

Usability evaluation of MOOC platforms

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<p>In recent years, the popularity of massive open online courses (MOOC) has increased significantly. MOOCs are one of the most promising and controversial trends in education for the last decade. Supporters tell that MOOC revolutionized traditional face-to-face learning process. Opponents think that this type of education has no future because completion rates are extremely low, and it hurts to high education standards. However, it is difficult to object that this type of open online courses opens new possibilities for distance learning and crushes geographical and time barriers.</p> <p>The objective of this thesis paper is to evaluate overall user satisfaction of top three MOOC providers – Coursera, Udacity, and edX.</p> <p>The framework of the thesis includes history and main milestones in the development of distance education, history of massive open online courses (MOOCs), MOOC structure, and different types of MOOC. Theoretical background also contains usability theory. Thesis research work includes questionnaire designing phase, results gathering process, and analysis of the research findings.</p> <p>Findings of the research show levels of user satisfaction and its comparison among three MOOC platforms.</p>	
Keywords MOOC, usability, usability testing, website user satisfaction, distance learning, massive open online courses	

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Terms and Abbreviations

CSS	Cascading Style Sheet
HTML	Hyper Text Markup Language
IT	Information Technology
JavaScript	Dynamic programming language
LMS	Learning Management System
MOOC	Massive Open Online Course
PLE	Personal Learning Environment
Python	High-level programming language
VLE	Virtual Learning Environment

1 Introduction

In recent years, the popularity of massive open online courses (MOOC) has increased significantly. MOOCs are one of the most promising and controversial trends in education for the last decade. Supporters tell that MOOC revolutionized traditional face-to-face learning process. Opponents think that this type of education has no future because completion rates are extremely low and it hurts to high education standards. However, it is difficult to object that this type of open online courses opens new possibilities for distance learning and crushes geographical and time barriers.

Massive open online courses give an opportunity to participate in high-quality courses organized by top universities mostly for free for everyone who is interested in it. On the one hand, this is a powerful tendency in global education. MOOCs actively use modern technologies, mobile and network services to support users' learning process. On the other hand, MOOC challenges traditional high education, and that may change usual way of learning entirely.

Nowadays, many universities around the world develop MOOC. Online courses is a very useful learning tool for those students who are willing to grow professionally in the era of the fast-changing digital world.

1.1 Research goals and research questions

The purpose of this thesis paper is to evaluate the user experience satisfaction level of three top MOOC providers – Coursera, Udacity, and edX.

The research aims to know the user satisfaction level of the user-system interaction process. What are students' opinions about the leading MOOC platforms? How do they feel what is right and wrong with the platforms in general? Is it easy to navigate through the course? Are there any errors? Do website pages load quickly? Does platform support all the expected functionalities and capabilities?

These questions help to evaluate and to compare top MOOC providers from the point of users who differently perceive these complicated educational learning tools.

The research scope includes theoretical background, questionnaire designing phase, results gathering process, analysis of the research findings and conclusion.

2 Massive open online courses

In this chapter, the author will briefly cover history and trends in distance learning, and will look at MOOC phenomenon more carefully and thoroughly. This section contains history and trends in distance education, history of MOOC and its definition, information about leading MOOC platforms (Coursera, Udacity, edX) and structure of the typical online course. The author also compares two main different MOOC approaches: xMOOC and cMOOC.

2.1 History and trends in distance education

The term “distance education” defines the form of education that provides learning materials to the students who are not physically present in the classroom. In other words, teacher-student interaction is carried out remotely. (Bates 2008).

The idea to provide education remotely is not new. Forms and methods of distance learning follow the evolution of technology.

Bates (2005) and Peters (1994) distinguish three stages of distance education:

- Print-based correspondence education. During this stage printed tests and learning materials were delivered to the students via postal services;
- During the industrial era several universities used broadcast media – television and radio – to deliver educational programs to a mass audience;
- The third stage uses computer technologies to interact with the students – through external storages or web-based applications.

According to Taylor (2001) there are five generations of distance learning:

- First generation – the correspondence model based on print technologies;
- Second generation – the multi-media model based on print, audio, and video technologies;
- Third generation – the telelearning model based on telecommunication technologies;
- Fourth generation – the flexible learning model based on Internet delivery;
- Fifth generation – the creative, flexible learning model based on the interactive nature of the Internet.

For the last decade main trends in distance learning are:

- Blended learning – educational approach that combines two systems: traditional face-to-face lectures and online learning (Tucker 2013);
- Technology Web 2.0 – technologies to organize web resources for educational process (Waldrop 2008);
- Mobile technology (m-learning) – type of e-learning via mobile devices (smartphones, tablets) and wireless networks;
- Augmented reality – technology to overlay information on a real world picture and to support new ways to access information (Maxwell 2010);

- MOOC (massive open online course) – open online courses for a significant number of students, mostly free.

2.2 MOOC definition

Acronym MOOC stands for the massive open online course. MOOCs are online courses with video lectures, interactive assignments, homework, and exams. Students watch videos, study learning materials, complete quizzes, and tests, and participate in course discussion forums. Courses are created by professors from leading universities or professionals in their area of expertise. Number of students can vary significantly from one course to another and may be up to hundreds of thousands. Many universities all over the world actively create and develop own MOOC platforms.

Acronym “MOOC” includes four separate terms:

- Massive. Theoretically, can support unlimited number of students;
- Open. Courses are mostly free and open for everyone;
- Online. Asynchronous or synchronous access to course materials through the Internet;
- Course. Set of learning activities that pursue educational goals.

Typically, courses are divided into modules. Every module consists of theoretical material, interactive assignments and tests, different training sessions and virtual labs. Small tasks every 5-10 minutes help to keep students' motivation high. Average course length is 6-10 weeks. One module takes one week (3-4 hours of learning). An entire course contains around 500-1000 minutes of theoretical material.

The number of new MOOC users is growing every year. Now a total number of courses are more than 4,200 on different platforms and MOOC user base about 35 million. Some MOOC platforms recently started to provide learning certificates for a small price, and some of them began to award academic credits or even full degrees. (Shah 2015)

MOOC aimed to replace traditional educational process, but now they are actively used as a tool for blended learning. Blended learning means that course theory is available online, and face-to-face learning is used for practice.

2.3 History of MOOC

For the first time, the term ‘MOOC’ was coined in 2008 by David Cormier during the conversation with his colleges. (Cormier 2008) Around that time, the first MOOC was created.

It was “Connectivism, and Connected Knowledge” (CCK08) by George Siemens and Stephen Downes. Initially, it was designed for their own group of students, but they decided to open it for anyone for free. Around 2300 people enrolled for CCK08. It showed that people are interested in this type of learning. (Marques 2013)

Three years after CCK08, Sebastian Thrun and Peter Norvig from Stanford University opened access to their Stanford course “Introduction to Artificial Intelligence”. On this course enrolled more than 160,000 students. By the creators’ opinion it was a success. Sebastian Thrun created MOOC platform Udacity. (Marques 2013)

The interest from students as well as from universities in this type of online education was apparent and in the following years so-called “MOOC boom” began. In 2012 were created Coursera and edX. In 2013, universities from the United Kingdom opened own MOOC platform FutureLearn. MOOCs and open education timeline is shown on picture 2.4-1.

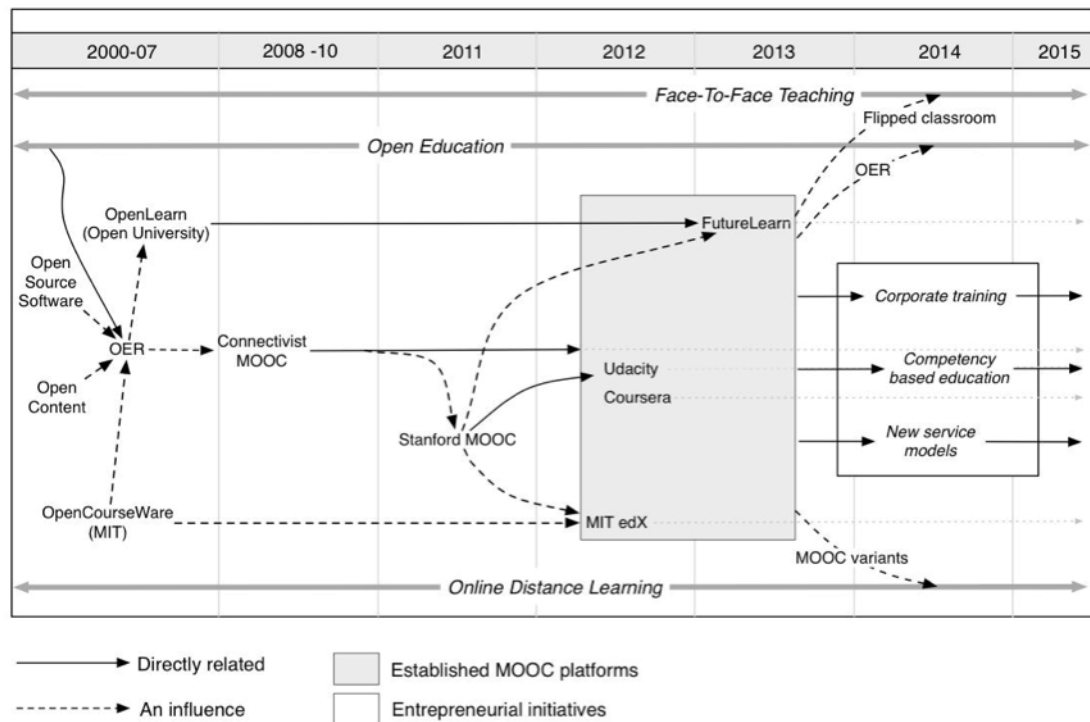


Figure 2.3-1. MOOC and Open Education Timeline. (Powell & Yuan, 2015)

