

E-LEARNING PLATFORM DIRECTIONS AND FUTURE EXPANSION WITH CASE STUDY

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Abstract: When we look at the current situation in the world we can see that world shifts into digital era. This means, it will also influence the learning and educational section. In this science paper we will analyze e-learning platform architecture, propose architecture based on the teaching process and perform comparative analysis of leading e-learning provides.

Keywords: E-learning, Education, Databases.

INTRODUCTION

When we look at the current situation in the world we can see that world shifts into digital era. This means, it will also influence the learning and educational section.

We can narrow down few of the advantages and disadvantages researched with students and their professors.

Benefits are that lectures are being recorded and posted for the easy access for students. Also, another benefit is that students could reach teacher and professors at any time. Response from professor and teaching stuff was in time and with consultation provided. Another benefit is that location is totally irrelevant, so the approach was flexible for most of the students and professors.

Disadvantages are lack of social interaction in term of everything was done online. There is certain physical need to be established between people in general so the same goes for the teachers and students.

Techniques being used in e learning were the same as in face to face class rooms. This means, lectures, exams and essays were being organized online. When it comes to lectures, benefit was that it was being streamed and recorded at the same time,

which helped students to pick up some stuff they missed or some issues were overlooked and this way they could rewind or go back to part of the lecture they needed to get explanation.

From the part of submitting essays, this was similar process as it was before. Students were already used to send written essays to the professors, so in e-learning this process was not changed at all.

However, from the part of exam or taking exam process, this required some adjustments. For example, if exams was structured in real face to face situation, now it needed to be stricter as online, professor has no influence on the student environment. Of course, this was also being possible to track by having included online camera, and with camera with sound on, professor or teaching stuff, had possibility to overview the exam process. Another benefit of e-learning is screen sharing, as with this method interaction with students on exams or labs, was almost the same as in real face to face situations.

With this being said, facts that points to e-learning, has proven that new digitalization era is already in place, and that e-learning provides similar or same effects as regular face to face learning process.

Factor that is important for e-learning to be successful is the modernization and fact that students

in their early age have learned how internet is being searched and how to use different kind of applications. They are also familiar with capability of retrieving desired information over internet and how to work with various forms of documents.

Depending of area where e-learning can be implemented, providing knowledge without limits from seafarers and providing centralized certifications for example with using Moodle [1], to concepts of providing e-learning in space program [2].

Here we will analyze e-learning tools architecture, their structure and how they are helping improving learning process.

ARCHITECTURE OF E-LEARNING PLATFORM

When human society begin their innovation era, they basically imitated forms in nature and around us. This has helped from the early stage such as Da Vinci innovations like flying machine, to help humans advance and prosper.

Same thing applies to the e-learning platform. To have successful e-learning platform that fulfills its goal, we need to imitate the learning process in educational systems.

Structure is to have entities or objects such as classrooms, subjects and some form of chat interaction.

Entities are designed based on the domain level they present, with properties as holders or keepers of the values in the right form. Within concept of domain, processes must be executed in right way where the relationship between entities and domains should provide the real life examples.

Relationships between entities should follow loose coupled principle, where based on the poten-

tial growth of e-platform, should be enough flexible to implement new concept needed to follow learning concepts.

With chat interaction, we can solve everything. We just add the entities such as students, location or classroom and subject for what chat relates to. Also, email is another tool that also is being added to e-learning platform. Scheduling or appointments for calendars makes automation to perfection, as the students and professors can organize the learning activities.

Regarding storing data we can use document oriented databases or we can use relational database systems. For example, one of the e-learning providers Udemy is using document oriented database called MongoDB, and other e-learning provider such is Codecademy is using SQLite as one of the databases.

We can use advantage of new database concepts for storing large data volumes [3], however this all depends on how we want to scale learning content including tests and certification data.

TYPES OF E-LEARNING PLATFORMS

We can divide e-learning platforms based on different criteria. For example, one important criteria is financial criteria. In this way we can say there:

- Free (open source)
- Paid (commercial)

If we look by the type of access we can divide into:

- Computer/Device based (offline)
- Online (internet/cloud) based

If we look by the type of usage criteria we can say:

- Company based (for employees)
- Massive Open Online Courses (MOOCS)

When we look at financial aspect, it is pretty simple to recognize what are the benefits. However, just because it is free, it doesn't mean it has less quality, but it has tendency of having non-assigned administrators or teams that are supervising the quality of the learning content. On the other hand, paid courses have this advantage, as they can finance these resources.

