UDC 004 : 681.3

Kravtsov H.M., Chemisova I.O.
Kherson State University, Kherson, Ukraine

MICROSOFT CLOUD SERVICES IN DISTANCE LEARNING SYSTEM "KHERSON VIRTUAL UNIVERSITY"

DOI:10.14308/ite000496

E-learning with using spreadsheets requires the implementation of Excel-documents into the distance learning system. Simple and convenient solution of the problem of Excel-documents implementation is the use of cloud services.

Using cloud services, you can access to information resources of any level and any type with division of the rights of various groups of users to resources, using only an Internet connection and a Web browser.

Subject of research is the Microsoft cloud services.

The purpose of research is development and implementation of software module «ExcelReader» to use Excel spreadsheets on the Web pages of distance learning systems.

In this paper we solve the following tasks:

1) analyze the known software solutions to display Excel-documents in the WEB-based applications;

2) select an efficient software technology of processing Excel-documents;

3) design the access system and use of Web services of processing Excel-documents in distance learning system;

4) develop software module «ExcelReader» for correct display and edit Excel-documents on Web pages in distance learning;

5) implement software module «ExcelReader» in the distance learning system "Kherson Virtual University".

Processes of creating, editing and implementation of MS Office documents into electronic resources of distance learning systems were modeled. In particular, the software module «ExcelReader» for usage Excel spreadsheets on Web pages of distance learning system "Kherson Virtual University" using "cloud" service Excel Web App from Microsoft was developed and implemented in the educational process.

Keywords: *E-learning, iCloud services, Excel, embedding, distance learning, Kherson Virtual University, infrastructure.*

1. Introduction

One of the objectives of education in modern society is to ensure that every person has free and open access to education throughout his life, regardless of their interests, abilities and needs. Therefore, the distance learning systems (DLS) become relevant [1]. Now education does not depend on the geographic location of person, a significant number of obstacles on the way of education disappear with the emergence of distance education.

Among the main functional requirements to electronic educational resources in distance learning can be identified requirements of visibility and interactivity, both in lectures and tutorials, and tests and virtual labs. Microsoft Office documents are widely used in electronic learning resources. Therefore there is a need to display on the Web-resource pages Excel spreadsheet data, graphs, diagrams.

With the help of spreadsheet calculation is carried out promptly and processing large amounts of data and a visual representation of them in a short time, allowing almost instantaneous output this information to a computer monitor. The main advantage of a spreadsheet is that there is

a possibility of instantaneous automatic recalculation of all data related to functional dependencies, when the value of any items in the table is changed.

Because of its simplicity and usability, opportunities of teamwork, interaction with Internet re-sources, providing powerful tools for data analysis, the program Microsoft Excel is one of the most common, popular means to work with documents that have a tabular structure.

E-learning resource in DLS, such as "Kherson Virtual University" (KVU), should be effective and compelling it is need to solve the problem of displaying on Web-page Excel spreadsheet with the data, graphs, diagrams, as well as create and edit Excel, for example: lectures, practical work, tests. Because of this, there is the problem associated with the display Excel spreadsheets data on the Web pages.

The basic ways of displaying Excel spreadsheets data on the Web pages are:

- saving MS Excel table in XML file followed by it to display on Web page [2];
- development of web-oriented software support module of spreadsheets use in LMS with connection of software libraries to process of spreadsheets: Microsoft Office Web Apps on Share-Point Foundation 2010 database [3,4], Excel Reader.NET [5], Excel Viewer 2.0, and others for processing and display MS Excel spreadsheet on Web-pages;
- use of online cloud services for processing with spreadsheets such as OneDrive [6], Google-Drive [7] and others.

Simple and convenient solution is using cloud services.

Researchers at the UNESCO Institute for Information Technologies in Education note that the acquisition and maintenance of various computer hardware and software in modern educational institutions constantly requires significant financial investments and attracting qualified specialists (Neil Sclater, Cloud Computing in Education [8]). Now cloud computing and virtualization of computing platform reduce the cost of technology.

With the help of cloud services, you can access information resources at any level and any power division the rights of different groups of users with respect to resources, using only an Internet connection and a Web browser. Advantages of cloud technologies are managing large infrastructures, security, lack of dependence on modifications of computers and software. The disadvantages are dependent on the availability and quality of the communication channel, the risks of technical failures and legal issues

Cloud services may be divided into three main categories:

- Infrastructure as a service.
- Platform as a service.
- Software as a service.

As an example of the use of cloud technologies in education, can be given private rooms for students and teachers, electronic journals, thematic forums where students can exchange information, and more. Also, search for information, where students can solve certain learning tasks even in the absence of a teacher or under his supervision.

Object of research is the cloud services.

Subject of research is the Microsoft cloud services.

The purpose of research is design, development and implementation of software module «ExcelReader» for use Excel spreadsheets on the Web pages of distance learning systems, in particu-lar, the system "Kherson Virtual University" [9].

The paper deals with the following tasks:

1. Analyze of known software solutions display Excel-documents in the Web-based applications.
2. Select an efficient technology software processing Excel-documents.
3. Design the system to access and use Web services processing Excel-documents in distance learning system.
4. Develop software module «ExcelReader» for correct display and edit Excel-documents on Web pages in DLS.

5. Establish program module «ExcelReader» in the distance learning system “Kherson Virtual University”.

2. Model

Among the most popular cloud services are: virtual hosting Amazon, TheRackspace, Google, Microsoft, iCloud, SugarSync, Dropbox, Joyent, GoGrid, Terremark, Savvis, Verizon, NewServers, Yandex.