2.4 MOOC platforms

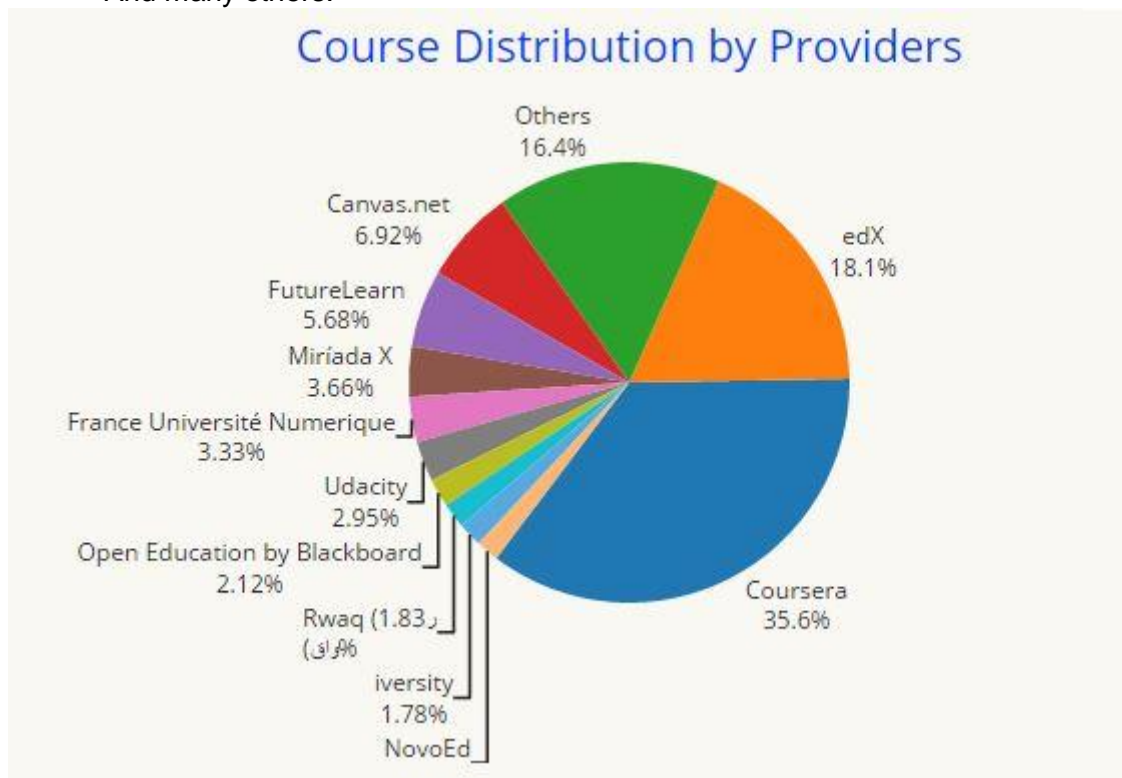
The term “educational platform” is typical for learning services in the digital environment. In most cases, it is a software or online application that provides tools to support the educational process. Some examples are:

- Learning management system (LMC) allows to create and manage online courses, to register new users, to plan the flow of the courses, to upload learning materials, to edit and moderate discussion forums and blogs, to evaluate students' performance. Two most popular are Moodle and Sakai;
- Virtual learning environment (VLE). It is a tool that supports a student's learning process using digital media and the Internet. Examples are Blackboard, Lotus Learning Space;
- Personal learning environment (PLE) is a system that helps learners to manage their learning – set their learning goals, manage their learning process and content, communicate with others students.

Further MOOC development depends on the development of educational platforms. At the moment, the variety of the platforms which provide and organize MOOC is quite wide. MOOC providers' market share by a number of offered courses is shown in picture 2.4-1.

Many universities in different countries recently developed own platforms or adapted, for example, edX open source platform for their needs. Here are the most popular ones:

- For-profit Coursera, leading MOOC platform by the number of students and variety of the courses;
- Non-profit edX created by Harvard and MIT, open source code platform;
- For-profit Udacity, one of the xMOOCs pioneers;
- British FutureLearn by OpenUniversity;
- Online collection of Massachusetts Institute of Technology course materials MITOpenCourseWare, one of the cMOOC pioneers;
- KhanAcademy. Platform with educational approach based on interactive education and gamification;
- Udemy, where anyone can create own courses;
- And many others.



Picture 2.4-1. Course distribution by provider. (Shah 2015)

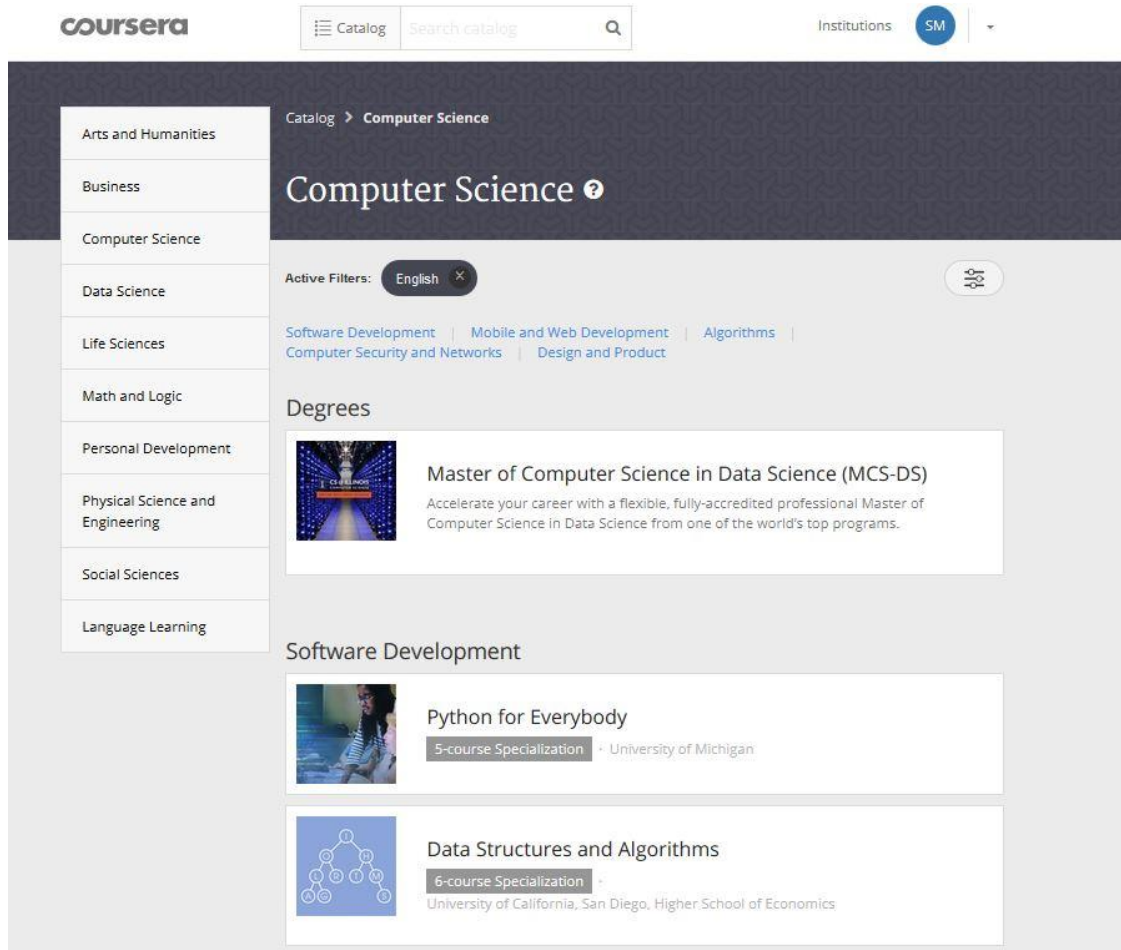
2.4.1 Coursera

Coursera is a for-profit company and has a great collection of courses that is still growing fast. The platform was created from scratch in 2013.

At the moment, Coursera is the largest of MOOC providers and has 17 million students in total. (Shah 2015) Coursera mission is to provide access to the world's best education from top universities and organizations worldwide and to offer courses online for anyone to take. More than 100 leading universities and organizations from around the world are Coursera contributors or partners. (Coursera Inc., About, 2016)

Student workplace is any computer with a web-browser and Internet access. In December 2013 Coursera introduced mobile version. The company also organizes modern educational centers in those countries where difficult to study online from home.

Typical Coursera course consists of short video lectures, reading materials, homework assignments, quizzes, and tests, peer-graded assessments and final exams. After every lesson, students have to pass tests or assignments. Usually, every test or assignments have a strict deadline. Students can interact with fellow class listeners on discussion forums and social media.



Picture 2.4.1-1. Coursera course catalog page (URL: <https://www.coursera.org/browse/computer-science>. Accessed: 12 May 2016)

Recently Coursera started a new business model – Coursera Specialization. It is interrelated courses for a particular topic. After all courses on a Specialization track are finished, a student can get a final certificate as well as separate certificates for each completed course. An example of “Python for everybody” Specialization is shown on the picture 2.4.1-2 below.