Type of access of the learning platform we can say that everything that is offline and can be access by the computer or device (mobile), it has the benefit of using it where there is no access to the in-

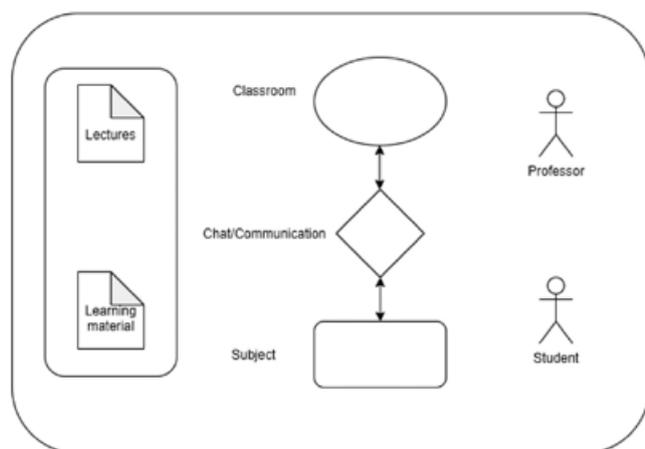


Fig. 1. Architecture of e-learning platform

ternet. This now is not that much of importance as most of the online courses can be downloaded as offline content, so it can be viewed later in the offline environment.

Types of usage in the term of who are teachers and students, we can say that companies where we can have also other instructions such as schools or universities, have dedicated teachers and learning content is restricted to the audience such as employees or students. One very important e-learning type of platform, which is gaining significant market share in the e-learning community is MOOCS. They have been constructed in the way that teacher can be student and student can be teacher. There are different types of content validation if the learning content is good or not. One of the main criteria is the reviewing system by the students, which have been proven as one of key value to recognize if course provides value to the students.

UDEMY CASE STUDY

Here we will address Udemy as one of the leaders

in the e-learning platforms. Udemy is not that old (started by getting funding in 2010) company which has started their platform with only one course and it was a video they published on the YouTube platform. In Udemy, they wanted to solve one problem and it is called “chicken-egg” problem. By this, people from Udemy, didn’t know how to get teacher to create and publish their courses on the platform where are not students, and they didn’t know how to get students on the platform that has no teachers with courses.

Interesting was how they manage to use outsourcing platform called ODesk (previous Upwork), where they managed to reach to each freelance which had different skills, in order to get them to start a course from their branch on Udemy platform. This later proved to be huge success in getting the right teacher and by having the right learning content, they managed to get students to enroll in these courses.

Udemy had a opportunity to start with business to client B2C model but later switched to the busi-