Consider two popular cloud services from Google and Microsoft for their use in distance learning.

We list the basic services offered Google:

- Gmail – mail system.
- Google Sites – Free Hosting, using wiki technology.
- Google Calendar – online service for scheduling meetings, events and affairs with reference to the calendar. It is possible sharing a calendar by user group. Service is integrated with Gmail.
- Google Drive – cloud storage with the possibility of online (Web Browser) view the contents of multiple types of files (including files and Photoshop). Support of popular office formats such as .Docx, .Doc, .Xls, .Pdf, .Rtf, .Txt, .Html, .Jpeg, .Png, .Gif, .Zip, .Rar etc., downloaded files for disc with such formats you can open and view and some of them edit online and offline within your Web browser. It is available storage capacity up to 15 GB.

To use all of the above services, it is required Gmail account.

Now consider what is included in the cloud service from Microsoft:

- OneDrive (previous name SkyDrive) – cloud storage. Provides up to 7 GB.
- Office Web Apps – tool for creating and working with documents MS Office, created in Word, Excel, OneNote and PowerPoint.
- Postal service Outlook
- Calendar - Classic organizer.
- People - is a tool of communicating with your contacts in Facebook, Google, LinkedIn, Sina and Twitter.

To work in OneDrive and for other services from Microsoft, you must have Microsoft account.

Consider the possibility of a teacher working with cloud services Microsoft in DLS KVU (Fig.1).

Both of these services allow implementing on the Web page a document stored in the cloud storage. Microsoft, unlike Google allows you to dynamically work with embedded documents on the Web page.

This ability has played a determinative role in our choice of a cloud service, as important for us to work with dynamic documents in distance learning system “Kherson Virtual University”.

An important feature is that the interactivity will allow the teacher during the learning process to demonstrate connection the above theoretical material with practical use of interactive documents in the same system, and the student has the opportunity to apply theoretical knowledge in practice during classes that fix the results of mastering the material.

And all this will be possible in a single LMS. For example, simplex - method of solving tasks using a spreadsheet Excel is studied on the lesson. The teacher will be able to demonstrate to students the dependence on the values of its variables, as well as student can independently "sound" this method.

Opportunities at working in Excel Web App are: working with Spreadsheets and books in the browser or in MS Excel desktop version (Fig.2).

For the implementation of MS Office document in text of electronic learning resource, the user must perform a series of actions: Sign in OneDrive, creation in OneDrive Microsoft document or using an existing document in OneDrive, setting access to this document, and set up its displaying on html-page of resource, in which the document will be implemented, obtaining html-code and finally inserting this html-code in editor of html-page.