About This Specialization

This Specialization builds on the success of the Python for Everybody course and will introduce fundamental programming concepts including data structures, networked application program interfaces, and databases, using the Python programming language. In the Capstone Project, you'll use the technologies learned throughout the Specialization to design and create your own applications for data retrieval, processing, and visualization.

Created by:  UNIVERSITY OF MICHIGAN

Industry Partners



4 Courses

Complete 4 courses in the suggested order.

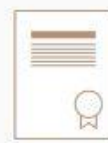
+



Capstone Project

Tackle the Capstone Project, designed to apply skills you've learned.

=



Certificate

Earn a Certificate to share your success with the world.

Courses



Beginner Specialization. No prior experience required.

Picture 2.4.1-2. Coursera Python Specialization page

(URL: <https://www.coursera.org/specializations/python>. Accessed: 12 May 2016)

This Specialization was developed by University of Michigan. This track consists of four courses and a final project. Specialization overview describes topics and technologies that student will learn, courses, creators and pricing.

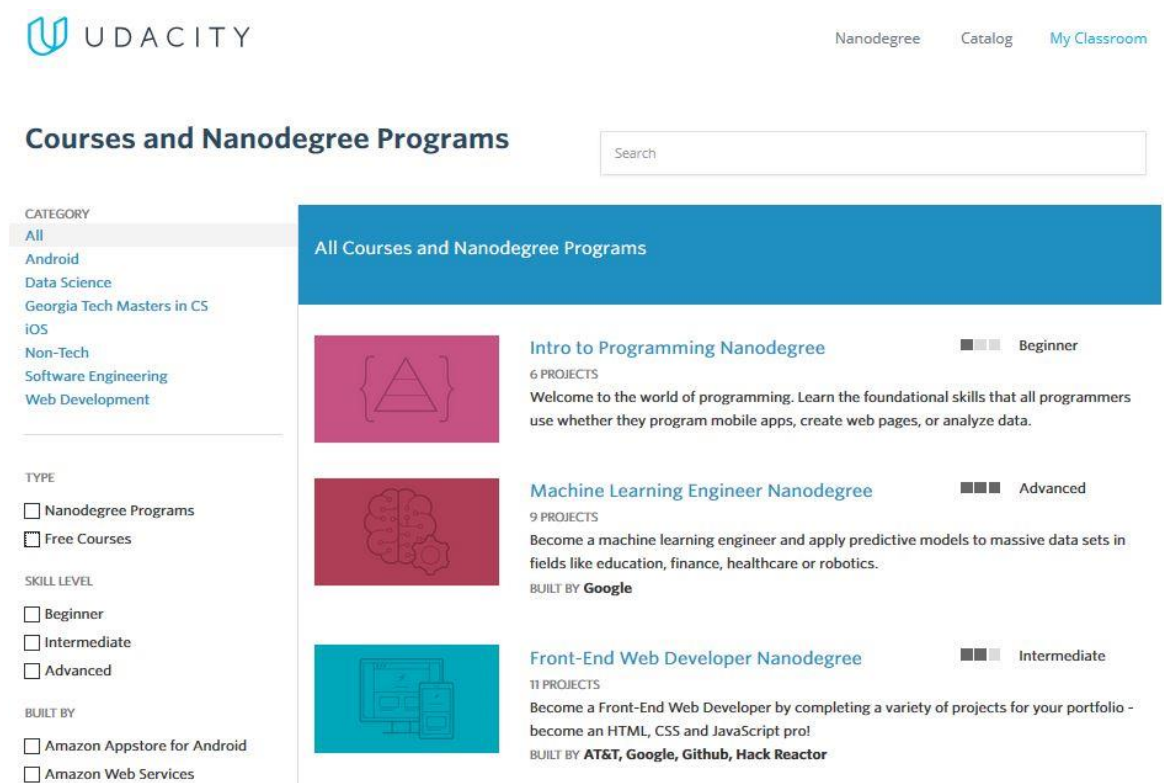
Some Coursera courses or some of the course content demand investments. There are different payment options: students may purchase all courses from one Specialization or each course individually.

Recently Coursera also started experiments with courses on-demand. These courses do not have strict dates or deadlines, and anyone can register for the course whenever he or she wants. The main distinction of these courses is the absence of time limits.

2.4.2 Udacity

Udacity is a for-profit educational platform created by Stanford University. Its mission is to provide affordable, engaging and effective higher education to the world. (Udacity Inc., About Us, 2016)

Udacity has a great collection of video tutorials and learning activities. All courses have a summary, an indication of skill level that is required for a course, prerequisites, and information about what will a student learn in the course. Every course consists of video tutorials, interactive assignments, exercises, and quizzes. The final grade is determined by students' overall performance during the course and final exam.



The image shows the Udacity course catalog page. At the top left is the Udacity logo. To the right are links for 'Nanodegree', 'Catalog', and 'My Classroom'. Below the logo is the heading 'Courses and Nanodegree Programs' and a search bar. On the left side, there are filter sections: 'CATEGORY' with options like 'All', 'Android', 'Data Science', 'Georgia Tech Masters in CS', 'iOS', 'Non-Tech', 'Software Engineering', and 'Web Development'; 'TYPE' with checkboxes for 'Nanodegree Programs' and 'Free Courses'; 'SKILL LEVEL' with checkboxes for 'Beginner', 'Intermediate', and 'Advanced'; and 'BUILT BY' with checkboxes for 'Amazon Appstore for Android' and 'Amazon Web Services'. The main content area displays three course cards. The first is 'Intro to Programming Nanodegree' (Beginner, 6 projects) with a description: 'Welcome to the world of programming. Learn the foundational skills that all programmers use whether they program mobile apps, create web pages, or analyze data.' The second is 'Machine Learning Engineer Nanodegree' (Advanced, 9 projects, built by Google) with a description: 'Become a machine learning engineer and apply predictive models to massive data sets in fields like education, finance, healthcare or robotics.' The third is 'Front-End Web Developer Nanodegree' (Intermediate, 11 projects, built by AT&T, Google, Github, Hack Reactor) with a description: 'Become a Front-End Web Developer by completing a variety of projects for your portfolio - become an HTML, CSS and JavaScript pro!'.

Picture 2.4.2-1. Udacity course catalog page.

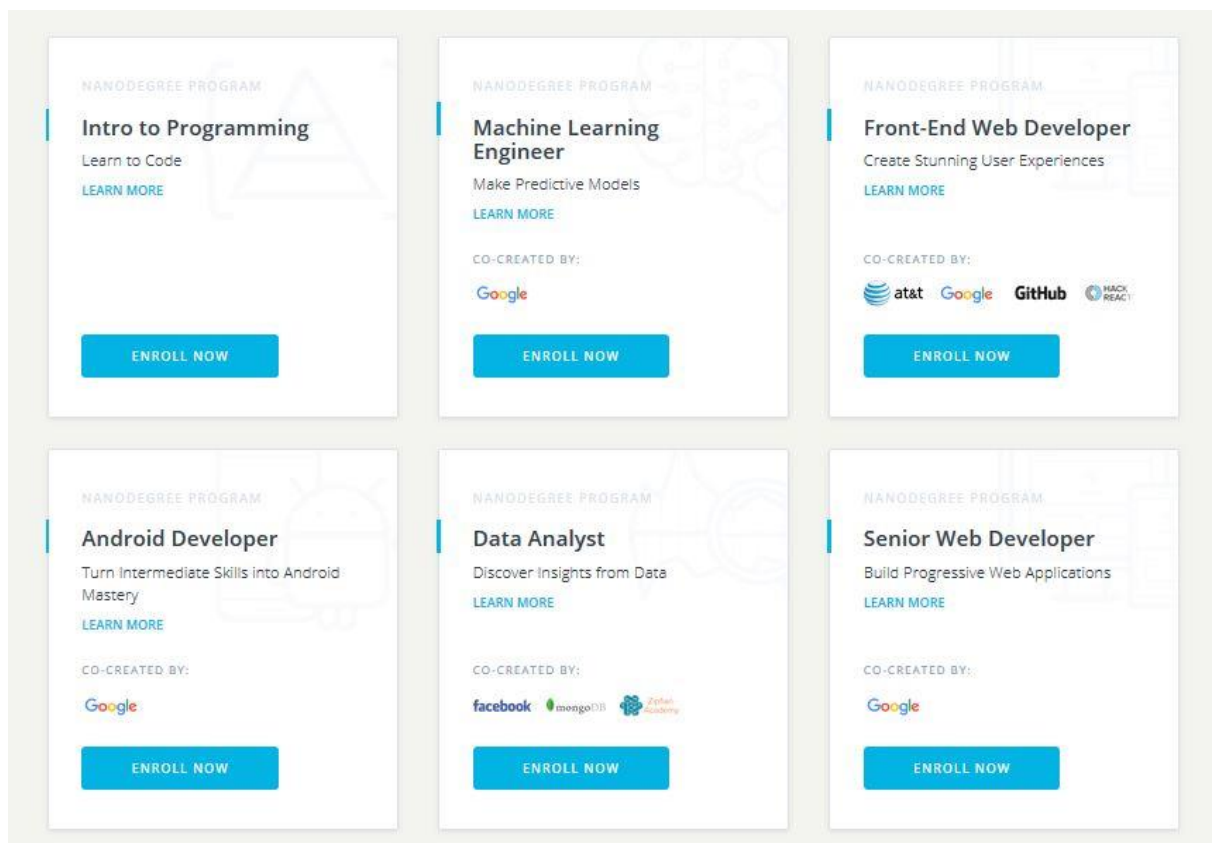
(URL: <https://www.udacity.com/courses/all>. Accessed: 20 April 2016)

As we can see from the picture 2.4.2-1 in the course catalog students can filter courses by type, skill level, or technology topic.

