Final Year Project Proposal

TU856

Eagna – A Learning VLE Hub for TUD

Conor Davis
C20441826

School of Computer Science
TU Dublin – City Campus

11 / 10 / 2025

Table of Contents

Contents

Declaration

I hereby declare that the work described in this dissertation is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

Signed:

*Conor Davis*_____

Conor Davis

11/10/202

Summary

My project idea, Eagna (the word ‘wisdom’ in Irish), is a web application, designed for the Technological University of Dublin, that would replace the core Brightspace & Registration System, into a single online portal, combining the functionality of a VLE, Registration System & access to the necessary tools and functionality needed to fully engage in our studies. The core design of this system would be a web application serving as the central learning hub for the university: handling student registration, assigning them their correct modules, being able to interact with these modules, in the way they we do now with Brightspace, efficient links to important external resources such as Microsoft Teams & their OneDrives – while also supplying lecturers the means to access their specific modules, to add their notes and videos, accessing assignment files, delivering grades and communicating with their students. To support this web application, I will design a database to support this system, while also creating a monitoring platform to manage the upkeep / runtime of the entire system.

With an in-house solution such as this, the system can be personalised and tailored towards the unique needs of the college, the security, standard and availability could be determined by the college alone, while the use of separate software services, that have to be rented, organized and then connected together, is diminished. The recent issues regarding the new registration system, which then affected Brightspace, inspired the idea of creating this platform. Like the various institutions that also use their own hub to link everything together, this application will allow the college full control over the necessary features, security, accessibility and other facets they may wish to provide.

For students and lecturers, this will give them a hub to access the essentials regarding their work. The students will be able to register, access their modules with ease, now tied into registration, and then get what they need to learn, take notes, upload assignments and engage with their lecturers for these modules, in an organized and accessible way – including quick links to external resources attached to studying at TUD, including the many Office365 services and various TUD website pages. The lecturers can manage their various modules all in one place, aiming to meet or beat the functionality of Brightspace, without having to worry about student accessibility to content or creating their own pages externally to support student learning.

My initial prototype will be run on a local network, using virtual machines, acting as servers forming the backbone of my system, which I will deploy my web application, database, and monitoring systems upon, to mimic a locally run system within the college. I will also explore using Infrastructure as a Service (CaaS) as web accessible infrastructure, to deploy my system on, so that the feasibility of a student / lecturer accessing this outside the college network is shown, while trying to work around having internal clearance for the firewall / network security for the purpose of demonstrating. As I will not have access to any internal data from the college, I will design the database and will input example user data to mimic the actual data of students / lecturers. The idea is that how it works for one student / lecturer / admin, it will work the same for their peers.

On a personal level, this project will give me an insight on all the facets of creating a full-stack system, from user interface design and accessibility, system design, site reliability engineering, database management and more. When I leave TUD, I hope to become a site reliability engineer or a full-stack developer. With an end deliverable such as this, I am excited to try it out. If this was something the college was also interested in, it could serve as a foray into feasibility and worth.

Background (and References)

My aim since the summer was to create a system composed of a web application, a database, and a monitoring system. On my internship at Mastercard, I was working with the Site Reliability Engineering team, and I created a similar, yet simpler system focused on this setup. I felt that is what I wanted to do when I was done studying at TUD. With the issues regarding registration and then Brightspace, the idea of creating a portal / hub, with Brightspace functionality, really interested me, to have a streamlined design that could integrate features like registration, that could be designed for the unique needs of TUD.

A large number of VLEs exist, with a number of different choices shown in Ireland alone, pointing to the fact that each university has distinct needs, like Brightspace, which we use in TUD *[1]* (also used in UCD *[2]*), with competitors such as Moodle (used by DCU *[3]* and Maynooth *[4]*), Loop (also used in DCU *[5])* & Blackboard (TCD *[6]*) being used by competing universities in the Republic of Ireland. An example outside the country would be Canvas (Oxford University *[7]*).

Portals / Hubs for universities are common, with their systems combined into one, removing the necessity for those at the relevant college to move between multiple resources, like St. Louis University in the US *[8]*. While the TUD website has the links to the various services available, it could be served with an option to log in at the top, and from there the students and lecturers can access a portal relating to their studies. With a long list of existing VLEs and Portals that have been designed to either work internally to suit their own university's unique needs, or as a widely available customizable platform that a business model can run on, there are plenty of potential competing solutions that I can look towards for inspiration, to see what is the required competitive level of features / accessibility / availability and for what areas I can research.