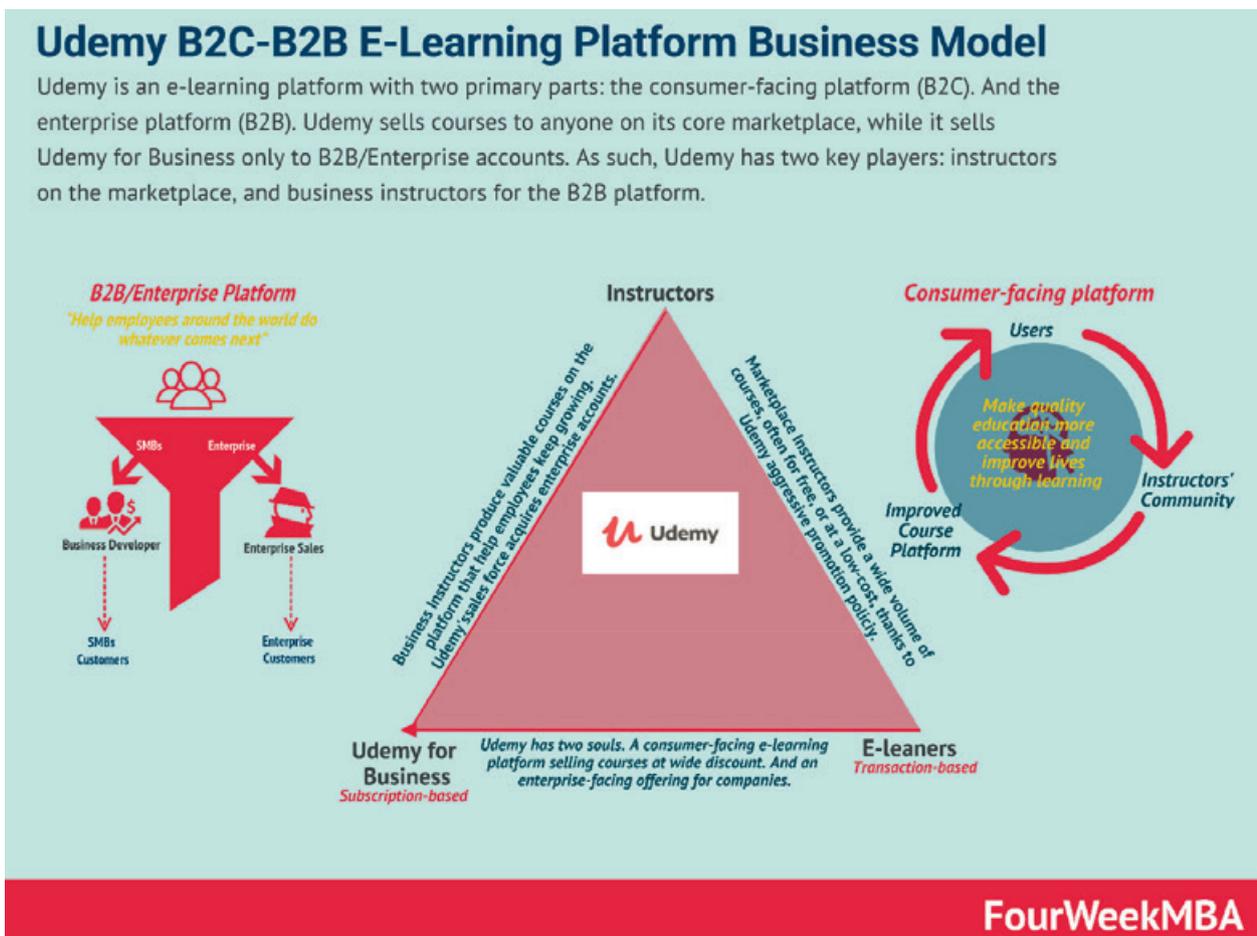


Fig. 2. Number of students on e-platforms in millions

ness to business B2C model [4]. Also Udemy has some courses for free, and this bring more students to the platform itself. With this approach, and by previously mentioned types of e-learning platform, we can see that Udemy has mixed different types into hybrid model, and by doing this approach has made a huge success and became a one of the leaders in e-learning business market.

For comparison, Udemy in 2015 had 8 million students, 32 000 courses and 18 000 teachers [5].

Today, Udemy in 2021 has 44 million students, 143 000 courses and 65 000 teachers.

Below is the chart of comparison with other popular e-learning platforms in term of quantity of courses provided on each of them.

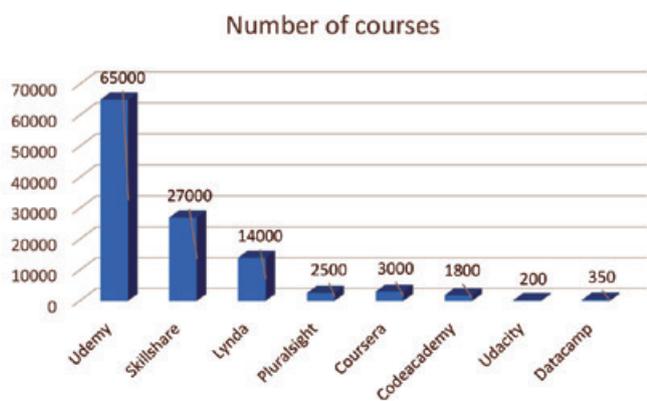


Fig. 3. Number of courses on e-platforms

As we can see on the graph above, Udemy is leader in providing the absolute biggest number of courses on e-learning platform. Following is Skillshare e-

learning platform with 27 000 courses, Lynda with 14 000 courses, then Pluralsight and Coursera with aproximalty 3000 courses, Codecademy with less than 2000 courses, Datacamp and Udacity respectively with 350 and 200 courses.

To analyze more deeply, here are the description in the table of pricing models and coverage of topics.

As we can see in the table above, pricing models are pretty similar except for some e-learning providers like Udacity where courses have period of couple of months to be attended. However, some providers also provide cooperation with Universities such is Coursera, where you can also enroll in degree program and earn an official university degree. When it comes to topics of courses, they also tend to be almost the same except for some e-learning providers like Pluralsight, Datacamp and Codecademy, which are specialized in certain topics like coding and database development.

Another comparative analysis needed to be done in order to get more information are number of students attending each of e-learning platforms.

