ADAPTIVE, INTERACTIVE AND DISTRIBUTED E-LEARNING PORTAL WITH RESUME AND ASYNCHRONOUS LEARNING FEATURES TO COLOMBO STOCK EXCHANG

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Abstract— **Development of Information Communication Technology have paved the way to evolution of educational industry with concept of digitization. With the radical development of smart, IOT devices and communication technologies have paved the way for rapid development of education system. E-Learning is a methodology which uses advanced technologies by exploiting digital network dynamics and the giant digital flow of information across the internet. E-Learning process explain the ability of an individuals to view online materials over the internet with the revolution of digitalization. Thanks to digitization the ubiquitous of education has been improved. In this situation Colombo Stock Exchange (CSE) is having a desperate requirement of increasing the number of investors in share market and to provide knowledge on share market transactions. To facilitate the said requirement with the collaboration with CSE an Elearning portal is developed for the potential investors to learn about the CSE and share market transactions. The portal is developed using various E-learning techniques to provide a potential learner/investor to understand subject matters with minimum cognitive effort. E-learning portal comprises of Wizard oriented chapter courses, Video tutorials, online publications, E-books purchasing ability, notifying CSE announcements, Live market transactions viewing capabilities, feedbacks and online webinar features. As the main framework ASP.NET(MVC) is used along with various supportive frameworks in order to develop a highly responsive web app on both mobile as well as desktop platforms.**

Keywords— Digitization, Investor, CSE, Electronic-Learning

I. INTRODUCTION

With the development of modern technology and revolution of digitalization entire global system got changed and keep on changing. Digitalization is an integration of digital technologies into day to day life and business world. Which means digitalization invaded every single industry in the world and no industry can be named without digitalization.

Education is one area where digitalization invaded heavily, and modern way of education is totally different to conventional teaching – learning methods.

[1]E-Learning is a methodology where use of advanced technologies by exploiting digital network dynamics and the giant digital flow of information. E-Learning process explain ability of individuals to view online materials over the internet with the revolution of digitalization. E - Learning process totally changed the conventional onsite tutor student learning concept in a remarkable manner.

Thanks to digitalization, today students can enjoy all the luxuries at home and study via internet. This process is called E–learning and in the modern world E – learning is a key tool in the education industry. E - Learning has improved the self-learning skill and provided the opportunity to an individual to engage in learning activities by using a various E-learning tools such as E-books, videos, power point presentations. Thanks to E-Learning learner's location, time, language and other specific determinants are no more barriers for learner's education. E-Learning process totally changed the conventional onsite tutor student learning concept in a remarkable manner.

Colombo Stock Exchange (CSE) is having a desperate requirement of increasing the number of investors in share market. To facilitate the same CSE need to develop an E - Learning hub for the potential investors to learn about the CSE and market transactions.

Once the E-Learning hub is developed potential investors can enhance the knowledge about the share market and invest in the share market.

The proposed E-learning hub[2] was suggested by the Colombo Stock Exchange [CSE] due to the following reasons-

- To facilitate the general public and stakeholders to learn about the stock market and related activities via E-learning portal as they wish irrespective of time, location barriers.

- Cost effective approach to learn about the stock market and related activities.

- Real-time feedback through the chat bot assistance[3].

- Use of various interactive materials such as books, videos, power point presentations.

- Instant delivery of market information

Currently CSE do not have any automated or feasible methodology to attract the potential investors by improving the knowledge about the share market. With the development of this E-learning portal potential investors can learn about the stock market in an in-depth manner and that will facilitate the potential investors to learn the stock market and actively engage in the share market transactions. Once the E-learning portal is developed, similar platform can be utilized for other educational organizations for similar purposes with the necessary changes

II. PROBLEM DOMAIN

One of the major problem Colombo Stock Exchange have identified with the latest research findings are majority of market transactions are done by the corporate clientele, top rich niche clientele who are actively engaging in the business world and foreign investors. CSE further observed that Colombo, Suburbs and key towns (Kandy, Galle, Mathara, Anuradhapura, Negambo, Jaffna) upper and lower middle classes have a great tendency to invest in the stock market but

rural and village level cash rich people have a very low tendency in investing in the stock market. In present context young generation is having an eager to invest with stock market. However still an unurbanize, remotely located people are having limitations to get to know about the stock market and related activities.