Udacity Nanodegree program resembles Coursera specialization model. It is a curriculum path that is outcome-based and career-oriented. Courses are created by prominent companies like Google or Facebook and are taught by experts. Listeners can get personalized mentoring. The goal of Nanodegree program is to provide a set of skills student needs to be able to start his or her successful career. (Udacity Inc., Nanodegree, 2016)

Nanodegree takes 12 months or more time. Student gets personalized feedback and support from course teachers. General requirements for a student are self-motivation to learn, meeting deadlines and spending at least 10 hours per week on learning. (Udacity Inc., Nanodegree, 2016)

At the moment, Udacity has 16 Nanodegree programs, and they are all computer technologies related. Some of them can be seen on picture 2.4.2-2 in Udacity Nanodegree catalog.



Picture 2.4.2-2. Udacity nanodegree page.

(URL: <https://www.udacity.com/nanodegree>. Accessed: 20 April 2016)

An example of Front-End Web Developer Nanodegree program syllabus is on picture 2.5.2-3.

Nanodegree Program Syllabus

The image displays a grid of six project cards from the Nanodegree Program Syllabus. Each card is titled 'PROJECT' and contains a project title, a brief description, and a list of supporting courses.

- Project: Build a Portfolio Site**
You will be provided with a design mockup as a PDF-file and must replicate that design in HTML and CSS. You will develop a responsive website that will display images, descriptions, and links to each of the...
- P2: Interactive Resume**
You will develop an interactive resume application that reads your resume content from a JSON file and dynamically displays that content within a provided template. You will use objects, functions, conditionals, and control structures to compose the...
- P3: Classic Arcade Game Clone**
You will be provided with visual assets and a game loop engine; using these tools you must add a number of entities to the game including the player characters and enemies to recreate the classic arcade game Frogger.
- P4: Website Optimization**
You will optimize a provided website with a number of optimization- and performance-related issues so that it achieves a target PageSpeed score and runs at 60 frames per second.
- Project: Neighborhood Map**
You will develop a single-page application featuring a map of your neighborhood or a neighborhood you would like to visit. You will then add additional functionality to this application, including: map markers to...
- P6: Feed Reader Testing**
In this project you are given a web-based application that reads RSS feeds. The original developer of this application clearly saw the value in testing, they've already included Jasmine and even started writing their first test suite! Unfortunately, they...

Picture 2.4.2-3. Front-End Web Developer Nanodegree program.

(URL: <https://www.udacity.com/course/front-end-web-developer-nanodegree--nd001>. Accessed: 20 April 2016)

This program co-created by several prominent companies and takes about 252 hours. Students will master the skills required to become a front-end web developer and will gain knowledge of the three languages: HTML, CSS, and JavaScript. Nanodegree is divided into six projects and every project consists of several courses. Classes are free to learn, but the student can get more personalized mentoring from for a price. (Udacity Inc., Front-End Web Developer Nanodegree, 2016)

2.4.3 EdX

EdX is a non-profit initiative launched in 2012 by Harvard University and MIT. Its mission to increase access to high-quality education, enhance teaching and learning on campus and online, advance teaching and learning through research. (edX Inc., About Us, 2016)

In 2012 Harvard University and Massachusetts Institute of Technology signed an agreement to develop and implement own MOOC provider, offering courses from the world's best universities and institutions. Nowadays edX has more than 90 course's contributors and partners.

EdX is an open source platform. It is the main difference from Udacity and Coursera, and it is the only leading MOOC provider that is both non-profit and open source. edX code is freely available for everyone and institutions can use it and create their own classes.

EdX offers interactive online courses. At the moment of writing this thesis paper, there were 959 courses available. Picture 2.4.3-1 shows edX course catalog.

The image shows a screenshot of the EdX course catalog page. It features a grid of course cards and a sidebar for refining search results.

Featured Courses:

- HarvardX CS50x:** Introduction to Computer Science. Status: Current, Self-Paced.
- ETSx TOEFLx:** TOEFL® Test Preparation: The Insider's Guide. Status: Starting Soon, June 13, 2016.
- Microsoft DAT206x:** Analyzing and Visualizing Data with Excel. Status: Current, Self-Paced.
- UC3Mx IT.1.1x:** Introduction to Programming with Java Part 1: Starting to Code with Java. Status: Current, Self-Paced.
- CatalystX IL5x:** Inclusive Leadership Training: Leading with Effective Communication. Status: Current, April 19, 2016.
- IDBx IDB6.1x:** Project Management Techniques for Development Professionals. Status: Current, April 26, 2016.

Refine your search:

Availability	Count
Current	328
Starting Soon	106
Upcoming	81
Self-Paced	322
Archived	444

Subjects	Count
Architecture	12
Art & Culture	70
Biology & Life Sciences	97
Business & Management	157
Chemistry	28
Communication	50
Computer Science	207
Data Analysis & Statistics	87
Design	8
Economics & Finance	99
MORE...	

Courses & Programs	Count
Verified Courses	782
XSeries Programs	148
High School	70
Professional Education	37
Credit	9

Picture 2.4.3-1. EdX Course catalog page.

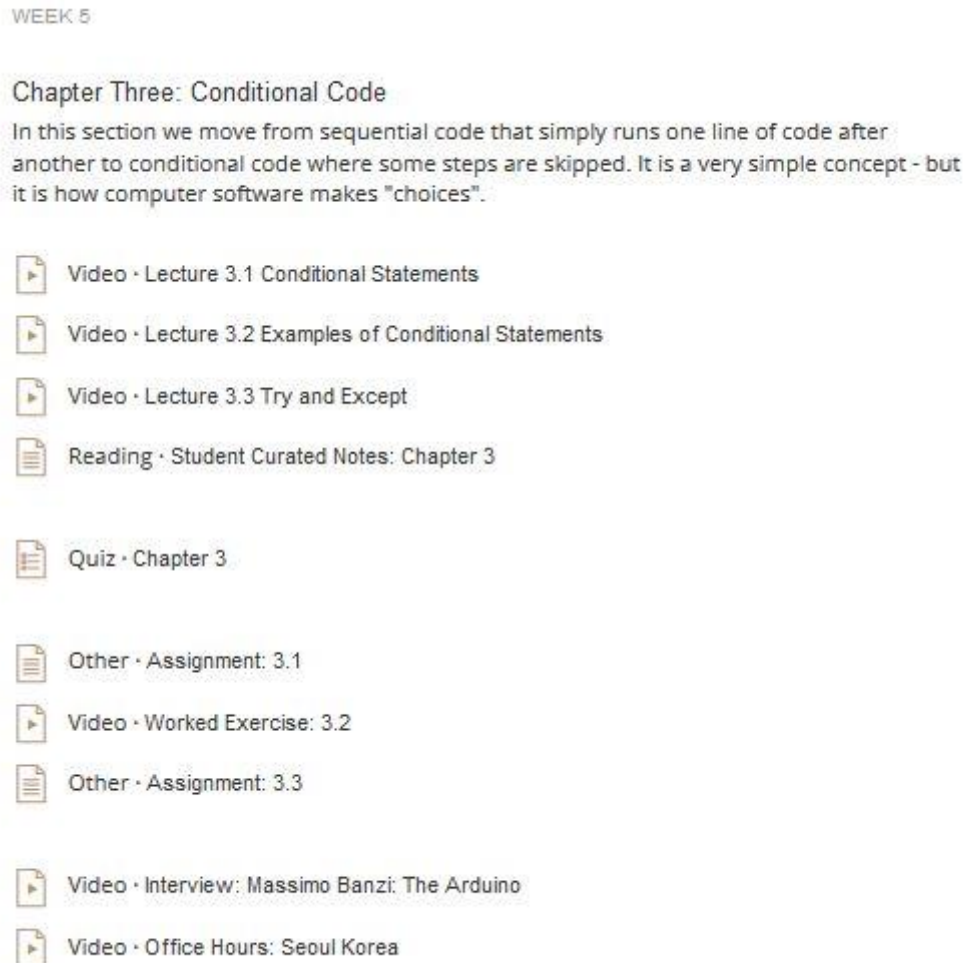
(URL: <https://www.edx.org/course>. Accessed: 20 April 2016)

Courses can be filtered by availability, subjects, schools, partners, programs, level or by language.

EdX gives a possibility to earn academic credits for several courses. These courses are free, but to get a verified certificate costs \$99.

2.4.4 Elements of MOOC

Let's take a brief look at the variety of assignments and elements of course content in typical MOOC. An example of course syllabus is on picture 2.4.4-1.



Picture 2.4.4-1. Coursera course syllabus example. (URL: <https://www.coursera.org/specializations/python> Accessed: 20 April 2016)

Reading materials.

Instructors provide lists of reading materials. It can be books, which students can borrow in the library or buy in local bookshops. Sometimes course does not have compulsory

reading materials. In most cases the list of literature is a list of links to articles in specialized journals, video on YouTube, materials, and booklets from different conferences and presentations.

Video lectures.