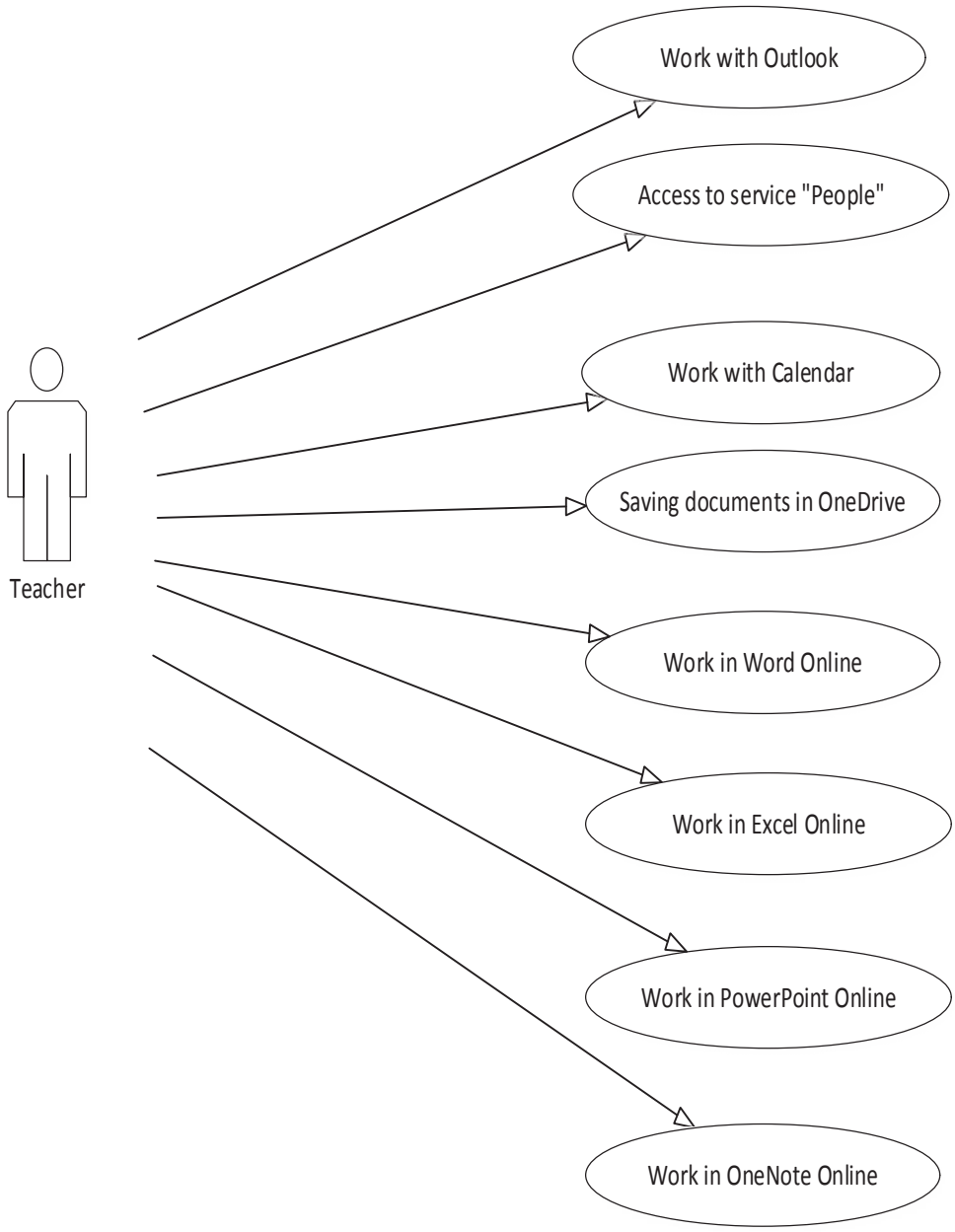

Fig.1. Use case diagram "Possible teacher working with Microsoft cloud services"

Algorithm of the teacher's activity with Excel-documents is presented at Fig.3-4 .

We now describe the operation of the module. Let's look at an example of inserting an Excel spreadsheet from OneDrive in an electronic resource of DLS KVU. When you call the insert command object from the Microsoft OneDrive in its address KVU server sends the request. After that there is a check of user authorization, after authentication all files of the user are displayed it means the page of "cloud" service of storage document OneDrive is opened. The user has the opportunity to create a Microsoft document (Excel, Word, PowerPoint, OneNote) or open a document stored on OneDrive for further work with it.

For example, consider the process of creating and editing Excel-documents (Fig.5-6).

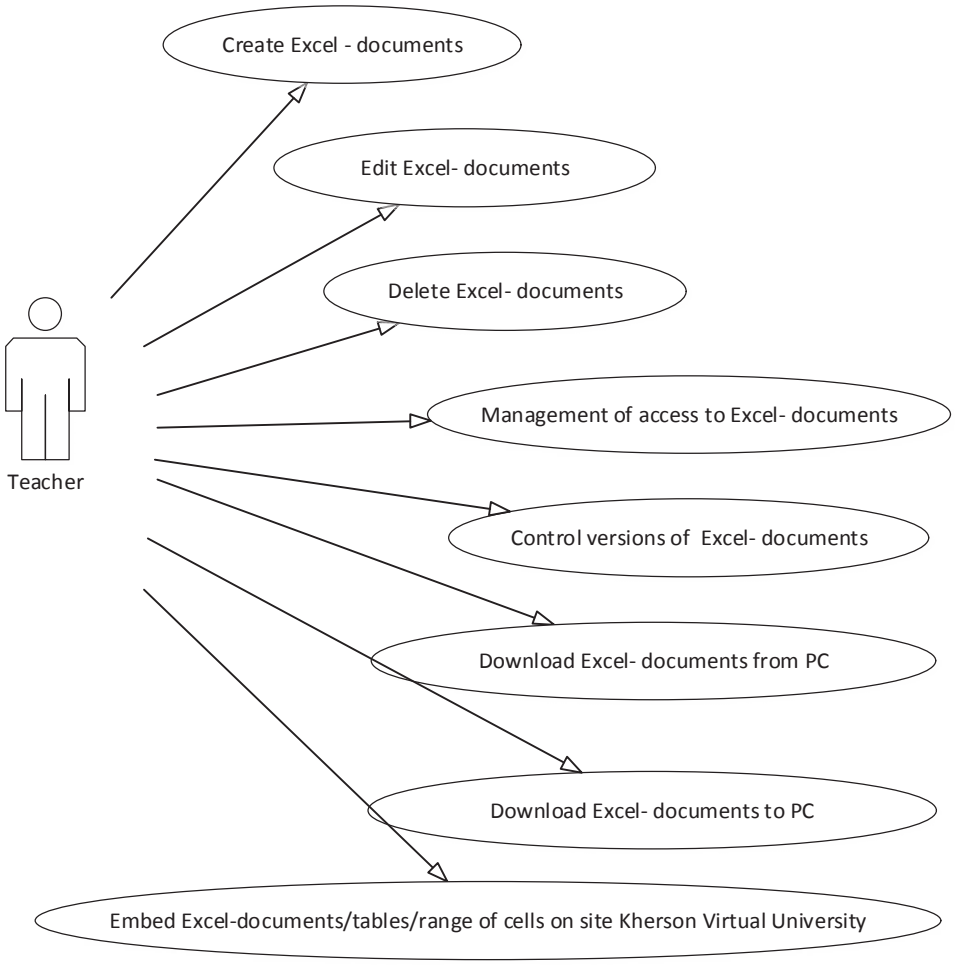

Fig.2. Use Case-diagram "Opportunities for teacher offered Excel Web App"

