledge of the process and different aspects of the software system in development. The team's iterative software design approach allows for varying emphases in different presentations, with specific aspects of the client's requirements taking the spotlight in certain instances. For instance, particular presentations may focus mainly on the user interface. These presentations are designed to provide the client with a comprehensive grasp of how their requirements are being met within the final product. Clients can offer recommendations and request changes based on their needs, and we collaborate with them to find feasible solutions.

### **4.3 Computerized, web-based system for reference statistics**

This system offers the core for the customer, and it includes a web-based tool. The client has identified key functions that this system needs to provide:

- Admin: General account and course management
- Teacher: Course management
- Student: Course enrolment & learning

The system consists of a graphical user interface (front-end) to assist users in utilizing the system's functions and a back-end data storage component where initial data and actual data in the programs that users interact with will be stored. Therefore, the system expands web-based interactions, and code runs on the local server.



## **4.4 Good faith requirements agreement**

After discussing and reviewing the project requirements with the customer, a formal requirement agreement will be presented to the client to clarify precisely what the project intends to achieve. The agreement will clearly outline the features and objectives that the team intends to deliver.

## **4.5 Documentation for use and mechanics**

The client will be provided with documentation explaining how to use our system and describing its basic mechanisms. The client has expressed interest in becoming familiar with the system, and the documentation will be useful for reference purposes.

## **4.6 Demonstration and client training**

In addition, the client requests training for their staff to use our system. The team will fulfill this requirement by providing system demonstrations (at different completion stages in coordination with our regular presentations) and by allocating time after the final system completion to train the client on how to use our system. The presentations include the execution of routine tasks as defined by the customer, and the training sessions will include guidance by team members. They may lead or conduct individual training with the customer.

# **5 Technical feasibility**

The feasibility of the technical prerequisites can be evaluated by identifying and outlining a technical approach that meets with the client's needs. Based on the identified client requirements, here is an outline of technical methods that can satisfy each need:

1. **Data Sorting by Different data types:** Implement a NoSQL database system, such as MongoDB or Cassandra, to store and manage data with flexibility in schema and the ability to handle various data types. This approach allows for efficient querying and sorting of data based on different fields.
2. **Centralized Data Repository:** Create a central database server accessible to all locations via the internet. Implement data synchronization mechanisms to ensure data consistency across distributed locations.
3. **Multiple Levels of Access to the System:** Develop role-based access control (RBAC) to differentiate between teacher, students, and administrator. Each role will have specific permissions and privileges within the system.
4. **User Analytics and Progress Tracking:** Utilize analytics tools and data tracking techniques to monitor user engagement, track progress, and provide personalized learning recommendations. Implement learning analytics dashboards to visualize student performance and engagement metrics.
5. **Content Authoring and Management:** Create a content management system (CMS) tailored for e-learning content, allowing instructors to easily author, upload, and organize



course materials. Integrate authoring tools like SCORM (Sharable Content Object Reference Model) for compatibility and reusability.

6. Test Creation and Management: Develop a comprehensive Test Authoring System within the e-learning website to enable educators or content creators to create, manage, and administer tests and quizzes
7. Calendar and Event Management System: Develop a calendar and event management system as an integral part of the e-learning website to enable users to create, view, and receive notifications for important dates and events.
8. Course Payments: Integrate online payment processing services into the e-learning website to facilitate secure and seamless course payments.
9. Administrative Interface: Develop a comprehensive administrative dashboard as part of the e-learning website to provide administrators and instructors with the necessary tools and features for efficient management and oversight
10. Security: Implement robust security measures, including user authentication with password protection, encryption for data transmission, and user access controls based on access level or user type.

In conclusion, there is a technically viable solution for the proposed system. This solution encompasses the utilization of a MongoDB database, a fusion of Node.js and Express.js for the back-end, and React.js as the core technology for the front-end. When it comes to project deployment, Docker is the chosen tool for streamlined and efficient deployment processes. For further test of the feasibility of this possible system, the team had to consider that the initial customer expected about 20-30 users to be able to access the system simultaneously. With a limited number of end users, the hardware limitations of the learning website's central server will not be an issue. Finally, it should be noted that the final system delivered to the clients may differ from the technically feasible system described here. The purpose of this project is to determine whether the project itself is possible or not. Future focus on system requirements will be implemented and an optimal architecture will be conducted.

Finally, it should be noted that the ultimate system delivered to the customer may differ from the technically feasible system described here. The purpose of this report is to determine whether the project itself is feasible. Future focus will be on the system's requirements, and an optimal architecture will be applied.

## 6 Visibility

Our team will work to maximize the visibility of the system and development process. This will ensure that the project is being developed to meet the client's specifications. Any bugs or issues can be detected and fixed early through client feedback.

**Communications:** Face-to-face meetings and emails will be the primary ways of open communication to update clients on project progress. By doing this, clients may have a better understand of the project as well as evaluate the project and find solutions to fix if the project does not follow the customer's demands. Organised meetings, specifically after 1 or 2 weeks, will be held with the client to discuss progress and aim for two-way feedback. The team will also meet

as a whole at least once a week to ensure all members are familiar with and understand their roles and work. To ensure effective communication and information archives, detailed meeting times will be diligently recorded and subsequently made available to all team members for future reference.

#### **Intermediate Deliverables and Presentations:**

- **Live demonstrations:** Progress updates for clients will be provided through in-person presentations held at the client's premises, as well as through monthly presentations corresponding to each major phase of the project.
- **Presentations:** A slideshow of the design layout of the screens, normally Powerpoint, progress reports and demonstrations of the working and system functions will be shown to the client.
- **Reports:** Customers will also be provided with copies of the documentation, which lists the details at each stage of the software development process. These progress reports will also allow them to clearly perceive the details of the project from their perspective.