Usually, it is just a course instructor who explains the new material, shows and comments presentation slides or does an example on a computer. Videos can be downloaded, and most of the videos have subtitles in different languages. Graphic materials are usually in pdf format. One video lecture is about 1.5-2 hours long and is divided into small 10-15 minutes pieces. Usually during the lesson self-proving tests help to remember and to understand new information. These tests do not affect course grade. A student can watch video unlimited times as long as they are available on the course page.

Tests.

Tests usually consist of multi-choice questions. The number of questions can vary depending on the course. Students have several attempts to pass it or to improve their grade. Every right answer gives points. The system remembers the best attempt. Some courses give penalty points for additional attempts.

Essay.

It is a written assignment on a particular topic. An essay must be submitted before the deadline in digital format online. It can be uploaded for evaluation and remarks earlier and after that can be rewritten or improved. Only the final paper will be evaluated.

Peer-to-peer evaluation.

A student gets other student paper for evaluation. One student can get up to 5 essays. The deadline for evaluation is strict. If the student did not evaluate work of other students his or her essay's grade can be lower, for example, for 20%.

Final exam.

Not every course has a final exam. Most courses evaluate students' performance by course assignments only. Usually, final exams are limited by time.

Evaluation.

Every course has its criteria for final grade evaluation. To pass the course, the student has to score not less than 70-80% of the maximum amount of points. For example, course Gamification on Coursera has the following criteria:

- Multi-choice assignments and tests – 35% of the final grade;

- Peer-to-peer essay evaluation – 35% of the final grade;
- Final exam – 30% of the final grade.

Final certificate.

Those students who successfully passed the course can get a certificate with teacher's signature in digital form. Depending on the course the certificate can contain information on student's course grade or just that the course was completed successfully. Academic credits usually are not awarded for MOOC.

Tutoring.

The course's creators have to organize communication between themselves and students. The most popular way is to use discussion forums. Sometimes course staff or students create public pages in social networks. Coursera students also can use web-site Coursera Meetups. Since the users are geographically dispersed, this site can help them to communicate and to meet up in different places around the world.

2.5 xMOOC vs. cMOOC

There are different types of MOOCs depending on pedagogical approach: xMOOC and cMOOC.

xMOOC model resembles traditional face-to-face learning. Courses are developed by professional teachers and instructors. They have a strict schedule, deadlines and different types of students' evaluation. (Bates 2013) Coursera, Udacity, and edX platforms are examples of xMOOCs.

cMOOC is based on the interaction between course's listeners and their discussion on different course topics. Knowledge is not delivered by the individual teacher, but all users contribute to the course and learn together. These courses are appropriate for those listeners who are motivated for self-education. (Bates 2013) Examples of cMOOC are blogs, public pages in social media, wiki pages.

3 Usability Theory

The following chapter discusses usability theory: several definitions of usability, quality features of usability, the importance of usability testing and usability in learning services.

3.1 Usability definition and quality features of usability

Usability is a characteristic of a product which is determined how easy for a new user to understand how to do and what to do with a product and how comfortable and convenient for an old user to work it.

The international standard ISO 9241-11 defines usability as: “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”.

Web-usability means how convenient to use a web-site. If web-site has wrong categorization and complicated navigation users will be feel lost and leave the page. If a user cannot accomplish a task or figure out where to go on the website and how it works, he or she feels frustration and also leave.

Jacob Nielsen defines web-usability as a quality attribute of a system that determines how easy to use system’s interface. (Nielsen 2012)

A product with a lack of usability may be hard to operate. A website interface with usability flows may be inconvenient to surf, and a new user even may get lost there.

Nelsen (2012) distinguishes five quality features of usability:

- Learnability – Is it easy for a new user to perform tasks in the system?
- Efficiency – How quickly users can accomplish tasks after they adapted to the system design?
- Memorability – How quickly a user can re-establish skills to work with the user interface after a period of absence?
- Errors – How many errors do users make, how critical are these errors, and how quickly can users recover from them?
- Satisfaction – How friendly is the system design?

3.2 Usability testing

Usability testing is a set of methods and techniques to measure characteristics' of user-product interaction and to identify problems. (Churm 2012) Usability evaluation is important to understand product's flows and to improve it before the final version of product design. Different evaluation methods uncover different kinds of problems.

ISO standard 9241 recommends following usability metrics:

- Effectiveness is the accuracy and completeness with which users achieve specified goals. Example metrics include: percentage of goals achieved, functions learned, and errors corrected successfully. (Mifsud, 2016)
- Efficiency assesses the resources expended in relation to the accuracy and completeness with which users achieve goals. Example metrics include time needed to complete a task, time to learn how to use a system or a product, and time spent correcting errors. (Mifsud, 2016)
- Satisfaction shows how comfortable for a user to work with a system or a product and acceptability of use. Example metrics include: ratings for satisfaction, ease of learning, and error handling. (Mifsud, 2016)

3.1 Usability of educational systems

User interface in educational learning environment consists of three core parts:

- Visual area – system interface;
- Functionality of educational system, including tools to perform learning activities;
- User-system interaction process.

Quite often software developers focus more on functionality and forget about user interface and user-system interaction process. Users of a system usually do not recognize the difference between functionality and system interface. They think that user interface is an actual program because they perceive working with an application as working in a system interface.

User interface of educational systems must follow the core usability rules:

- User should be able to learn how to interact with the system;
- Interface must be intuitive; user does not have to think about how to work with it;
- Educational process has to be uninterrupted and allow to work smoothly;
- Instructions must be clear and understandable;
- User actions do not lead to situation when user do not know how to proceed;
- Content have to be succinct and comprehensible;
- User has to be able to correct his or her mistakes in a fast manner;
- Site navigation has to be intuitive;
- User has to be able to track own educational progress.

4 Empirical part

This section contains a description of the research methodology, questionnaire planning and distribution phase, and data gathering process.

4.1 Research methodology

There are two main types of academic research: quantitative and qualitative research.

Qualitative research aims to gain an understanding of underlying reasons and motivations, to gather ideas and to provide insights into a problem. Data collected using unstructured or semi-structured techniques e.g. individual interview or group discussions. (Qualitative vs. Quantitative Research 2016)

Quantitative research quantifies data and to measure opinions in a significant number of cases. Respondents are selected in a random manner. Data collected using structured techniques such as an online questionnaire. Results are usually in the form of tabulations. (Qualitative vs. Quantitative Research 2016)

For this research quantitative research method was chosen.

Methodology of this research is based on evaluation of user satisfaction level and consists of following steps:

- To develop a questionnaire;
- To distribute questionnaire;
- To analyze results;
- To evaluate user satisfaction for each platform;
- To compare user satisfaction.

4.2 Questionnaire planning and designing phase

A questionnaire is a traditional method of quantitative research. It allows to reach out a large number of respondents and to gather data for a short time.

The questionnaire was designed to collect quantitative data. Participants' answers represent their subjective opinion about the systems. The whole bunch of answers shows objective overall user satisfaction from the systems. The questionnaire does not require personal information and guarantees the confidentiality of participants' responses.

The set of questionnaire's statements were designed by combining several metrics to measure user satisfaction of educational systems correctly. The survey consists of five questions to collect data for respondents' profile, fifteen usability evaluation statements for each platform, one question about entire system usage satisfaction and one open-ended question for each platform.

To measure user satisfaction 5 points Likert scale was used. (Finstad 2010) The response format ranges from Strongly Disagree to Strongly Agree.

Table 4.2-1 shows questionnaire usability statements.

Site navigation and structure:	The website is easy to navigate Desired information easy to find It is easy to know in which part of the course you are currently on Links are clearly identifiable
Technical side of the site:	The site does not have technical errors The site's pages load quickly
Site visibility and organization:	The site's design is appropriate The organization of the site's information is appropriate The site's interface is pleasant
Site functionality:	The site supports all the expected functionalities The site supports all the expected capabilities
Site effectiveness:	The site offers tools that enrich the learning experience The site provides the user with varied activities that promote learning
Site content:	Forums and discussion tools on the website are useful Courses have a good and consistent level of quality
User's satisfaction:	How would you qualify Udacity / Coursera / edX? How would you improve Udacity / Coursera / edX?

Table 4.2-1 Questionnaire usability statements.

4.3 Questionnaire distribution and data gathering phases

This questionnaire was created using online survey service and a browser with Internet access. The service let quickly collect and organize participants' answers.

The link to online questionnaire was posted to various MOOC-related public pages: Coursera Facebook page, Udacity Facebook page, edX Facebook page, and Facebook groups: MOOCS Addicts, MOOC collaboration Network, MOOC Forum, MOOCs. Link also was posted in VK social network (group "MOOC education"). On Reddit was created topic with link to questionnaire.

The data were saved automatically on the service's server after participants completed their answers.

5 Findings

This chapter provides the results of the survey. The data shows respondents' profile and survey findings with charts, tables, and author's comments.

5.1 Profile of the survey respondents

The questions were aimed to ask the respondent's gender, age, level of education, occupation and level of computer expertise. This information helped to understand the degree of user skills and knowledge. The results are shown in Table 5.1-1 and the following figures.

A total number of respondents were 61. Among them were almost equal number of male and female respondents – 49.2 percent (n=30) and 50.8 percent (n=31) respectively. Age of the participants is in the range from 18 to 44 years. The biggest part of respondents' answers – 52 percent (n=32) were between 18 to 29 years. 48 percent (n=29) were in the age group from 30 years to 44 years. No one of the participants was younger than 18 or older than 44 years.