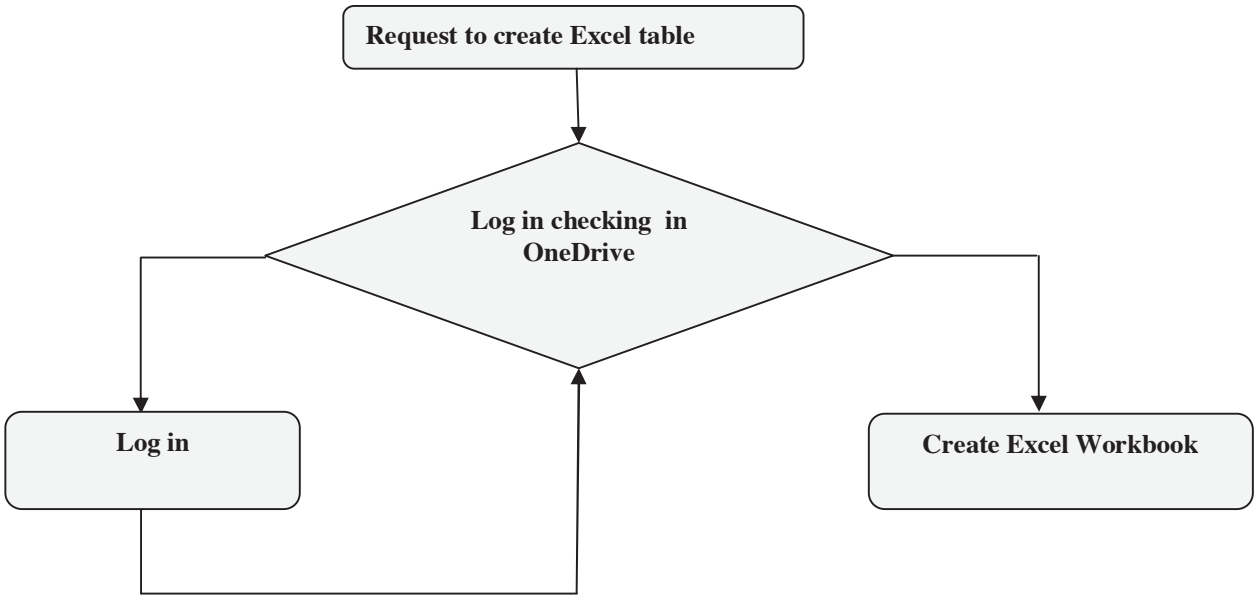

Fig.3. Algorithm of creation Excel-document with Microsoft service

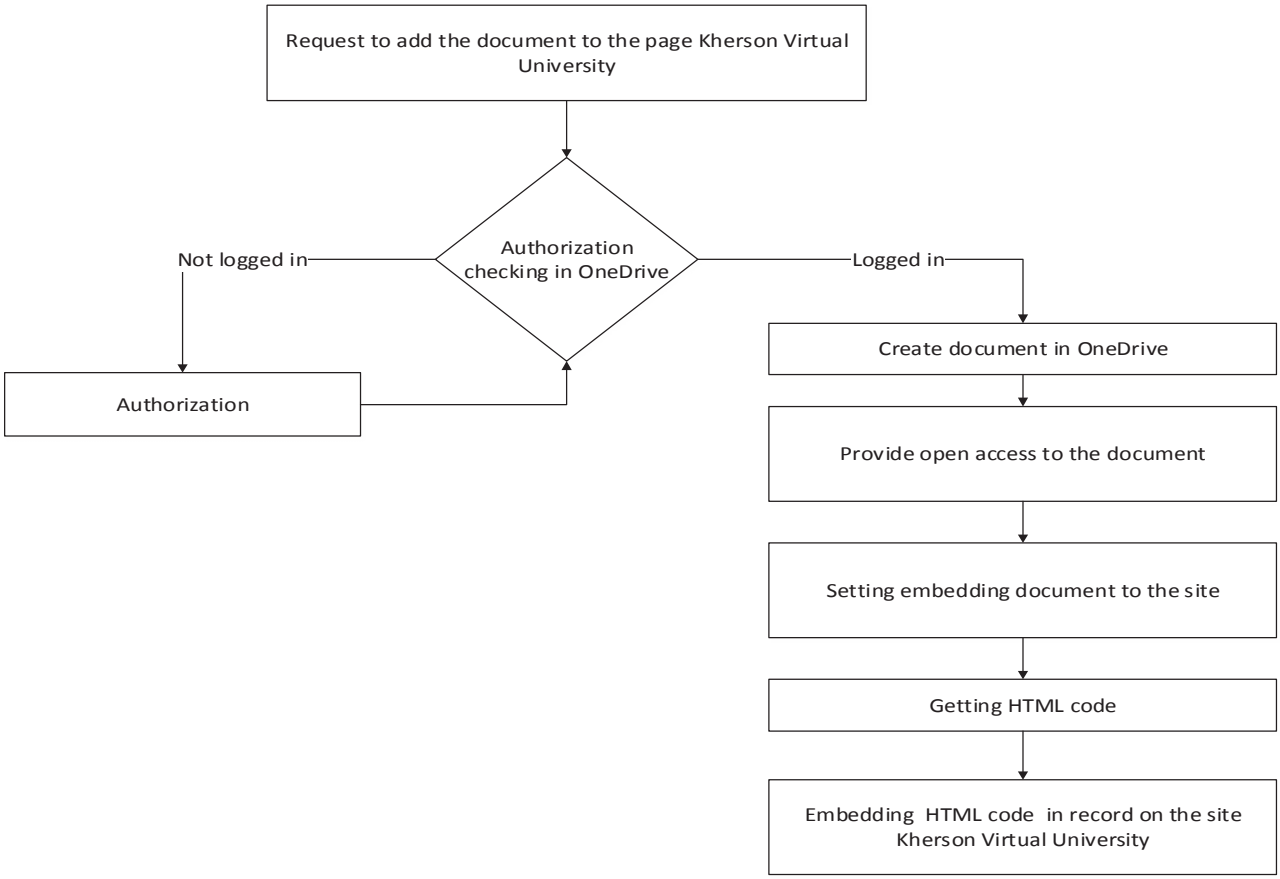

Fig.4. Algorithm of implementation of document in the distance learning system "Kherson Virtual University"