As an assumption CSE believe that the lack of information about the stock market and initial mechanism to engage with the market activities are the key drawbacks to actively join and engage in share market.

With the intention of addressing the said issue CSE is organizing regional workshops and seminars. Further CSE have appointed the province level coordinators around the country to support the potential investors. However, the CSE regional workshops / seminars and by appointing regional level coordinators anticipated results are not visible.

As a result of this, CSE is having a requirement of developing a special online hub for the potential investors to learn about the CSE. Once the hub is developed potential investors can learn about CSE functionalities, fundamentals of the share market, market behaviour, 291 listed companies and current position of those companies, market performance, activities of the listed companies, transactions, updates of the on-coming CSE events and workshops, accessibility to read E-publications and most importantly online chat assistance.

III. AIM AND OBJECTIVE

Aim

With the introduction of E-learning hub there will be an improvement of stock market investors and on that context market transactions would significantly improve. This will lead to improve the country's GDP (Gross Domestic Production) in mid and long term.

Objective

Main objective is to develop an interactive and user-friendly E-learning hub to improve the knowledge of the potential investors and by doing that they can actively engage with the day today market transactions.

IV. LITRETURE REVIEW [4]

A. *London Stock Exchange educational portal-Academy*

[5]Since there is a growing interest internationally on financial market a necessity for financial education was risen. On 18 November 2008, the European Union (EU) Parliament commented on personal finance education and issued a session document entitled on "protecting the consumer'' by enhancing consumer education and awareness on credit and finance. Through a monthly issuing of academic articles, Academy will provide a summary of how monetary markets work, to ultimately boost one's own personal investment and trading strategy[6]

London Stock Exchange educational portal, Academy is unique type of a portal that is build combining the traditional as well as technological approaches. Using the portal Academy combine instructor followed learning with interactive self-learning course materials. Courses provided in the portal are flexible giving the opportunity to the user to learn the way which is unique.

The learning portal is made up of two main foundation factors-

- Focus on collaboration- collaborative learning is followed using the virtual campus.

- Personalized career paths- Academy supports customized learning to students enabling to focus on the areas that need to most attention to fulfil future achievements[7].

London Stock Exchange educational portal is subdivided into many areas,

1) Online courses[8]:

The main range of courses provided by the portal are as follows-

a) Self-learning courses:

On these type of courses Academy provide highly effective E- learning resources and materials such as Ebooks, videos, and demonstrations to support a user to engage on self-studying.

b) Collaborative courses[9]:

Using one's own E-learning platform, online space classes are conducted by specialist instructors which facilitates participants to collaborate with each other as small groups.

c) Blended Courses:

Designed to fulfil individual academic requirements of a user.

2) LSEG Academy online learning:

LSEG Academy online learning portal organizes on-line classes, where participants on remote locations could interact with each other as small teams. Collaborative learning methodology is practiced under the supervision of trained academics and tutors. The cooperative learning methodology promotes sharing of information, team working, online group works through 'peer-to-peer' discussions, chats, and virtual classrooms.

3) Virtual campus:

Virtual campus is an E-learning platform that is solely owned only by LSEG Academy. Virtual campus mainly targets to improve the cooperative learning methodology. The specialty of courses provided by LSEG Academy is that it is a mix of face-to-face teaching and on-line learning. All most all on-line courses could be accessed from anywhere. The price of an online training program is £100 plus VAT. As a Motivational act taken by LSEG, provides the opportunity to visit the London Stock Exchange in Milan. Each group is guided by an expert trainer who will lead and provide an introduction on how the market works on day to day.

On London Stock Exchange (LSE) education portal some key features identified are the availability of free courses as well as paid courses. Team observed that LSE learning hub was developed to cater to different knowledge level of users. The user can select the preferred course type as per the user existing knowledge level.

The main drawback of the said portal is the user has no ability to check his progression while following the courses. The layout was well delivered where any person could initiate from the beginning to build up the knowledge on stock market related activities.