Gender (61 responses)

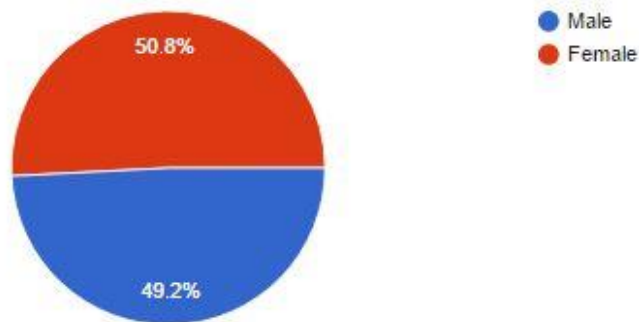


Figure 5.1-1. Respondents' gender.

Age (61 responses)

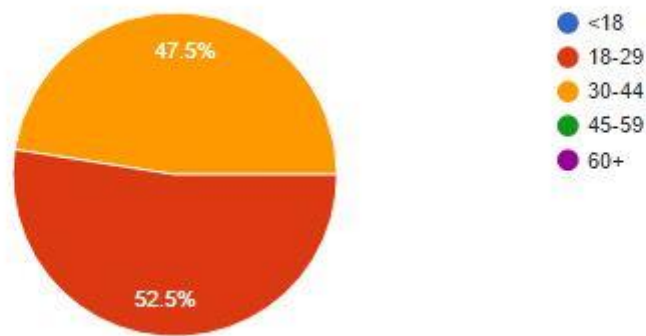


Figure 5.1-2. Respondents' age.

The respondents' level of education was quite high. Master's or professional degree have 34.4 percent (n=21) of the participants, Bachelor's degree have 39.3 percent (n=24), and secondary or high school finished 26.2 percent (n=16).

What is your level of education? (61 responses)

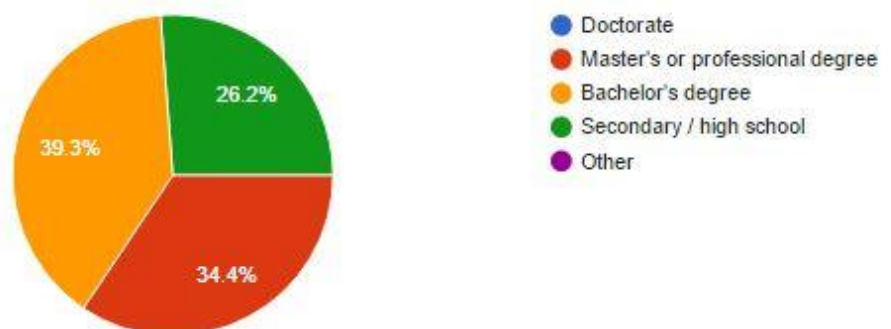


Figure 5.1-3. Respondents' level of education.

Among 61 respondents, 54.1 percent (n=33) are employed and are working full-time or part-time. 21.3 percent (n=13) are not employed, but looking for a job. No one of the respondents is retired. Percentage of not employed students is 11.5 (n=7). 13.1 percent (n=8) of all participants have chosen option 'Other'.

Occupation (61 responses)

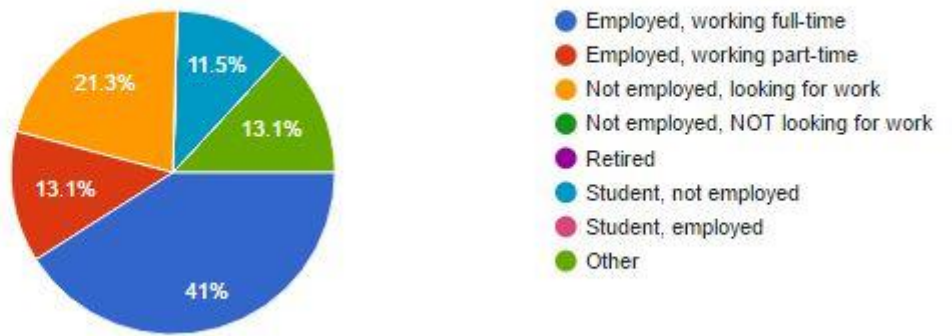


Figure 5.1-4. Respondents' occupation.

With regards to the level of computer expertise, from a total number of 61 respondents, no one thinks about itself as 'Complete newbie' or 'Beginner.' 21.3 percent (n=13) evaluated his or her level as intermediate. The biggest part of the survey's participants – 44.3 percent (n=27) – have chosen an advanced level. 21.3 percent (n=13) considered itself as a computer expert and 13.1 percent (n=8) evaluated itself as computer gurus.

What's your level of computer expertise? (61 responses)

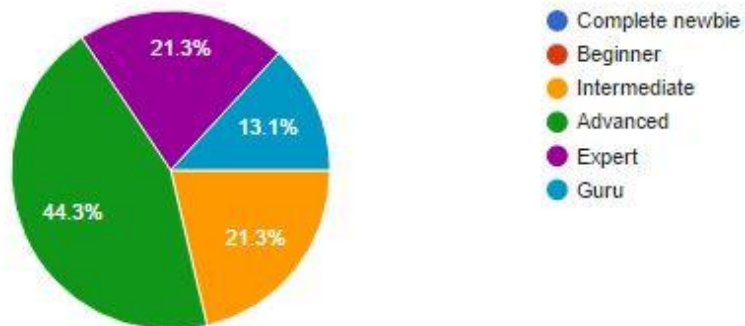


Figure 5.1-5. Respondents' level of computer expertise.

	Total	
	N	100%
Gender	Total number of responses: 61	
Male	30	49,2
Female	31	50,8
Age	Total number of responses: 61	

<8	0	0
18-29	32	52,5
30-44	29	47,5
45-59	0	0
60+	0	0
Level of education	Total number of responses: 61	
Doctorate	0	0
Master's / professional degree	21	34,4
Bachelor's degree	24	39,3
Secondary / high school	16	26,2
Other	0	0
Occupation	Total number of responses: 61	
Employed, working full-time	25	41
Employed, working part-time	8	13,1
Not employed, looking for work	13	21,3
Not employed, NOT looking for work	0	0
Retired	0	0
Student, not employed	7	11,5
Student, employed	0	0
Other	8	13,1
Level of computer expertise	Total number of responses: 61	
Complete newbie	0	0
Beginner	0	0
Intermediate	13	21,3
Advanced	27	44,3
Expert	13	21,3
Guru	8	13,1

Table 5.1-1. Participants' profile.

5.2 Udacity evaluation results

To calculate and to present obtained data author used Microsoft Excel. Participants' responses were calculated against each usability features. Figure 5.2-1 shows results of the Udacity platform evaluation.

Site navigation and structure.

As we can see from the chart 64% of the respondents are satisfied with the Udacity navigation. They strongly agreed or agreed that website is easy to navigate, desired information easy to find, links are clearly identifiable, and it is easy to know in which part of the course you are currently on. 34% respondents evaluated Udacity navigation and structure as average. Only 2% disagreed, and no one strongly disagreed with the statements.

The technical side of the Udacity platform.

Half of the respondents (51%) strongly agreed or agreed that Udacity platform does not have technical errors and website's pages load quickly. Percentage of users who evaluated technical side of the platform as average is 43%. No one strongly disagreed with it, but 6% are unsatisfied with the technical side.

Site visibility and organization.

According to the results, the majority of the respondents (72%) are satisfied with the organization of the site's information, platform design, and interface. 5% do not agree with the statements and 23% evaluated this feature as average.

Site functionality.

55% of the survey participants strongly agreed or agreed that Udacity supports all the expected functionalities and capabilities. 34% neither agreed nor disagreed with these statements. 11% are unsatisfied with the platform's functionality.

Site effectiveness.

Results show that 66% are satisfied with the website effectiveness. 31% evaluated platform effectiveness on an average level. Only 4% disagreed that offered tools help to enrich the learning process or that Udacity provides the users with activities that promote learning.

Site content.

Only 40% strongly agreed or agreed that Udacity courses have a good and consistent level of quality and forums are useful. The major part of the respondents (53%) neither agreed nor disagreed with the statements. 7% of users are unsatisfied with the site content.

User satisfaction.

Overall users' appreciation of the Udacity platform is above average. 58% of the respondents evaluated website as excellent or good. 35% assessed their satisfaction as average. 7% said that Udacity is regular.