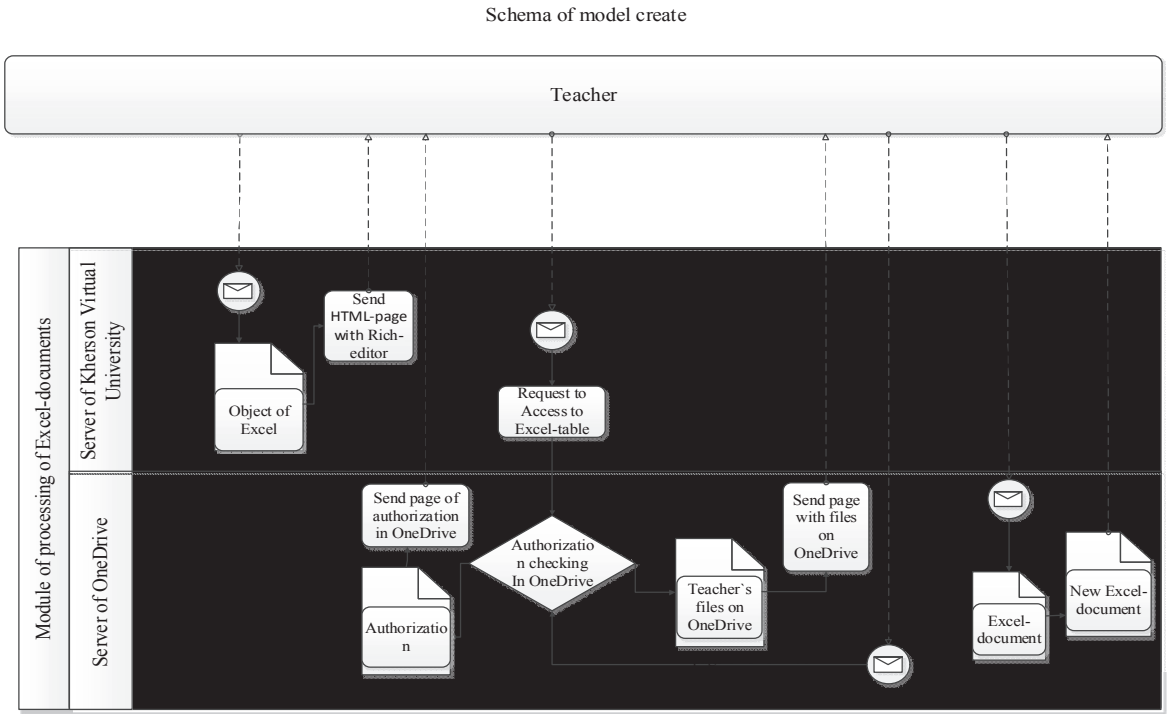

Fig.5. Scheme of model of Excel-document creating process

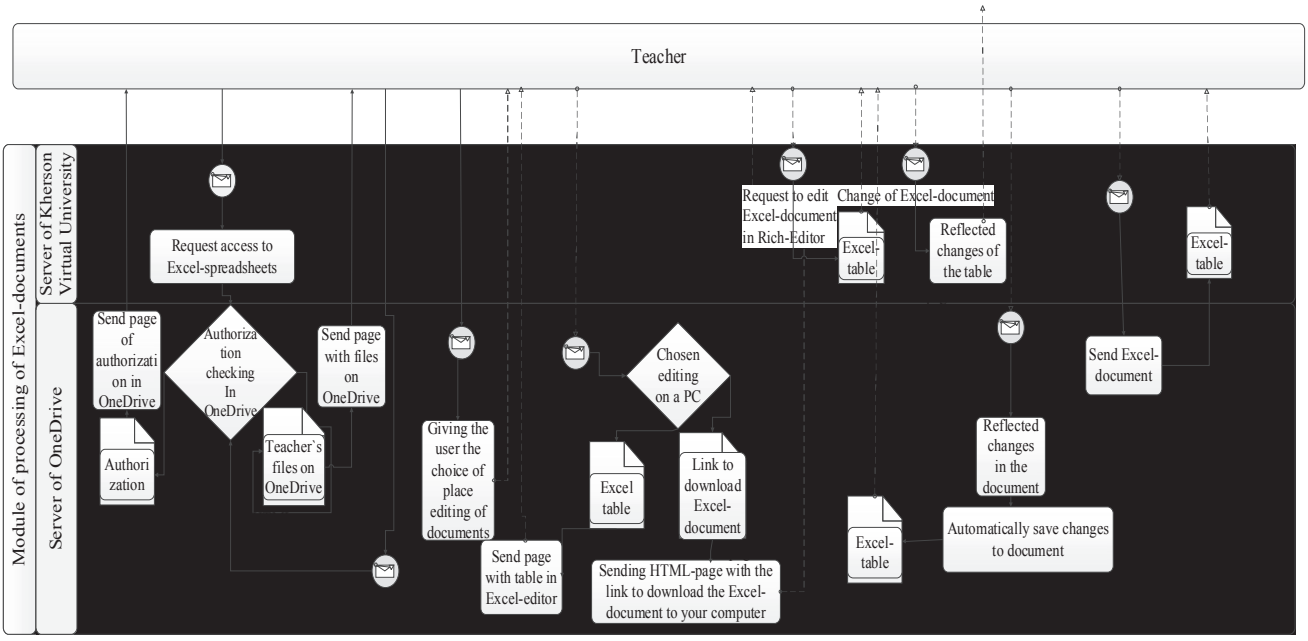

Fig.6. Scheme of model of Excel-document editing process

3. Description of the development system

Prerequisite to add Excel-table to html-page of e-learning resource is the presence of an account OneDrive, so always at request to add Microsoft document the check of authorization in OneDrive will be.