B. National Stock Exchange of India (NSE)

[10]A set of brokers created the Native Share and Stockbrokers Association, which later have become the Bombay Stock Exchange (BSE) in 1875. The Bombay Stock Exchange Limited is the oldest stock alternate in Asia and was the first inventory alternate to be identified by means of the Indian authorities, in 1956. Today, the BSE is professionally managed underneath the general direction of the board of directors, which formulates larger policy issues and exercises events overall control. The board accommodates eminent professionals, representatives of buying and selling individuals and managing director of the BSE. In addition to the BSE, there are different principal exchanged–the National Stock Exchange (NSE) and the Over the Counter Exchange of India Limited (OTCEI)– which function at a countrywide degree.

NSE targets on enhancing the knowledge of the investors to obtain strategic decisions related to financial market and transactions. In order to achieve this NSE initiated several educational initiatives such as certification programs, training, financial literacy at school level, short term courses at college level.

As an effective approach to deliver knowledge on share market activities, education portal called "NSE Academy" and Finvarsity portal was introduced by National Stock Exchange of India [NSE] to provide a diversified financial education to develop new generation investors

[11]The prime motto of NSE Academy is "To introduce more first-time investors to the Indian markets and attract them to our exchange, our outreach, advertising and expansion initiatives seek to transform India's strong culture of saving into an equity culture".

The NSE Academy plans to provide necessary education to school level which promotes financial literacy as a necessary life skill. Further "NSE Academy" strategically developed interactive courses on personal finance and certification programs in schools. Further "NSE Academy" targeting other non-finance professionals introducing the Indian capital markets and value of investing help to develop new market professionals.

C. Trends in E-Learning Techniques[12]

Undoubtedly E-learning is changing the educational sector rapidly. The technology of information and communication has opened a new heaven for the experiments on teaching-learning methods to make education interesting, flexible and extensive.

In a broad term E-learning includes several types of teaching-learning methods based on information and communication technology. Based on the participation of E-learning content can be classified into two types-

- Complete the online learning.
- Combined learning.

a) Complete online learning-

This type of learning depends entirely on E-learning tools. Delivery of course materials, discussions, assignment, evaluation, the exam and other evaluations are carried out only on the electronic learning platform. Complete the online learning provides maximum flexibility to students in relation to location and time of learning.

b) Combined learning-

In this segment, E-learning tools are used to increase the effectiveness of conventional face-to-face methods as in the additional tools. Sometimes, these tools are used to reduce the time of face-to-face contact. Some part of the learning activities is done in the classroom and the rest of the part in the E-learning platform.

Advantages of E-learning-

1) Global connectivity

E-learning provides fast and comprehensive access to learning resources. There is no meaning to the limit of the campus of the institutions. In E-learning people can connect around the world. This process provide ability to access the several countries located in different part of world. This process provide ability access the resources and learning partners and allows us to use several electronic repositories. This process facilitates opportunities to create several groups of students and teachers around the world with common interests. E-learning breaks all the limits and create an unlimited space to share the knowledge of students and teachers.

2) Quick access

Quick access to information is an important characteristic of E-learning. Ability to access the global information only from one mouse click E.g.-Ability to access the electronic books and electronic journals in a few seconds.

3) Convergence of different media

Electronic learning platforms provide unique feature of having many types of media in one place, such as text, graphical illustrations, audio and video which facilitate to

increase the quality and cognitive ability of the study material. Convergence of different mediums offers an ideal opportunity to develop easy to understand, excellent learning materials. Further provide the ability to break the monotony of the learning process and create interesting and easy-to-understand course materials.

4) Flexibility

E-learning offers options for student's time and place of learning. In the conventional classroom learning method, the time and place are must factors. Students are required to enter to a private classroom at a time under whatever the circumstances. Electronic learning allows students to learn according to his or her own convenience and own timetable. Students have an ability to study the required subject material of their course anytime and anywhere. The concepts of online and on demand exams completely revolutionized the traditional educational system of the entire world undoubtedly.