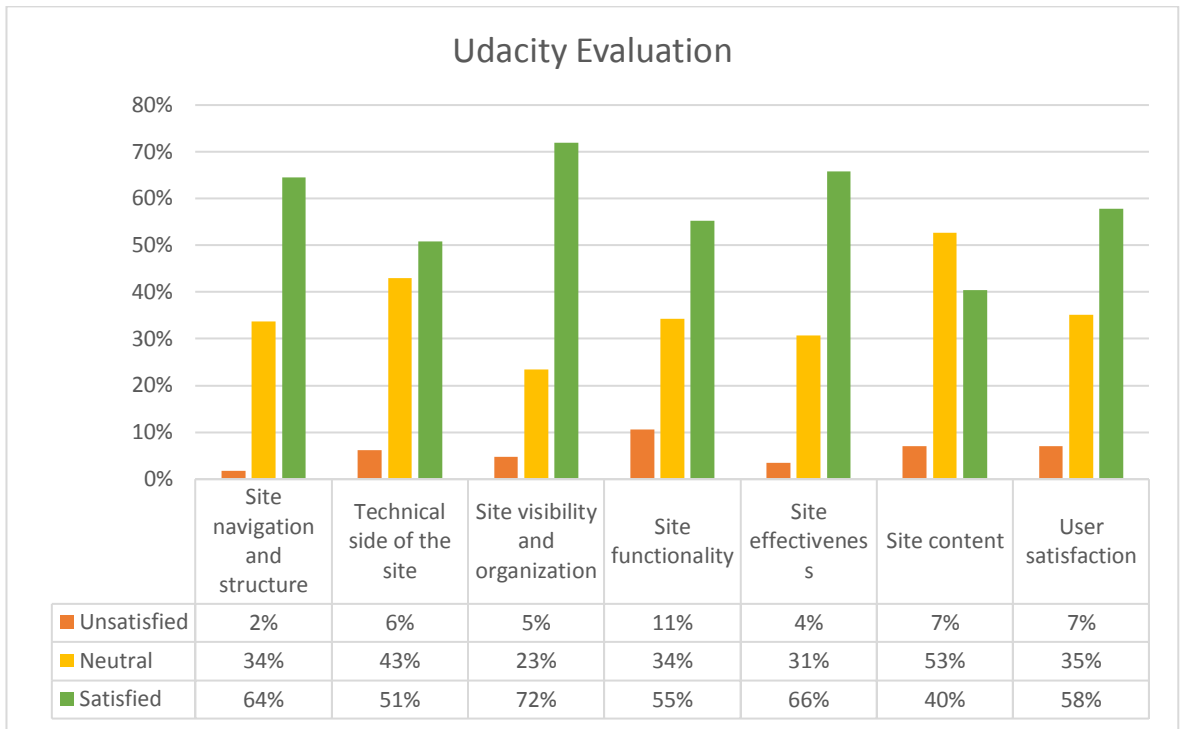


Figure 5.2-1. Udacity evaluation results.

Open ended question “How would you improve Udacity?” was not obligatory, and only three opinions were collected. One of the participants want “more structure for the course order”, the second one would like “quicker response from the web pages”. One respondent suggested that “the price for the course should be in more visible place,” because it took time to find this information. The same respondent thinks that the price of the courses is too high.

5.3 EdX evaluation results

EdX evaluation results are shown in Figure 5.3-1.

Site navigation and structure.

Data show that majority of the respondents (77%) are satisfied with edX navigation and structure. 21% evaluated this feature on an average level, and 2% are unsatisfied.

The technical side of the edX platform.

78% of the participants strongly agreed or agreed that edX platform does not have technical errors and problems with site’s pages load time. 22% evaluated this usability feature as average. No one of the respondents is unsatisfied with this feature of the edX platform.

Site visibility and organization.

77% of the users evaluated edX design and interface above average level. 21% neither agreed nor disagreed with the statements. 2% were unsatisfied.

Functionality.

As we can see from the figure 61% satisfied with the functionality of the edX. 32% think that it is of average level, and 7% disagreed.

Effectiveness.

72% strongly agreed or agreed that site offers tools to enrich the learning experience. 25% neither agreed nor disagreed. 4% of the users are unsatisfied.

Site content.

Satisfied with edX course quality and discussion tools 54% of the respondents. 39% evaluated this feature as average. 7% are unsatisfied.

User satisfaction.

According to the results overall edX usability satisfaction is above average level among 72% of the survey participants. 21% appraised it as average. 7% think that edX platform is deficient.

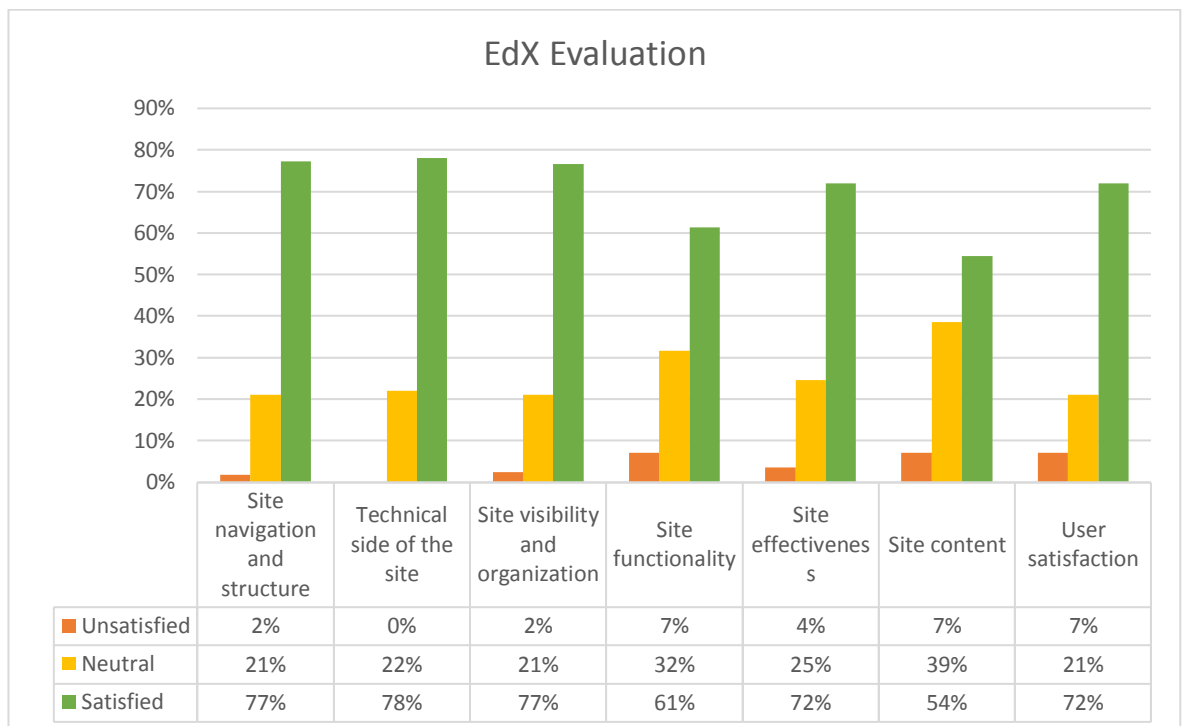


Figure 5.3-1. EdX Evaluation results.

Open ended question “How would you improve edX?” was not obligatory, and only four opinions were collected. Respondents suggested “to increase the supply of the courses”, “add more on-demand courses”, “build more stickiness to improve the cs50 course”. One participant wants “easier layout for the courses, similar to Coursera”.

5.4 Coursera evaluation results

Graphical representation of Coursera evaluation results is shown in Figure 5.4-1.

Site navigation and structure.

According to the results, the majority of the respondents (80%) are satisfied with Coursera navigation and structure. 18% think that this feature is on an average level. 2% unsatisfied.

The technical side of Coursera platform.

79% of the survey participants are satisfied with the technical side of the platform. 11% neither agreed nor disagreed. 11% strongly disagreed or disagreed that website does not have technical errors or site’s pages load time is appropriate.

Site visibility and organization.

Results show that 80% are satisfied with this feature. 15% neither agreed nor disagreed. 4% disagreed that Coursera’s design, interface, and organization is appropriate.

Functionality.

73% of the respondents satisfied with platform’s functionality. 20% find it on an average level, and 7% are unsatisfied.

Effectiveness.

75% of the users think that Coursera offers tools to enrich the learning experience and provides the users with different activities to promote learning. 25% think Coursera’s effectiveness is average. No one is unsatisfied.

Site content.

Findings show a good level of satisfaction of Coursera courses (66%), forums and discussion tools. 30% neither agreed nor disagreed. 3% strongly disagreed with the statements.

User satisfaction.

The major part of the respondents (80%) evaluate Coursera platform as excellent or good. 7% qualified their satisfaction as neutral. 13% of the users evaluated Coursera website as regular or deficient.

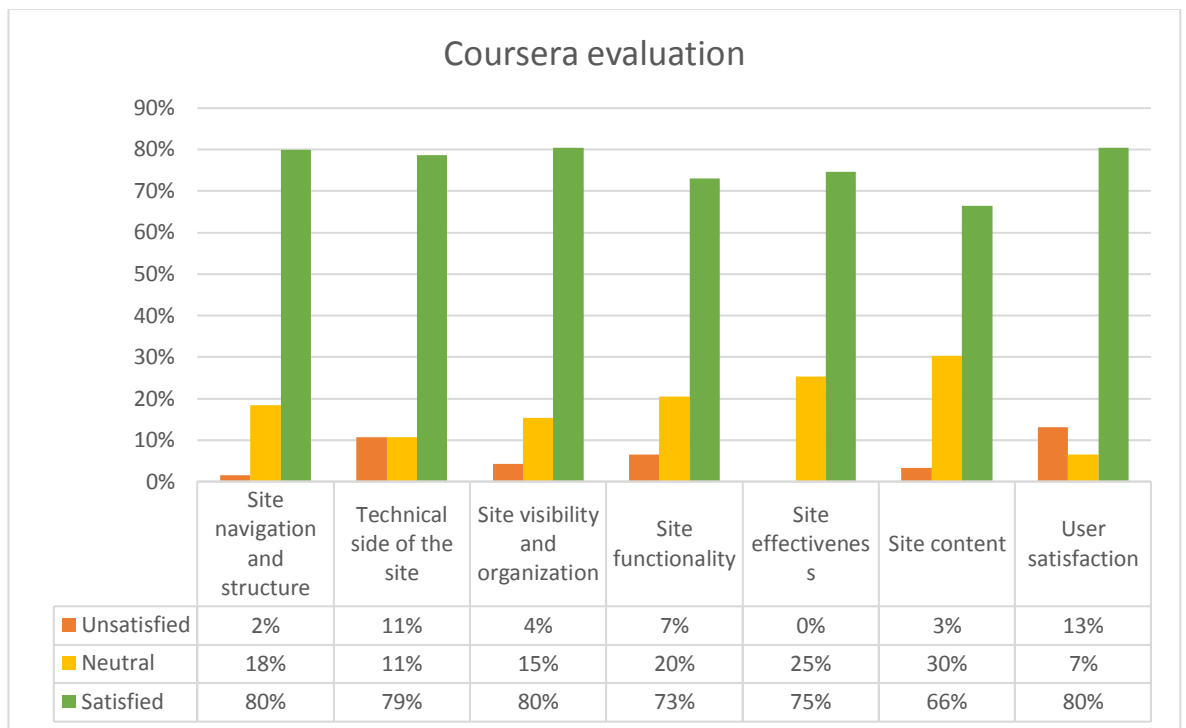


Figure 5.4-1. Coursera evaluation results.