For adding document to a record in DLS "Kherson Virtual University" on the site OneDrive it is necessary to set the display of document and access rights to it, and get a html-document code, which is iframe tag types:

```
<iframe width="402" height="346" frameborder="0" scrolling="no" src="https://onedrive.live.com/embed?cid=2B0C4195906D5E81&resid=2B0C4195906D5E81%21197&authkey=ALxgdY4CVNRy7bk&em=2&AllowTyping=True&wdDownloadButton=True"></iframe>.
```

Iframe tag attribute contains information about the display size of the document that we want to implement: `width = "402" height = "346"` display frame `frameborder = "0"`, the ability to scroll through a document `scrolling = "no"`, and a link to this document `src = "https://onedrive.live.com/embed?cid=2B0C4195906D5E81&resid=2B0C4195906D5E81%21197&authkey=ALxgdY4CVNRy7bk&em=&2` and additional mapping features to download the document to your computer.

After that you should insert the generated code into the html-page editor and save the changes. Similarly, the PowerPoint Online, OneNote Online and Word Online documents can be used.

For development of module «ExcelReader» the following technologies: JavaScript, HTML, .Net. Consider JavaScript - Code were used:

```
<script type="text/javascript">
<!--
var theElement = document.getElementById("div1");
//-->
</script>
```

document.getElementById – method of object of document. It returns a reference to component of document, which can be used to modify the properties and calls to methods of component. We use this method to find places in the code where the document will be implemented in future.

Now consider the html-code, which is used to insert the document in the text of html-page:

```
<form name="my_form" id="my_form" action="#" method="get">
Insert HTML - code:
<input type="text" name="content" id="content" size="60" />
<input type="button" value="Send"
onclick="theElement.innerHTML =
document.my_form.content.value;" />
<input type="button" value="Update"
onclick="theElement.innerHTML =
document.my_form.content.value;" />
</form>
```

InnerHTML method we use to insert text.

When you click “Send” the document will be added in text of html-page of electronic educational resource in DLS “Kherson Virtual University”.

When you click “Update” the document will be updated in text of html-page in DLS “Kherson Virtual University” to the latest version of this document on the server OneDrive.

4. Implementation in the educational process

How necessary and important service processing Excel-documents is in distance learning system “Kherson Virtual University”? To answer this question, we conducted a polling of students of Kherson State University, Department of Computer Science, Software Engineering and Economic Cybernetics. Assessing of the usefulness of this module was made on five-point scale from 1 to 5 points.

In the poll 210 students participated. Results of the poll were as follows (Table 1).

Table 1.

Results of questioning of students.

Points	Number of students
1	5
2	5
3	11
4	168
5	21

The results of importance evaluation of service «ExcelReader» are presented at the diagram (Fig.7).

More than half of the students consider necessary to use service of processing of Excel documents in distance learning system “Kherson Virtual University”.

We calculate the average score $\bar{x}$, which was exhibited for the usefulness of module:

$$\bar{x} = \frac{1*5+2*5+3*11+4*168+5*21}{210} = 3{,}928 \qquad (1)$$

High average score of usefulness of service processing of Excel-documents confirms the need of its implementation in the educational process. We verify the accuracy of the obtained result using the criterion χ^2. Our task is to check whether the significantly different obtained empirical data from the theoretically equally likely. For this it is necessary to find a theoretical frequency as equiprobable frequencies which are found by adding up all the frequencies, and dividing the count by the number of categories. In this case:

$$\frac{(5+5+11+168+21)}{5} = \frac{210}{5} = 42$$

The formula for calculating the criterion χ^2:

$$\chi^2 = \sum_{j=1}^{k} \frac{(n_j - E_j)^2}{E_j} \quad (2)$$

Calculate χ^2 components for each line from Table 1.

For 1 point:

$$\chi_1^2 = \frac{(5-42)^2}{42} = 32{,}59$$

For 2 points:

$$\chi_2^2 = \frac{(5-42)^2}{42} = 32{,}59$$

For 3 points:

$$\chi_3^2 = \frac{(11-42)^2}{42} = 22{,}88$$

For 4 points:

$$\chi_4^2 = \frac{(168-42)^2}{42} = 378$$

For 5 points:

$$\chi_5^2 = \frac{(21-42)^2}{42} = 10{,}5$$

Construct the table of calculation criterion χ^2 (Table 2):

Table 2.

Final results of the criterion χ^2 calculation.

Points	Empirical data	Theoretical data	χ^2
1	5	42	32,59
2	5	42	32,59
3	11	42	22,88
4	168	42	378,0
5	21	42	10,5
∑	210	210	476,56

Calculate the sum of all χ_j^2

$$\chi^2 = 32{,}59 + 32{,}59 + 22{,}88 + 378 + 10{,}5 = 476{,}56$$

Now it is necessary to find the critical value of the criterion in the table of critical values. For this we need the number of degrees of freedom k:

$$k = (R - 1) * (C - 1),$$

where R – number of rows in the table, C – number of columns.

