Methods of Analysis, Visualization, Forecast of Financial, Economic and Marketing Data by Means of Integration of Google Technologies and GitHub

Vasily M. Yavorskiy [0000-0002-3040-0668]

[1] Russian Presidential Academy of National Economy and Public Administration, Lipetsk branch, 3 Internatsionalnaya str., Lipetsk, 398050, Russia
lip@ranepa.ru

Abstract. In this article we discuss problems of usage of the integration of Google technologies, Android and GitHub in analysis, visualization and forecasting of financial and marketing data.

Google Sheets tool, which allows you to work in online mode using any browser, is efficient for collaboration and analytics as well. We can highlight some of the advantages, for example, there is an ability to connect to dynamic data on international web resources, data parsing, automation of processes in Google Sheets and other Google applications, creation and modeling of systems which are processing numerical data. It is also possible to connect to Google Data Studio to create dashboards for visualization of the calculated data, generate economic reports, connect to neural network models via Google Colaboratory and GitHub.

Regarding marketing features, one can check the popularity of a website (i.e., with data analytics) using Google Analytics tool, a free web and mobile tracking service for measuring digital marketing KPIs. After creating Google Analytics account and posting a short script code on a website, one can start collecting the website or application data. Google web browser for Android [1] allows you to work on data processing using a desktop computer and a mobile device at the same time.

We have identified the features of information flows, we explained and proposed the main directions of modeling systems for the analysis, visualization and fore-casting of economic data in the context of the integration of Google Android and GitHub technologies. We determined methods for modeling systems for the analysis, visualization and forecasting of economic data using Google technologies.

Keywords: Google, Analytics, Android, GitHub, Colaboratory, Drive, Internet browser.

1 Introduction

Internet collaboration, electronic manufacturing and electronic services introduced over the past decades have provided the foundations for the design, development and

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management of next generation manufacturing systems, providing computer support, communication and cyber-enhanced collaboration, production activities [2]. Therefore, different principles of working in the network are required while conducting analysis and data processing. This circumstance determined the topic and direction of the research.

New computing power of desktop computers and mobile devices, various resources, modern engineering technologies make it possible to process not only individual information, but also use recommendation systems, transforming expert knowledge into data processing tools.

The main tools for visualizing the results of the research are Web 2 Technologies, since they are widely used in knowledge management systems [3, 4, 5], these technologies allow you to see the research results interactively online.

For the convenient viewing and study of the proposed research, we use the visualization of Internet resources used in my work using QR code technologies. Also, individual links to research resources are indicated in a short version. The research algorithm and results are shown on the site http://bit.do/research-results [6], QR code in Fig. 1

Fig. 1.

The research objective is to determine the directions and methods of systems modeling for the analysis, visualization and forecasting of economic and marketing data in the context of integration of Google, Android and GitHub technologies.

2 Literature Review

2.1 Convergence of devices in data processing

Convergence is an important trend in information technology. There are several types of convergence. For example, convergence of services, where various services are combined into one converged service. As per network convergence, individual networks are included into the converged network, this has developed to the point that the distinction between wired and wireless networks is almost non-existent.

As marketing and business are getting closer to each other, many value chains or business strategies change to newer and more convergent chains or strategies. With interface and terminal convergence, also called device convergence, many kinds of existing devices and terminals used for different media are incorporated into a new converged device that allows consumers to use converged services and connect to the converged network.

Convergence itself is an important trend not only in IT, but in twenty-first century society in general. Over time, given the rapid advances in information technology and changing consumer needs, there is a trend towards overlapping and unification of applications and blurring difference between previously distinct industries will become increasingly prevalent (Blackman, 1998) [7].
Kim Y., Lee J.D., Koh D. noted the possible direction of convergence of devices based on consumer preferences in relation to the main attributes of the mobile terminal [8]

