Integration of chatbots into the system of professional training of Masters

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Abstract

The article presents and describes innovative technologies of training in the professional training of Masters. For high-quality training of students of technical specialties, it becomes necessary to rethink the purpose, results of studying and means of teaching professional disciplines in modern educational conditions. The experience of implementing the chatbot tool in teaching the discipline "Mathematical modeling of socio-economic systems" in the educational and professional program 124 System Analysis is described. The characteristics of the generalized structure of the chatbot information system for investment analysis are presented and given: input information, information processing system, output information, which creates a closed cycle (system) of direct and feedback interaction. The information processing system is represented by accounting and analytical data management blocks. The investment analysis chatbot will help masters of the specialty system analysis to manage the investment process efficiently based on making the right decisions, understanding investment analysis in the extensive structure of financial management and optimizing risks in these systems using a working mobile application. Also, the chatbot will allow you to systematically assess the disadvantages and advantages of investment projects or the direction of activity of a system analyst, while increasing interest in performing practical tasks. A set of software for developing a chatbot integrated into training is installed: Kotlin programming, a library for network interaction Retrofit, receiving and transmitting data, linking processes using the HTTP API. Based on the results of the study, it is noted that the impact of integrating a chatbot into the training of Masters ensures the development of their professional activities, which gives them the opportunity to be competent specialists and contributes to the organization of high-quality training.

Keywords

Master's students, system analysis, innovative training, chatbots, programming language

1. Introduction

At the current stage of education development, the issue of introducing innovative teaching methods is the one of the greatest significance.

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The Law of Ukraine On Higher Education stipulates “ensuring an organic combination of educational, scientific and innovative activities in the educational process” as one of the primary tasks of higher educational institutions [1].

Government documents on education declare significant changes concerning improvement of higher education: focusing on the world’s best standards of education, new intensive educational technologies, differentiation and integration of the content of education, implementation of modern educational technologies. In the formation of innovative society, the functional features of education are not only providing students with the knowledge and skills already accumulated during the previous years, but also the development of their ability to perceive and use new scientific ideas, tools and methods in practice [2].

Thus, the current state of society requires the use of innovative methods and technologies of training students in higher educational institutions which will enable future professionals to be more competitive in the labor market [3, 4, 5, 6]. In particular, Master’s students of System Analysis (Educational Program (EP) of System Analysis) should be able to perform innovative tasks of the appropriate level of professional activities which focus on researching and solving complex problems of designing and developing information systems to meet the requirements of science, business and enterprises in different spheres [7].

2. Results

Innovative training is characterized by a constant desire to reappraise values, to preserve the ones that are of undeniable importance and to reject those that are already outdated. Innovations in education are associated with an active process of creating and spreading new methods and tools for solving didactic tasks of training specialists in a harmonious combination of classical traditional methods and the results of creative search, application of non-standard, advanced technologies, original didactic ideas and forms of educational process [8].

The process of innovations in technology and methods of modern training has become the object of study of numerous scientists. Scientific studies deal with general theoretical, scientific and practical problems of the innovation paradigm in higher education, some progressive forms and technologies of teaching, experience and prospects of their use in practice [9, 10, 8, 11, 12].

Particularly, the authors relate innovations in education to the necessity of improving the traditional pedagogical process (modernization, modification, rationalization) and of transforming the existing traditional educational process i.e. radical transformations and complex changes [13]. The researchers of pedagogical innovation correlate understanding of the new in education with such features as being useful, progressive, positive, modern and advanced [14].

Communication technologies based on messengers and chatbots are becoming a global trend in education [15]. The Internet, which was originally a medium for transmitting information, is now increasingly assuming the functions of a communicator. The global network is becoming a special communication environment, which occupies an important place in all spheres of society. This is especially true of the modern generation with mobile devices being dominating [16]. The studies have shown that phones are used for messaging more often than for other purposes [17].

Therefore, companies aspire to gain the attention of online users and create chatbots in order

that they should integrate into messengers. According to Flurry Analytics' study, the demand for messaging applications on social networks and mobile networks is continuing to grow in contrast to other spheres. Thus, in 2016, which is associated with the peak of chatbot popularity, the demand for messaging applications increased by 44% compared to 11% of the average annual growth of all the applications, and the time spent by users in messengers increased by 394% compared to 69% of average growth [18].

Scientists address to approaches to the creation and application of chatbots in different fields of work [19, 20, 21, 22].