Open question “How would you improve Coursera?” was not obligatory, and only four opinions were collected. Respondents suggested to add “a category for free courses”, “make quizzes available when auditing”. One user would like “more courses in German and Hungarian”. One participant likes Coursera “the way it is”.

5.5 User satisfaction comparison

Graphical representation of user satisfaction comparison is shown in Figure 5.6-1.

The overall user satisfaction level of the platforms is above average level.

As we can see from the results, user satisfaction of Coursera platform is the highest of all three MOOC platforms in each of usability feature group. 80% of the respondents strongly agreed or agreed that website navigation, visibility, the technical side is on a high level.

Open source platform edX overall user satisfaction is a little bit less than Coursera, but higher than Udacity platform.

The weakest part of all three providers by users' opinions is content.

The number of unsatisfied users' regarding technical side of the platforms show opposite results. No one is dissatisfied with the technical side of the edX platform. The biggest percentage (11%) of unsatisfied students for this usability feature got the Coursera platform.

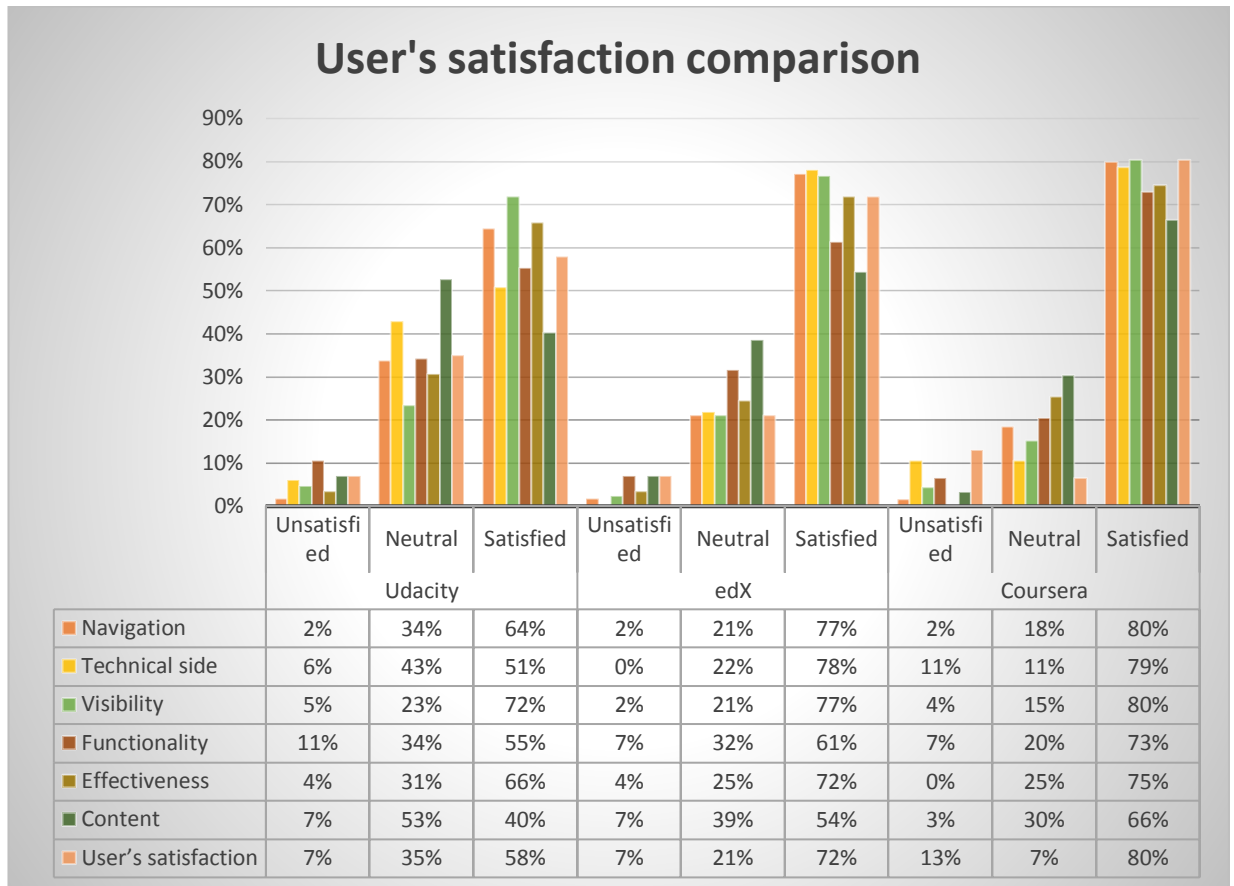


Figure 5.5-1. User satisfaction comparison.

6 Conclusion

The purpose of this research was to identify the level of user satisfaction of leading MOOC platforms and to compare it. The quantitative method of research was used in this thesis paper. Usability inspection technics were applied to investigate user satisfaction of three massive open online course providers.

To answer to the main research questions, usability evaluation of each MOOC platforms (Coursera, edX, Udacity) was conducted. The questionnaire was created to determine levels of user satisfaction. Based on findings analysis Coursera is the most satisfying platform for online education among respondents. Satisfaction from interaction with open source platform edX was a little bit lower. Udacity platform was the least satisfying provider according to the respondents' answers. Nevertheless, the overall usability satisfaction was quite high.

To accomplish this work the author studied distance education development history, MOOC phenomenon, usability theory, methods and technics of usability testing and deepen her knowledge on the chosen subject.

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Appendices

Appendix 1. Questionnaire.

QUESTIONS RESPONSES 61

Section 1 of 4

Usability Evaluation of MOOC providers

Form description

Gender *

Male

Female

Age *

<18

18-29

30-44

45-59

60+

What is your level of education? *

- Doctorate
- Master's or professional degree
- Bachelor's degree
- Secondary / high school
- Other...

Occupation *

- Employed, working full-time
- Employed, working part-time
- Not employed, looking for work
- Not employed, NOT looking for work
- Retired
- Student, not employed
- Student, employed
- Other...

What's your level of computer expertise? *

- Complete newbie
- Beginner
- Intermediate
- Advanced
- Expert
- Guru

Udacity Evaluation

<https://www.udacity.com/>

The website is easy to navigate

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

⋮

Desired information easy to find

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

It's easy to know in which part of the course you're currently on

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Links are identifiable clearly

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site doesn't have technical errors

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site's pages load quickly

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site's design is appropriate

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The organization of the site's information is appropriate

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site's interface is pleasant

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site supports all the expected functionalities

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site supports all the expected capabilities

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site offers tools that enrich the learning experience

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site provides the user with varied activities that promote learning

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Forums and discussion tools in the website are useful

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Courses have a good and consistent level of quality

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

How would you qualify Udacity?

- Excellent
- Good
- Neutral
- Regular
- Deficient

How would you improve Udacity?

Long answer text

After section 2 [Go to section 3 \(edX Evaluation\)](#)

Section 3 of 4



edX Evaluation

<https://www.edx.org/>

The website is easy to navigate

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Desired information is easy to find

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

⋮

It's easy to know in which part of the course you're currently on

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Links are identifiable clearly

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

⋮

The site doesn't have technical errors

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site's pages load quickly

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site's design is appropriate

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

⋮

The organization of the site's information is appropriate

- ⋮ Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site's interface is pleasant

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site supports all the expected functionalities

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site supports all the expected capabilities

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site offers tools that enrich the learning experience

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

...

The site provides the user with varied activities that promote learning

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Forums and discussion tools in the website are useful and promote discussion

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

...

Courses have a good and consistent level of quality

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

How would you qualify edX?

- Excellent
- Good
- Neutral
- Regular
- Deficient

How would you improve edX?

Long answer text

After section 3 Go to section 4 (Coursera Evaluation) ▼

Section 4 of 4



Coursera Evaluation

<https://www.coursera.org/>

The website is easy to navigate

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Desired information is easy to find

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

It's easy to know in which part of the course you're currently on

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Links are identifiable clearly

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site doesn't have technical errors

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site's pages load quickly

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

...

The site's design is appropriate

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The organization of the site's information is appropriate

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

...

The site's interface is pleasant

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site supports all the expected functionalities

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

⋮

The site supports all the expected capabilities

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The site offers tools that enrich the learning experience

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

⋮

The site provides the user with varied activities that promote learning

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Forums and discussion tools in the website are useful and promote discussion

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Courses have a good and consistent level of quality

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

How would you qualify Coursera?

- Excellent
- Good
- Neutral
- Regular
- Deficient

How would you improve Coursera?

Long answer text