5) Rapid creation

E-learning offers all the supports to associate vibrant Elearning study materials. Materials with the combination of text, graphics, audio, video and Photographs could be used to facilitate the said purpose. Textbooks and printed study materials are physical and printed impressions in large quantities. If the changes are needed, to update them it takes months, E-learning study materials could be updated as and when its required. In today's contest information updates incredible fast and that updated information needs to be updated in the study materials quickly. Otherwise people are learning the outdated information in the study materials. For example: A printed study material data may be old and obsolete. But the same document in the E-learning platform information could be updated. Hence E-learning is bridging the gap between speed and the rapidly changing knowledge and information.

6) Ability to serve many students at a low cost:

Providing education for all the people required is the biggest challenge for a developing country like India where you have far remote areas. This demographic challenge can be easily address by the E – learning and would overcome the problem of scarcity of limited resources. The research's conducted and studies carried out confirmed that India needs thousands of universities and colleges, but financially It is not practical to open universities and colleges in such a large number. But in E-learning has the ability to educate a lot of students at a relatively low cost irrespective of geographical barriers. E-learning is an only tool to provide quality education at a low cost if the required IT (Information Technology) infrastructure is available.

V. SOUVEY DONE PRIOR TO THE DEVELOPMENT

[13]In order to gather requirements from the clients two data gathering techniques are focused (requirements elicitation techniques) to identify the functional and nonfunctional requirements-
- Questionnaire

- Interview

Interviews are followed as the primary medium to obtain informative information from the client, since it is a formal approach of collecting data on software projects. By conducting an interview, data and information from a broad perspective could be captured from different type of stakeholders with in the CSE.

As a medium of collecting data from the public audience, questionnaires are used, since it is an easiest and fastest way of collecting data from a non-target sample of audience. Questionnaire are developed comprising of 17 questions covering a broad context including (accessibility, UIX (User Interface Experience), functionality, user friendliness and content management).

Questionnaire was presented to sample of 120 respondents and obtained their responses. The questionnaire is mainly based on close ended questions. As the sample space people who are engaged in various professions are selected such as doctors, engineers, judges, businessmen.

Outcomes of the questionnaire are subjected to a statistical analysis, which will assist in determining various requirements including functional and non-functional and user requirements.

VI. RESULTS

Based on the analysis of interviews conducted the following functional requirements and non-functional requirements were identified-

Functional Requirements:

- User need to create an account in order to interact with the learning portal.

- Each user is logged in to the system using a unique ID and a password to his/her dashboard.

- User must be delivered with today's market summary in his dashboard.

- User has the preference to initiate with following the course, access the publication, and watch the video tutorials.

- User must be provided with a progression bar to show the progress on following the online course.

- User must be able ask queries and obtain answers as response using a chat bot.

- Update user data.

- Ability to create and update the course materials, publications, video and other related online materials.

- Ability to add or remove users (user management).

- Ability to stream workshop and other seminars using a webinar.

- Obtain feedback from the registered users.

Non-functional requirements:

- Interface-The layout and UI which user interact from

the logging page to the course modules[14].

- Availability-The portal should be available (24x7).
- Security-Part of E-Learning database may be confidential and as the data is distributed on different servers on public cloud, data is out of the control from the customer as well as from the administrators. As a result, necessity of strong security measures is taken such as SSH and HTTPS.
- Usability: Interface of E-Learning portal should be user •
- Effectiveness.

VII.   E-LEARNING PORTAL DEVELOPMENT CRITERIALS CONSIDERED

E-learning portal development is a challenging aspect. It mainly deals with combining human understandability or interaction and executing them using various technologies. Since the understandability, capability of a human differs from one another various cognitive learning techniques should be utilized. Main learning features provided to a registered user are as follows-

A. Designing based on visually aspect

After analysing the outcomes from the questionnaires 91.7% is intended to use the portal on the night time(Most of the users are employed so only leisure time available for them is at night).Since most users are intended to use the portal at night time the user interface is designed using light colour theme that also contribute to reduce the stress level of the user.

Navigations are designed based on the responses from the questionnaire such as 50.0% agreed on using of interactive links and consistent navigation mechanisms while 8.3% strongly disagreed to this factor and 8.3% provided neutral responses.