Ushakova [16] mentioned that messengers are currently used all over the world for solving various tasks that go beyond simple text messaging, as well as for customer's interaction with companies, searching for necessary products, content consumption and others. At the same time, this area is developing dynamically and requires a more detailed analysis and justification of the approaches, frameworks, platforms and analytical tools used to create chatbots.

Thus, due to the rapid development of computer technologies, artificial intelligence (AI) has entered lives of ordinary Ukrainians, making it simpler and more comfortable. Chatbots built on the basis of neural networks [23, 24, 25, 26] and machine learning [27, 28, 29, 30, 31] technologies can communicate using auditory or textual methods. These computer programs are gradually displacing the usual communication marketing, and can significantly help in education.

The digital format of mastering educational programs is expanding at all levels of education. Though online courses have made learning available to millions of people all over the world, researches show that only 7% of students enrolled in a course actually complete it. Despite the global digitalization [32, 33], users in web classes feel uncomfortable due to the lack of support and feedback. Chatbots help to fill in this gap by acting as teaching assistants [34].

With a large number of existing online services in the eLearning segment, chatbots are a promising tool, as they can support each listener individually, according to their level and pace of learning, making learning available to almost anyone who has Wi-Fi access. Chatbots do not require significant resource costs and can potentially help millions of students all over the world [34].

In view of the above, it should be emphasized that the use of chatbots is one of the innovative methods of training and its implementation in the system of professional training of Master's students, specialty 124 System Analysis, is a critical task. The purpose of the article is integrating of chatbots into the system of professional training of Master's students, specialty 124 System Analysis.

Let us consider the implementation of a chatbot into the system of professional training of Master's students, specialty 124 System Analysis while teaching the discipline of Mathematical Modeling of Socio-Economic Systems at Mariupol State University, Ukraine.

Mathematical Modeling of Socio-Economic Systems is taught on the basis of the Educational-Professional Program 124 System Analysis (hereinafter EPP) of Mariupol State University for Master's students and is part of the compulsory components of EPP as a discipline of the training course [7].

The discipline is taught in the 1st term and contains 7 ECTS credits (210 hours), 24 lectures, 46 practical classes, and student's independent work – 140. The form of the final control is an exam.

The purpose of the discipline is to form a system of knowledge and practical skills in the field of structural organization and functioning of socio-economic systems, elaboration and implementation of economic and mathematical models for their analysis, synthesis and optimization.

Teaching of the discipline is carried out through lectures and practical classes, individual and group consultations, independent work of students performing practical tasks on each topic on individual options, presentation of practical work, and testing.

The Department of Mathematical Methods and System Analysis at Mariupol State University has developed and implemented into the educational process a working mobile application with an integrated information retrieval system that helps an investment specialist to make decisions. This application is used in studying the topic Models and Methods of Financial Systems Management in the discipline Mathematical Modeling of Socio-Economic Systems. The information coming from the chatbot is used by students for building optimization models of investment processes in financial systems and for risk optimization in financial systems.

The main professional program training outcomes achieved through the use of this tool are the ability to use various methods, for example, the method of modern information technologies, for effective communication at professional and social levels; an ability to adapt to new situations and to make appropriate decisions; to gain knowledge and skills of working with sources of information for data and knowledge integration in the field of work of the organization through methods of knowledge acquisition, knowledge representation, knowledge classification and compilation [7].

The structure of the information system of the chatbot consists of the following components (figure 1): input information, information processing system, output information.

Information support in this system enables an investment analysis specialist to determine the expedience of investments and further cooperation with various partners.

Information collection involves the implementation of the following subprocesses: creation of information channels; selection of information objects, determination of its sources; organization of work with information sources, information consumption; ensuring continuous functioning of information sources.

Information processing, in its turn, is provided through accumulation, evaluation and analysis of the information, its classification, comparison and verification, extraction of biased and contradictory information, formation of hypotheses, interpretation of information, creation of information databases, distribution of information, elaboration of information documents [35].

The sources of external information of the working mobile application of investment analysis with an integrated information retrieval system are:

- electronic data with news of economic, industrial, financial and marketing activities of different levels;
- information on quotations of economic, industrial and financial tools transmitted via the Internet.

At the input of this system, the information flows are channeled into appropriate functional blocks, in which they are processed to identify key parameters and indicators. At the next stage of data processing, information and accounting information materials are divided and analyzed by the analytical module of the system. After that, the filtered information with answers to the questions is presented in a user-friendly form.