As an interesting point, UCD are also seemingly doing extensive research into developing a support structure for VLE Standards *[9]*.

An important point to be made is that I am a student at the college, and I interact with the people that use / have used these services for extended periods of time, so myself and my potential test users are readily accessible for feedback and information, with plenty of experience using what I intend to improve on.

This is not meant to replace the website, or Office365 services, which will both be used to support this new web application – this is intended to replace the current system between registration and VLE Brightspace.

Proposed Approach

For my proposed approach in bringing this project to fruition, I will lay out the following plan for completing my project.

Research

The first stage of this project has and will continue to be research. The first initial research point is the feasibility of the idea, can I do it with the time I have within reason, the technologies at hand, and the skills I have. Once I decided on this project idea, the next stage is researching deeper, in the following way.

The Framework
This is the foundation for my project, inquiring into what are the core technologies I require to design this project, discovering if or how they will work with one another, starting from the bottom up: Virtual Machine Deployment until Fully Connected & Functional System. I will be asking some of the following questions - What virtual machine software will I use? What Operating Systems will my virtual machines have? What technologies for building web applications, databases and monitoring systems support these operating systems? Will those technologies work in tandem with one another? - This will give me the know-how for how exactly I will begin designing and implementing my project.

The Details
This will be the second stage of my research, where I will research the important real-world problems that may be associated with a program such as this. Areas such as security, data integrity for GDRP related laws, accessibility and more, will be crucial for providing the best implementation that I can come up with, to hopefully lead to a feasible real-world design. I will be asking some of the following questions – How should I secure my network? How should a database be maintained to stay in line with GDRP laws? What should I offer as features for accessibility, such as changeable colour schemes for colour blindness?

The Implementation
This is where I begin the final stage, by researching the implementation. Now that I know what I have to base my implementation on, I can research deeper on how I should implement the project using the previously researched areas, for example - With the web application, I will be looking for the best frameworks / modules for visual design, while looking to ensure features remain feasible when working with my chosen database. For the database, I will need to know how I will design the layout, in order to work with this web application and its features, including what are the necessary tables and queries that I will need to prepare for storing data and providing functionality, and what I need to keep in mind for a secure implementation in relation to requesting data. For the monitoring system, I will look into what are the best metrics to record and measure the availability of the system. Details such as these will be essential for my design and implementation.

Requirements Gathering

Here is where I begin laying out what is needed to meet the standard and level necessary for this system to function. If I am going to be replacing Brightspace and the registration system, I need to know what should be kept, removed or added. By forming a questionnaire and a user group with a complex variety of needs, I can form the foundation for the design of my system.

For my user group, I have a number of people in mind that I have asked already to help, with different backgrounds, and a variety of needs, including former students, students from other colleges, people with dyslexia and autism, and potential mature students. The more direct feedback I can get, the more it will help bolster the research I will do to account for as many backgrounds as I can.

Analysis & Design

Once I know what I need, would like to implement, and what to avoid, I can begin planning the design to implemented, while analysing it for where I can improve the project.

I will first be designing the pages of the web application, the framework of the application. After, I will then begin laying out a database design to accommodate the features of the application, comparing the design implementation needed between the web pages and the database. Once I have designed my web page setup, and how it will interact with the database design, I will then design the monitoring system, analysing the most important parts of the system that will need to be monitored, and how I will implement the monitoring.

Implementation

Once the analysis and design are finished, I will begin turning it into code and material work. Starting with setting up the virtual machines and the local network, I will then implement the web application in tandem with the database to check functionality as I go, before I finally setup the monitoring system, ensuring that the connection between one another is stable and accessible.

Testing / Evaluation

Once my implementation is complete, I will begin my testing and evaluation of my product, starting with my own self-testing, knowing what weaknesses could exist, what was tricky to implement and what may have been done incorrectly. I will then ask members of my user group to use the program themselves, where I will involve another questionnaire, while keeping an ear out for any more bugs that have been discovered. Once I have gotten all this feedback, I will try and implement / evaluate what is necessary.