2.2 Mobile platforms usage in data analytics

Methods and software for mobile data visualization platforms are being improved. Existing applications can help to create, edit and analyze data using spreadsheets (in particular, Google Sheets), it allows pre-submissions, documents editing, messaging and other user actions. Users can store data files associated with the usage of these applications to improve performance across a variety of distributed or cloud environments. These storage and processing systems are designed to make data files available wherever a suitable network connection is available. Thus, a user gets a flexible and portable set of applications which are designed to improve productivity of data analysis too.
A very promising direction of the technological development is the open source digital platform for developing applications for Android [9]. On this platform, a lot of attention is paid to the development of Google applications for Android, which makes it possible to use the computing power of mobile devices in data analytics.
The GitHub and Google Play platforms are crowdsourced and provide separate publicly available data that can be used in various development and research projects through the source code. Social factors and peculiarities of crowdsourcing based on open source technologies are very important and it explains the popularity of Google Play in comparison with other applications.
K. Crowston, B. Scozzi [10] relate this popularity to open source projects, which attract the attention of the end user. Most of these studies [11, 12, 13] examined how the technical aspects of applications are related to the popularity of projects.
With increasing competition in sales of mobile apps, application developers have to use advanced machine learning algorithms to control and determine various aspects of users' behavior and their decision making, including downloading and installing applications. This can be done using PRADO technology [14].
The PRADO programming pattern allows users to manage events, it helps developers to focus better on business logic, rather than being distracted by tedious and repetitive processing of low-level code.
PRADO has many features that can significantly help to reduce development time. Specifically, it provides a rich set of pluggable web controls, full database support including both active writing and complex object mapping, seamless AJAX support, a theme and a wrapper, internationalization and localization, various caching solutions,

security measures, and many other features that are rarely found in other programming environments [15].
In the Google Play ecosystem, which is focused on applications storing, application developers need to optimize their release. Shen S. suggests to optimize Google Play app release strategies to maximize the likelihood of success for those apps. The studies were conducted on the basis of checking the difference in users' feedback regarding software updates for mobile devices in accordance with different update intervals, building an update rating, identifying factors affecting the consequences of the updates. [16].

2.3 Google Cloud digital platform and useful repositories

Google Cloud digital platform definitely deserves specific attention. The platform includes a variety of solutions that allow users to form, process and visualize numerical data, using comprehensively the advanced features of Google technologies on one digital platform.
Google Cloud platform has (as of September 23, 2020) 787 repositories and 513 people are working on them. Google Cloud has its own repositories on GitHub [17]. This is where the content uploaded to the Google Cloud community is stored, files that were added to tutorials will appear on page [18].
Let's take a look at the individual Google Cloud repositories stored on Github [19]:
Magic Modules is a tool used for automatic generation of support in various open source DevOps tools for Google Cloud Platform.
The Google Secret Manager is a provider for the Private Information CSI driver.
Container Definitions is a repository that contains Bazel targets for generic Google-maintained container definitions and their dependencies. Each folder in this repository is a separate Bazel project that creates deterministic and reproducible containers for every commit.
COVID-19 Open Data, this repository contains daily time series data related to COVID-19 for over 50 countries around the world. The data has state / provincial spatial resolution for most regions, and district / municipal resolution for Argentina, Brazil, Chile, Colombia, Czech Republic, Mexico, Netherlands, Peru, United Kingdom, and United States.
OSS PROW, this is where the OSS prow configuration is for Google-owned OSS projects. This file can only be obtained under the Apache License, version 2.0.
Anthos environment sample package. Sample Anthos Environment Package is for creating GKE clusters on any Anthos platform and managing the lifecycle of Anthos components in those clusters. It relies on the Anthos admin service cluster to provide functionalities.
Python Samples for Google Cloud Platform. This repository contains samples used in the Python documentation at cloud.google.com.
Google Play works with Android, not only introducing Android apps, but also offering mobile apps for developers.