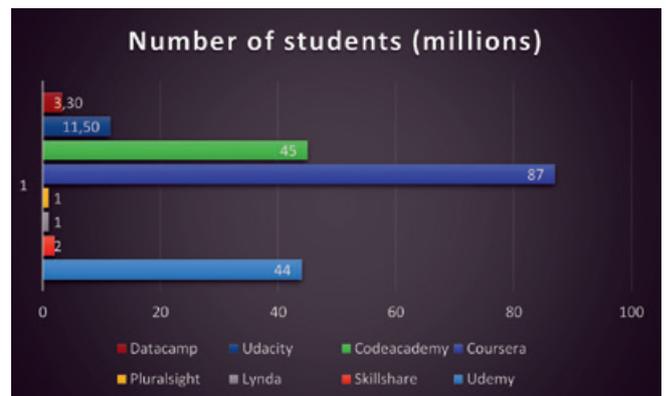


Fig. 4. Number of students on e-platforms in millions

Table 1. E-learning pricing models and coverage of topics

Name	Pricing model	Coverage of topics
Udemy	0-199\$ (mostly they are at 12\$)	Best Selling, Development, Design, Business, Personal Development
Skillshare	32\$ monthly	Animation/Creative, Business/Marketing, Lifestyle/Productivity
Lynda	\$25 monthly	Business, Creative, Technology
Pluralsight	\$35 monthly	Technology/Development
Coursera	30\$-80\$ monthly	Data Science, Business, Computer Science, Personal Development, Information Technology, Language Learning, Health, Social Sciences, Math and Logic, Physical Science and Engineering, Arts and Humanities
Codecademy	40\$ monthly	IT/Development
Datacamp	29\$ monthly	Database/Data Development
Udacity	718\$- 2154\$	Programming and development, Artificial Intelligence, Cloud Computing, Data Science, Business, Autonomous Systems, Career/Personal Development

On the graph above is presented the number of students in millions on e-platforms, where we can see disproportional numbers to the previously presented number of course categories and prices. For example, Coursera [6] has the highest number of students, 87 million enrolled in their course but the number of courses are 3000 compared to Udemy which has 65000 courses and 44 million students enrolled. However, what is symptomatic that with Coursera students can pursue the university degree and with Udemy it is not possible.

Another example which can prove paradigm that number of courses are not valid factor for gaining students is Codecademy [7], which has 45 million students with nearly 2000 courses. This proves that niche e-learning platforms are also viable in providing value, knowledge to students and contributing to the e-learning market share.

Another conclusion what can be reached from these comparative analysis is that Udacity [8] with high pricing courses has 11.5 million students. We need to mention that this e-learning platform has accomplished that success with 200 courses.

CONCLUSION

E-learning has proven to be mandatory part of human society. Pandemic that unfortunately occurred in 2020/2021 has just pushed the limit of introducing knowledge to students. With understanding fast developing technology, we should embrace the new methods of grasping knowledge and sharing the knowledge with others.

In this science paper, was researched the future possible development of e-learning platforms, also was analyzed the current e-learning leaders with their various approaches, including number of courses, financial models and knowledge areas that are being covered.

We can conclude that e-learning has bright future, with making students grasp knowledge in easy

and understandable way. Also, teachers are assimilating to the new technologies, using it to provide quality content for students and taking advantage of the e-learning platforms to make it possible to validate students' knowledge and track progress of each student.

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Nedeljko Šikanjić holds a Magister degree in Informatics and Computer Science and has worked for more than 15 years as a Software and Database Architect/Engineer. His main fields of studies are in the area of advanced Databases and Software Architectures. He has been a holder of an active Microsoft Certified Trainer Certificate since 2012 and has been teaching courses on various topics in Information Technologies. Doctoral studies of the third degree enrolled in the academic 2017/2018.



Zoran Ž. Avramović was born in Serbia, on September 10, 1953. He finished elementary school and high school in Loznica with great success. He was awarded several diplomas by Nikola Tesla and Mihailo Petrović Alas. He graduated on time at the University of Belgrade - Faculty of Electrical Engineering, with an average grade of 9.72 in five-year studies. He received his master's degree at that faculty (all excellent grades, exams and master's degrees), and then obtained a doctorate in technical sciences (in 1988). As an excellent student of the University, he had the right and at the same time studied mathematics at the Faculty of Mathematics in Belgrade. He was the champion of Serbia in mathematics ("first prize") and Yugoslavia in electrical engineering ("gold medal").

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