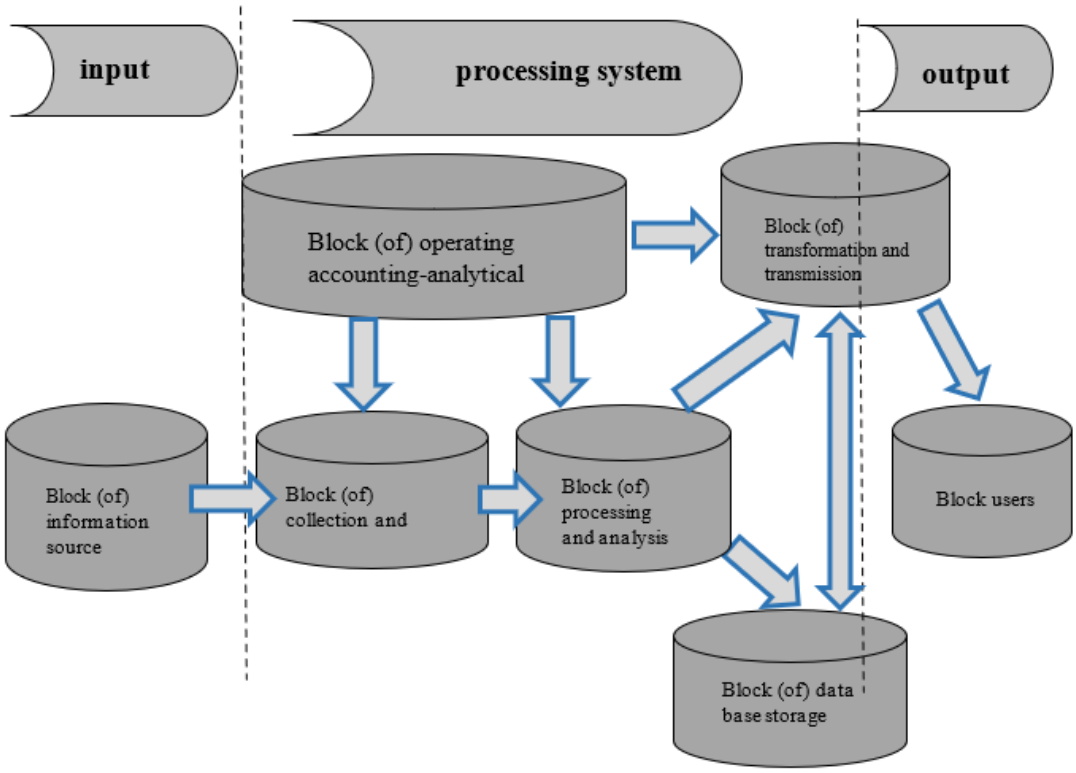

Figure 1: General structure of the chatbot information system for investment analysis.

When searching for tools for creating a chatbot, it was determined that to build a bot you should have knowledge and skills of a particular programming language, such as Python, Ruby, Node.JS, PHP, Kotlin. It was necessary to determine which language should be used for programming the mobile application. It is also important to be able to work with the REST (Representational State Transfer) API (Application Programming Interface), which is provided by messengers and other services.

The analysis of the studies on the demand for specialists in a particular programming language, which are publicly available, shows that the Kotlin programming language is becoming increasingly popular.

Thus, in May 2017, at the Google I/O conference Kotlin was announced to be included in the list of the official languages that are supported for the development of Android applications.

At the current stage of development of programming tools, the Kotlin language has gained popularity in Brazil, India, Germany, the United States and Japan. It should be added that among Android developers the Kotlin programming language is considered to be an alternative to Objective-C and also acts as an analogue of the Swift tool which is used to develop applications on Apple's iOS [36].

The Kotlin language was designed and developed by the Czech company JetBrains, which is known for its popular IDE – IntelliJ IDEA. Google's Android team has announced official

support for the Kotlin programming language.

Among the significant advantages of the Kotlin language is its ability to compile in JavaScript or Native to run on the iOS platform; an easy transition from Java to Kotlin (it is sufficient to install the Kotlin plugin and their compatibility); availability of extension functions for the development of pure ARI; the presence of "null" in the system of types; conciseness, which, consequently, reduces the number of errors. However, there are also some drawbacks, among which there is a slower compilation speed of the program, for example, Android Studio runs a bit slower with Kotlin.