In our case, only one column (the initial empirical frequency) and five rows (points), so the formula is changed – exclude columns:

$$k = (R - 1) = 5 - 1 = 4.$$

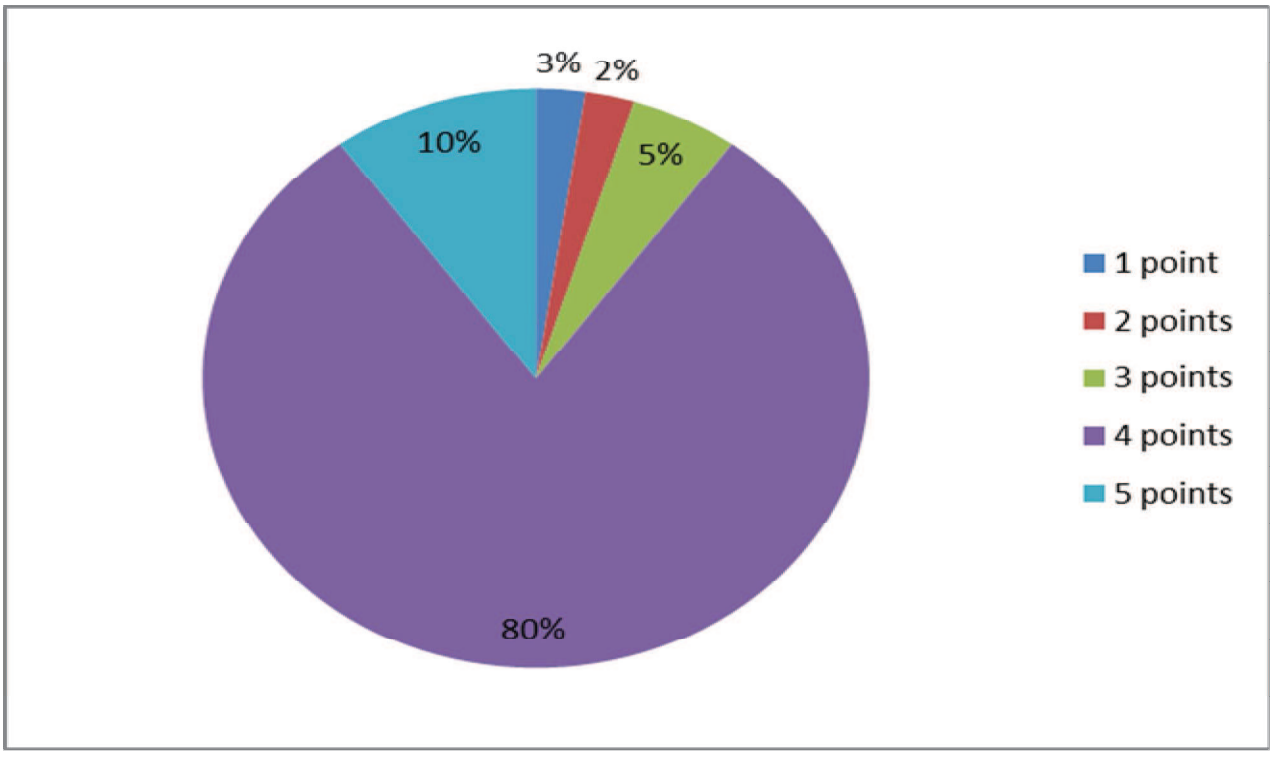

Fig.7. Diagram "The estimation results of utility Excel Reader module".

For the error probability $p \leq 0,05$ and $k = 4$ critical value $\chi^2_{cr} = 9,49$.

Since the resulting empirical value $\chi^2 = 476.56$ more critical χ^2_{cr}, then the frequency differences are valid (Table 2).

Based on the above calculations, we conclude that the results of the evaluation of students learning process for usefulness of service «ExcelReader» with use of Microsoft cloud service OneDrive in distance learning system "Kherson Virtual University" is authentic.

5. Conclusions

In the article the analysis of existing software libraries and cloud services processing Excel-documents: Excel Reader.NET, Excel Viewer 2.0, virtual hosting Amazon, TheRackspace, Google, Microsoft, iCloud, SugarSync, Dropbox, Joyent, GoGrid, Terremark, Savvis, Verizon, NewServers, Yandex is made. The analysis of this services showed that cloud services can be used to dis-play the content of MS Office documents on html-pages of electronic learning resources.

The comparative characteristic of the cloud services from Google and Microsoft is made. Choice was made and reasoned of cloud service OneDrive Office Web Apps for implementing in the distance learning system "Kherson Virtual University".

The processes of creating, editing and implementation Excel-documents in the distance learning system "Kherson Virtual University" using cloud service Excel Web App from Microsoft were modeled.

The functional properties and features of software module "ExcelReader" are described.

Statistical analysis of polling of students about the assessment of the usefulness of this service in the educational process is performed. Reliability of the poll's results is proved using the statistical criterion χ^2.