Deliverables

I will be aiming to deliver a functional demo of my web application, interacting with the database live, while having access to the system monitoring. With custom user data, I would be able to register, enter the program, access my modules, read lecturer notes, upload assignments and more, while a lecture can log in, interact with their modules, organise them, take assignments and give grades. There will be a limited number of custom users in the data, depending on what I need to test, I will not be replicating the thousands of students that exist, but I will be looking to conform to the technology and design that would accommodate this many. I will deliver a deep report based on my working demo, scaling it to a size necessary to support the university, what infrastructure / hardware may be required, notes on various potential concerns regarding security, accessibility, availability and GDPR requirements.

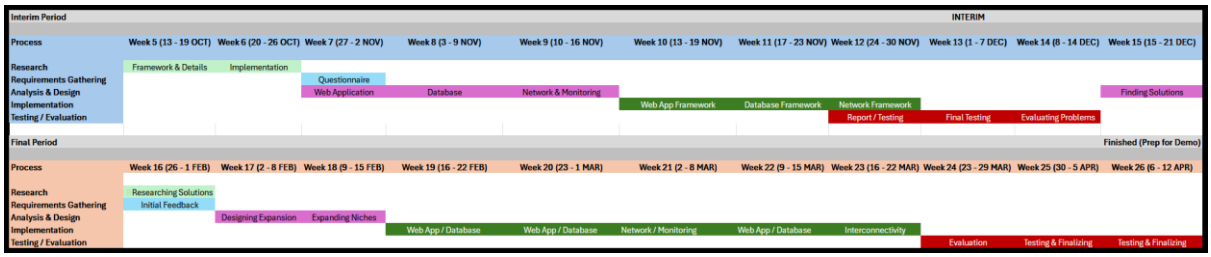
Project Schedule

My schedule is based on the given timeline we have received, and I have broken it down into rough weekly parts where I will know what I need to have done in time to finish the project, potentially adjusting where necessary.

There are two main periods – one aiming for the Interim Report / Demo, while the latter will expand on the functionality and depth of the system, for the final version of the project.

The areas are based on my previously outlined approach, with an aim to have finished my development cycle by early April. The aim for my final report is to write it once the document has been provided, filling it in bit-by-bit while working on the project.

Here is my **GANTT Chart** displaying my proposed schedule:



Technical Requirements

The technical requirements of this project revolve around software and infrastructure, with the hardware side being not as vast. For infrastructure, I will need at least three virtual machines, run on software such as VMWare, that will act as my servers, with the potential for Cloud as a Service to be used down the line instead. These 'servers' will run on Linux, most likely Ubuntu Server, to serve my needs. They can be linked as a local network that can then be accessible on my local web browser. They could also be deployed on Cloud as a Service, should I either be provided with assistance by the college, or if I can do it by my own financial means, so that it may be run non-locally (the best way given I have no access to servers on campus nor the ability to get clearance through firewalls by network security due to host from my own machine on their internet.) and therefore accessible to the Internet. In regard to software, I believe I have access to everything I need, such as VSC and the various languages I will need to utilize, the infrastructure software for the VMs, the Database software I will require, to name a few. Hardware will likely be my own laptop and PC.

Conclusion

In conclusion, this project has the aim of replacing Brightspace and other attached systems, in order to create a more streamlined, sustainable and reliable alternative, one that the people who study there and work there, can have a voice in, and one that the college themselves could manage and add on to as they need. The project is ambitious, and should there be places in this project where I cannot fill the necessary gaps, I will research what could be done to improve that area, and if given enough time, I would relay how and why it should be implemented. It is a deep dive into a full-stack system, composed of a web application, database and monitoring – aiming for the professional standard that will be found in the workforce, and worthy of the time and effort I have spent on completing my course.