## **7 Risk analysis**

### **7.1 Time risks**

Time is a critical component in project management. For our e-learning application, there exists the potential for delays in various stages of development given that our team follows the Agile model to implement the project, with the requirement that a portion of the system's functions must be completed after each sprint. However, this approach can introduce risks if the functions are not completed properly after each sprint, primarily due to the limited time available for each sprint. Such issues can subsequently impact the progress of future sprints. Unanticipated technical challenges, complexities in functionalities, or issues with third-party integration can all result in a development process that takes longer than initially planned. Additionally, the emphasis on quality assurance means that we could encounter extended periods of testing, especially if critical bugs or issues are identified that need multiple rounds of rectification and re-testing.

### **7.2 Resource risks**

Managing both human and material resources effectively is foundational to our project's success. Human resources present challenges in the form of potential skill gaps. With technology's relentless pace, certain skill sets within our team may occasionally fall short of the evolving industry standards. Additionally, communication complexities, misunderstandings, or lack of clarity in roles and assignments can also impede the project's trajectory.

On the technological front, risks arise from system failures or hardware errors. Limited resources, such as inadequate server capacity or storage limitations, can impede the performance and scalability of our learning platform. Web display inconsistencies across various browsers pose another challenge, as variations in rendering or layout due to browser differences can affect user experience. Moreover, software license issues, like expiration, incompatibilities, or restrictions in usage, can disrupt development or application functionalities, further highlighting the importance of regular software audits and updates.

## 7.3 Functionality risks

The functional dimension of our learning application presents a series of potential challenges. A primary concern is the risk of delivering a user experience that is not intuitive or friendly enough, which could deter users or reduce their engagement levels. Likewise, the aesthetics of the user interface play a pivotal role. If the interface is not attractive or visually compelling, potential users might opt for alternative platforms. Further complicating the matter is the development of features that, while innovative, might prove unsustainable in the long run due to technical complexities or changing user demands. Scalability also stands as a main concern; as our platform grows, it must be adept at accommodating an increasing user base without compromising performance or reliability.

Of the various risks identified, functional risks might seem more straightforward to mitigate—often by simplifying or limiting feature details. However, while such an approach can address potential challenges, it may come at the cost of compromising the application’s richness and utility. Our group is committed to finding a balance, ensuring that while we prioritize functionality and usability, we don’t diminish the application’s feature set. We aim to navigate these functional challenges without resorting to mere feature reduction, striving to deliver an e-learning application that stands out in both utility and user experience.

## 7.4 Risks management

Managing and mitigating the aforementioned risks is paramount for our project’s success. For time-related and resources risks, our approach will involve careful planning, integrating buffer periods, regular training sessions, and periodic system and software checks. Additionally, we will monitor software licenses proactively to ensure continuous and legal usage, minimizing disruptions.

The functional risks, especially those concerning user experience and interface aesthetics, will be addressed through iterative design and feedback loops. Engaging real users for feedback in the early stages will help us refine and perfect the application’s usability. It is worth noting that while simplifying feature details can be a straightforward way to navigate functional challenges, we aim to avoid this potential pitfall. Limiting or reducing feature details can mitigate challenges but might compromise the richness of our online learning platform. Therefore, our goal is to strike a balance—navigating these functional challenges by innovating and adapting, but without resorting to reducing the depth and breadth of our application’s offerings. In essence, our risk management strategy prioritizes delivering an application that is both functionally robust and user-centric, all while ensuring optimal resource utilization.

# 8 Business considerations

## 8.1 Secure transactions and sensitive information

We assure that all sensitive information that relates to either personal users or enterprises are prevented from illegal accesses. Note that any commercial secrets should be kept internally, and if client provides any that exists on one’s profile without hidden policy, or visible to other users, it is not team’s responsibility to secure that information. We commit that there will be neither sensitive information nor secrets are processed in our system.

The transaction information is stored in our database, but we ensure that none of those information related to this is leaked outside our workspace. Transaction information is also considered as sensitive information, and according to our policy, this data is only used for extracting, searching, storing, scheduling and manipulating, it is neither being distorted nor modified.

## 8.2 Copyright and trademark

Our product is of organization-scale type. This infers that any other personal users or organizations should have a license to access and install our product. The license lasts for a limited time, and after the license being expired, client should pay to extend the limit of license. After being provided a license, organizations can offer accounts to users, or particularly students, teachers and staffs, the license provides a limited number of free accounts. The number of offering accounts depends on the need of the organization. However the expense for additional accounts, other than those free accounts provided with the license, will be charged and will be billed as the license expired.

Our team will not be responsible if any information is modified after the license was provided, but we are open to reply and respond to any questions or problems from any user if the time and plans are not restricted.

We suppose that we have a right to make a demonstration of our product to any potential recruiters or partners and give an introduction about our team, staffs and their works. Since our team does not plan to register or maintain a brand, so this is not a problem for us.

## 9 Conclusion

Based on the analysis of this feasibility study, the team has collectively agreed that this project is **feasible** and we are **willing** to take on the project following aforementioned plans. The benefits are substantial enough to justify the required development efforts. Currently, the costs of the project are expected to only involve the labor expenses of the group. With a time limit of 7 - 8 weeks, we are confident that the scope of the project is manageable and customer requirements can be satisfactorily met upon completion of the system. Team members are skilled enough and familiar with the tools and frameworks that may be applied in this project to implement the website. The conclusion of the feasibility report is to continue with this software development project.