REFERENCES

1. Aleksander Spivakovsky, Lyubov Petukhova, Evgeniya Spivakovska, Vera Kotkova, Hennadiy Kravtsov. Three-Subjective Didactic Model. Springer Verlag, Berlin-Heidelberg, CCIS Vol. 412, pp 252-273 (2013).
2. Implementation of the Excel spreadsheet into a web page, URL: http://office.microsoft.com/ru-ru/excel/FX102602477.aspx (visited on 10/05/2014)
3. Web App – Easy Excel Tutorial. URL: http://www.excel-easy.com/examples/web-app.html (visited on 10/05/2014)
4. Excel Web App. URL: http://www.microsoft.com/office/RM/ExcelWebApp.aspx (visited on 10/05/2014)
5. Excel Reader .NET. URL: http://www.devtriogroup.com/Excelreader/Default.aspx (visited on 10/05/2014)
6. OneDrive. URL: https://onedrive.live.com (visited on 10/05/2014)
7. Google Drive. URL: https://drive.google.com/#my-drive (visited on 10/05/2014)
8. Sclater, N. eLearning in the Cloud, International Journal of Virtual and Personal Learning Environments, Vol 1, No 1, pp. 10-19, IGI Global. (2010)
9. Distance learning system Kherson Virtual University, URL: http://dls.kherson.ua/dls (visited on 10/05/2014)

Стаття надійшла до редакції 06.07.14

Кравцов Г.М., Чемісова І.О.

Херсонський державний університет, Херсон, Україна

ОБЛАЧНЫЕ СЕРВИСЫ MICROSOFT В СИСТЕМЕ ДИСТАНЦИОННОГО ОБУЧЕНИЯ «ХЕРСОНСКИЙ ВИРТУАЛЬНЫЙ УНИВЕРСИТЕТ»

Дистанційне навчання з використанням електронних таблиць потребує впровадження Excel-документів в систему дистанційного навчання (СДН). Простим та зручним рішенням

задачі впровадження Excel-документів в електронні навчальні ресурси систем дистанційного навчання є використання «хмарних» сервісів.

За допомогою «хмарних» сервісів можливо отримати доступ до інформаційних ресурсів відповідного типу, з розподілом прав доступу різних груп користувачів по відношенню до ресурсів, використовуючи тільки підключення до мережі Інтернет та веб-браузер.

Предметом дослідження є «хмарні» сервіси Microsoft.

Мета дослідження – розробка та впровадження програмного модуля «ExcelReader» для використання електронних таблиць Excel на веб-сторінках СДН.

В роботі розв'язані наступні задачі:

- провести аналіз відомих програмних рішень використання Excel-документів у web-орієнтованих додатках та платформах навчання;
- визначити ефективну технологію програмної обробки Excel-документів;
- спроектувати систему доступу та використання веб-сервісів обробки Excel-документів в СДН;
- розробити програмний модуль «ExcelReader» для коректного відображення та редагування Excel-документів на web-сторінках СДН;
- впровадити програмний модуль «ExcelReader» в СДН «Херсонський віртуальний університет».

Змодельовані процеси створення, редагування та впровадження документів MS Office в електронні навчальні ресурси систем дистанційного навчання. Зокрема, розроблено і впроваджено в навчальний процес програмний модуль "ExcelReader" для використання електронних таблиць Excel на веб-сторінках системи дистанційного навчання «Херсонський віртуальний університет» з використанням «хмарного» сервісу Excel Web App від Microsoft.

Ключові слова: E-learning, хмарні технології, хмарні сервіси, Excel, дистанційне навчання, система дистанційного навчання «Херсонський Віртуальний Університет».

Кравцов Г.М., Чемисова И.А.
Херсонский государственный университет, Херсон, Украина

ОБЛАЧНЫЕ СЕРВИСЫ MICROSOFT В СИСТЕМЕ ДИСТАНЦИОННОГО ОБУЧЕНИЯ «ХЕРСОНСКИЙ ВИРТУАЛЬНЫЙ УНИВЕРСИТЕТ»

Дистанционное обучение с использованием электронных таблиц требует внедрения Excel-документов в систему дистанционного обучения (СДО). Простым и удобным решением задачи внедрения Excel-документов в электронные образовательные ресурсы систем дистанционного обучения является использование «облачных» сервисов.

С помощью «облачных» сервисов можно получить доступ к информационным ресурсам различных типов, с разделением прав доступа групп пользователей по отношению к ресурсам, используя только подключение к сети Интернет и веб-браузер.

Предметом исследования являются «облачные» сервисы Microsoft.

Цель исследования – разработка и внедрение программного модуля «ExcelReader» для использования электронных таблиц Excel на веб-страницах СДО.

В работе решены следующие задачи:

- провести анализ известных программных решений отображения Excel-документов в WEB-ориентированных приложениях и платформах обучения;
- выбрать эффективную технологию программной обработки Excel-документов;
- спроектировать систему доступа и использования веб-сервисов обработки Excel-документов в СДО;
- разработать программный модуль «ExcelReader» для корректного отображения и редактирования Excel-документов на web-страницах в системах дистанционного обучения;
- внедрить программный модуль «ExcelReader» в СДО «Херсонский виртуальный университет».

Смоделированы процессы создания, редактирования и внедрения документов MS Office в электронные ресурсы систем дистанционного обучения. В частности, разработан и внедрен в учебный процесс программный модуль “ExcelReader” для использования электронных таблиц Excel в веб-страницах системы дистанционного обучения «Херсонский виртуальный университет» с использованием «облачного» сервиса Excel Web App от Microsoft.

Ключевые слова: E-learning, облачные технологии, облачные сервисы, Excel, дистанционное обучение, система дистанционного обучения «Херсонский Виртуальный Университет».