References

[1] T. U. Dublin, ‘Connect | VLE - Brightspace | TU Dublin’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.tudublin.ie/connect/vle/

[2] ‘UCD Connect’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.ucd.ie/connect/

[3] ‘Moodle | DCU’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.dcu.ie/students/moodle

[4] ‘Moodle | Maynooth University’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.maynoothuniversity.ie/centre-teaching-and-learning/technology-enhanced-learning/moodle

[5] ‘About Loop | DCU’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.dcu.ie/teu/loop

[6] T. C. Dublin, ‘Blackboard Learn VLE - IT Services | Trinity College Dublin’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.tcd.ie/itservices/our-services/blackboard-learn-vle/

[7] ‘Canvas | University of Oxford’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.ox.ac.uk/students/academic/guidance/canvas

[8] ‘Using mySLU’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.slu.edu/its/using-myslu.php

[9] ‘Changes to the Virtual Learning Environment Standards - UCD IT Services’. Accessed: Oct. 12, 2025. [Online]. Available: https://www.ucd.ie/itservices/ourservices/educationaltechnologies/digitallearning-instructors/changestothevirtuallearningenvironmentstandards/

Appendix A: First Project Review

https://library.tudublin.ie/search?/Xtu856&SORT=D/Xtu856&SORT=D&SUBKEY=tu856/1%2C191%2C191%2CB/frameset&FF=Xtu856&SORT=D&30%2C30%2C

https://library.tudublin.ie/articles/5683162.6281/1.PDF

Title
Suaimhneas: A responsive web application for anxiety management and wellbeing

Student
Ben McCormack

Description
Web application designed to help people manage anxiety using CBT techniques, recording their daily moods, with personalized feedback and a recommendation system.

What is complex in this project
His research is complex, diving deep into both the technologies he should use, and the experience for the user, and given that it is similar in setup to my own idea, in relation to the technologies and system he built, what he has done here could be a great help to understanding the level I require. While it is not relevant to my idea, his ideas around creating the registration system, and the algorithm he may use, is quite complex, how he outlined the use of the cosine similarity algorithm as his final choice was interesting, and not really something I was familiar with.

What technical architecture was used
He used PostgreSQL as his database, Django as his framework for Web Development, JavaScript as his Front-End Technology, alongside using Docker, HTML & CSS. He also selected Digital Ocean as his Web & Database hosting service. (Figure 2.3)

I will be looking into similar technologies, and when I was reading about Django, it was something I was interested in, as I love Python. Yet, I have to keep in mind the time required to use new frameworks such as that.

Explain key strengths and weaknesses of this project, as you see it
Overall, this project seems to be on the stronger side, in most regards. His research was complex, thorough, the basis for his design and implementation on this research was equally as impressive. The main weakness I would say is his user interface, which could be improved upon a decent amount, making it softer in appearance and more accessible, the Mood Check-in Wireframe sticking out, along with the accessibility / readability of text across pages such as Create / Edit Goal Wireframe and View Individual Client (all found in the Appendices).

Appendix B: Second Project Review

https://library.tudublin.ie/articles/2945901.1871/1.PDF

https://library.tudublin.ie/search?/XDT228&SORT=DZ/XDT228&SORT=DZ&extended=0&SUBKEY=DT228/101%2C151%2C151%2CB/frameset&FF=XDT228&SORT=DZ&119%2C119%2C

Title
An eLearning system for Anonymous Feedback Sessions

Student
Daniel Hogan

Description (brief)
An older project, this was designed as an eLearning system that would provide the ability to give Anonymous Feedback,

What is complex in this project
His dive into Nielsen's Heuristics was deep, using it to examine the main operating functions of his project, such as the Lecture Tools, Poll Everywhere and E-instruction's Student Response System. He also provided an interesting overview of the technologies he was researching, such as a comparison between SQL and MongoDB commands / queries. His architecture research was also impressive, especially his overview of API routes.

What technical architecture was used
He used a central node server, storing all the system data and providing API & Web Socket events to manipulate his data, using MongoDB and Mongoose as his ODM. He also used Bootstrap as his main web development technology, linking it to the server functionality.

Explain key strengths and weaknesses of this project, as you see it
There are more weaknesses in this project than the last. Despite the idea being more similar to my own than the first project, that project has a far more expansive implementation, one that I would be aiming to meet. This project done well with certain areas of the research, such as Nielsen's Heuristics, but it appears to have suffered from a lack of research into the full implementation, and what would be necessary for important areas such as Security and Availability – something I will have to try and avoid.

Given that it is older, I would have to give leeway on what could be expected, as some of the issues he ran into, such as saving session status, could be more achievable with what technologies are available now, and in comparison, to the first project I reviewed.

Appendix C: Prompts Used with ChatGPT

N/A - Not Used In The Process

Appendix D:

N/A - Not Used In The Process