The portal dashboard from user's perspective is designed mainly based on icon driven menu rather than text driven menu. According to the responses 83.3% have agreed on Icon based while 16.7% have agreed on text based.

B. Designing based on multimedia aspect-Video tutorials

Based on the responses from questionnaires all most 100% agreed on using of multimedia content. The Elearning portal developed to CSE consist of video tutorials, by which a user who has difficulty on following the textbased wizard course can follow the video tutorials to obtain knowledge on CSE.

C. Designing based on courseware aspect-Course

This one of the main use cases of the portal in which a Wizard oriented course following approach was developed. The main reason for using this approach is mainly based on the responses from the questionnaire. Accordingly, 41.7% strongly disagreed for reading paragraph's with more than 20 lines, 25.0% Strongly agreed on reading paragraph's with more than 20 lines. As a respect to the said response Wizard oriented course following technique was developed.

Once a user logged into the main user dashboard a user can start following the course based on their preference Beginner, Intermediate and Advance. These are mainly categorised so that a user can start following the course based on their current knowledge level. Once a user starts with a preferred choice a progression level is indicated to show the status of course completion.

In order to maintain the resumability, the portal provides the ability to the user to follow the course from the point which he/she stopped earlier. This is one of the new features which has been introduced and embedded to the portal. Main advantage of this feature is, it provides the cross-device accessibility, as well as saves time and effort to the user on searching the previously stopped point.

D. Publication

The potential learner is provided with E-bookcase, related publications and research data by which a registered user could log into the portal and purchase the E-books using the cart and make the payments using an online gateway system. In order to provide real book reading experience to the user the turn page JavaScript is integrated to each and every E-book opened itself on the portal. CSE identified this as an interactivity factor and according to the responses from the questionnaires 50.3% Strongly Agreed and 8.3% Strongly Disagreed on using this.

E. Announcements

Traditionally CSE workshop and other market related announcements are made using newspaper articles. Based on the research's conducted by CSE they have concluded that most of the potential investors are not effectively communicated. As a feasible approach the announcements are notified to the registered user's once logged in to the portal.

F. Feedback

Feedback will allow a registered user to communicate the improvements, issue, subject related questions and various grievances to the CSE. On CSE perspective this will help to obtain feedback from the potential investors to make further improvements on the portal and what he/she feels about it.

G. Market Summary

Market Summary is a live widget feature which will allow a registered user to study the live market transaction when logged during the stock market active hours.

H. Online Workshop Stream

As mentioned before in order avoid the difficulties of potential investors in remote areas to participate in workshops, the portal is developed with online webinar feature. With this registered potential investor could log into the portal and participate to the live stream (the webinar could be accessed only from the portal).

VIII.   TECHNOLOGIES UTILIZED

As the main framework ASP.Net MVC (Model-ViewController)[15] is used that is followed by C# as the main scripting language, which is primarily used for managing the backend. ASP.Net is ideal to design web-based applications which consist of user-interface and data handling applications with complicated backends. Controllers are mainly used

within the portal to route and forward individual webpages based on the user's request. Controllers are identified as the main backbone of the portal which route the actions of a request by handling the methods and parameters. Front end was developed using HTML (Hyper Text Mark-up Language), CSS (Cascading Style Sheets), JavaScript, Angular Components and Bootstrap frameworks[16], [17].

Database is developed under the relational database schema architecture, where SQL (Structured Query Language) is used. As the database management system SQL server 2017(Community edition) is used. The database is developed under guidance of ACID properties. Such as Atomicity, Consistency, Isolation and Durability.

IX. DISCUSSION AND FUTURE WORK

The portal is intended to be equipped with the chatbot facility which allow the user to ask queries and obtain response in real time. The chat bot is intended to be designed using Machine learning, where user might be able to carry out questioning over and over under the same topic without help of a chat assistance.

X. CONCLUSION

At the conclusion of the development the main intention is to develop an interactive, more resourceful and fully functional E-learning portal, by which it would be beneficial for the potential investors to enhance the knowledge in the stock market and then invest in the stock market which ultimately leads to achieve the goals and objectives of the CSE. Consequently, this will lead to support a higher GDP in the country.

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