A necessary tool for creation a chatbot is a library for network interaction, one of which is Retrofit (REST client for Java and Android). The tool makes it easy to obtain and download JSON (or other structured data) through a REST-based web service. In Retrofit it is possible to configure the converter used to bring the data in series. GSon is typically used for JSON, but it is possible to add your own converters to process XML or other protocols. It should be mentioned that Retrofit uses the OkHttp library for HTTP requests.

The Retrofit library simplifies interaction with the REST API site by performing part of the routine work; it is convenient when performing a request to various web services with the commands GET, POST, PUT, DELETE; it works in asynchronous mode, which, in its turn, eliminates unnecessary code [37].

The following three classes are required to work with Retrofit:

1. Model class used as a JSON model
2. Interfaces that determine possible HTTP operations
3. Retrofit.Builder class is an instance that uses the interface and API Builder to specify the URL endpoint for HTTP operations.

Each interface method is one of the possible API calls, which must have an HTTP annotation (GET, POST, etc.) to determine the request type and relative URL. The return value completes the response in the Call object with the type of the result expected.

Figure 2 shows examples of using a working mobile application with an integrated information retrieval system (Android Studio is used), which helps to take investment decisions and advice from the expert system.

3. Conclusions

Communication technologies based on the use of various messengers and chatbots are becoming a modern trend in education. The introduction of such tool technologies in the educational environment is a practical example of the use of innovative methods and technologies of teaching students in higher educational institutions.

The Department of Mathematical Methods and System Analysis at Mariupol State University has developed and implemented into the educational process a working mobile application with an integrated information retrieval system that helps an investment specialist to make decisions. This application is used in studying the topic Models and Methods of Financial Systems Management within the discipline Mathematical Modeling of Socio-Economic Systems.

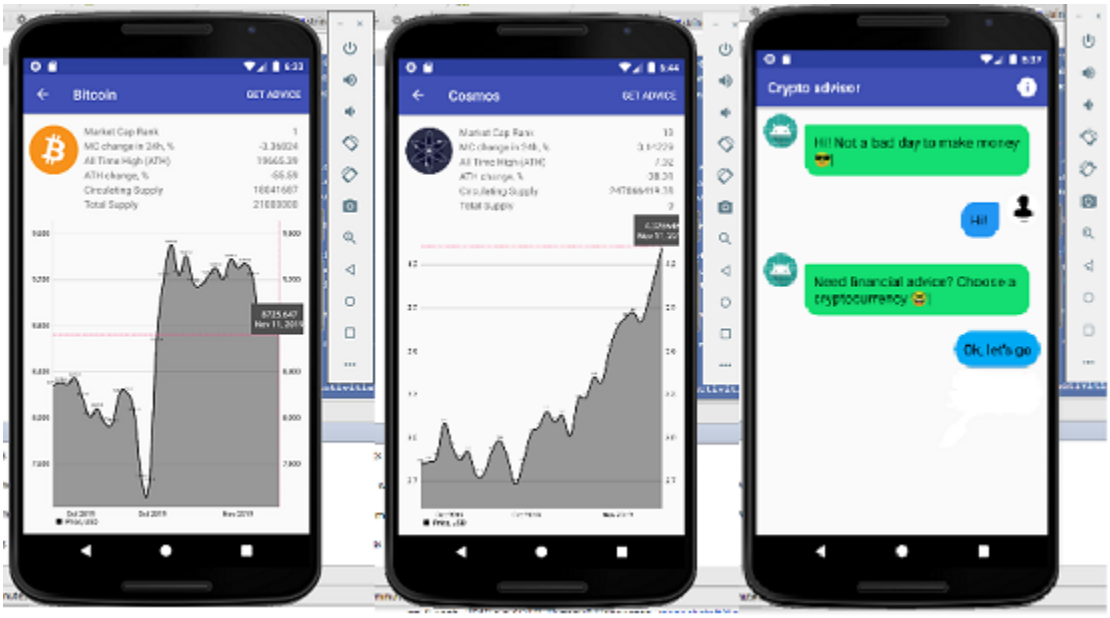

Figure 2: Examples of using a working mobile application for making investment decisions.

Using the application, students receive input information in constructing optimization models of investment processes of financial systems and in risk optimization in these systems, which ensures the acquisition of appropriate professional training results.

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