2.4 Overview of GitHub repositories which are useful for data analytics

Simple Stock Analysis in Python is a stock analysis tutorial, which is based on Python programming language. This guide is particularly useful for a beginner in stock market analysis [20].
Stock Analysis is a repository that contains Python scripts that are developed to analyze, visualize stock prices and other data. License belongs to Massachusetts Institute of Technology, and this is a free software [21].
Surpriver – "Find High Moving Stocks before they Move" - This repository allows a user to determine the movement of high-yield stocks before they start moving, using anomaly detection and machine learning techniques [22].
Stocksight is a stock market analyzer and stock prediction tool, which uses Elasticsearch, Twitter, news headlines, Python natural language processing and sentiment analysis [23].
Quant_stock is a model for analyzing and forecasting stock prices using machine learning, taking into account the influence of various factors not related to the market (weather, etc.) [24].
Trendet – "Trend detection on stock time series data" is a Python package for identifying and analyzing trends on the market [25].
StockRecommendSystem is designed to collect and store warehouse-related data in MongoDB or CSV mode [26]. In our research, we used CSV files.
StockInsider is a Python based tool to calculate trading indicators, to analyze and visualize stock prices and indicator charts [27].

3 Materials and methods

3.1 Possibility of using Google Sheets for data analysis, and visualization of the data using Google Data Studio

We have investigated the possibilities of using Internet and Google tables for data analysis based on works of multiple research scientists [28, 29, 30, 31, 32], we conducted the work on connecting international resources to dynamic data, parsing data, automating information processes in Google Sheets and other Google Applications, creating models of systems for processing numerical data and connecting to https://datastudio.google.com/ to create dashboards for visualizing calculated data, generating economic reports.
Below we describe the research algorithm.
We will obtain relevant links with dynamic, regularly updated data from International Monetary Fund website [33]. In order to do so, we go through the Data tabs, and then proceed to Principal Global Indicators http://bit.do/principalglobalindicators and next to the tab with National Data Sources http://bit.do/National-Data-Sources.
After that we choose the country which statistics we are going to study. We have selected the data of the National Summary Data Page (NSDP). The page of the national summary statistics of the Russian Federation is located here

http://bit.do/Russia-Economic-financial-data [34]. Further, we parse the links from this website to connect to the dynamic data.
As a next step, we create a Google table with NSDP - http://bit.do/NSDP. For the quick analysis of data on Internet web sources, we use the ImportXML function in Google Sheets.
Next, we implement ImportXML (Url; XPath) function to start data analysis.
We use ImportXML for parsing this way:
In one cell we write = IMPORTXML ("Our URL"; "//a/@ href"), and in the next cell to the right put = IMPORTXML ("Our URL"; "//a")
The complete functions for Google Sheets in our case look like this:
In cell A1 you can find links -
= IMPORTXML
("https://www.minfin.ru/en/key/macroeconomics/national_summary/"; "//a/@href")
In cell B1 there is a list of keywords, to describe links -
= IMPORTXML
("https://www.minfin.ru/en/key/macroeconomics/national_summary/"; "//a")
Check the Key Economic Indicators link http://www.eeg.ru/pages/123.
We use the following function to get the dynamic data from this page:
= IMPORTHTML("http://www.eeg.ru/pages/123"; "table"; 3).
For Google Sheets function we change numbering "table"; 3 and we get the necessary values from the third to the sixth, thus we obtain we dynamically updated data for the necessary calculations.
We have formed tables of dynamically updated data, which we will use in further analysis and visualization. For the convenience in understanding of labels of the data, we will duplicate the data using Russian language in this sheet of google tables using the technical translation and the function = GOOGLETRANSLATE (text; [original_language]; [translation_language]). The obtained dynamic data will be determined by a specific date.
The resulting tables http://bit.do/Key-Economic-Indicators/ can be used in further calculations, since later, when the data on the original resource changes, the data in the table will change as well.
We can also design a data visualization dashboard using the service https://datastudio.google.com. First, we create a new report called Key Economic Indicators. Next, we add a data source through the resource tab, and select Google Sheets, then synchronize and link to Key Economic Indicators table and insert it into the report. Then for completing the setup, select the Key Economic Indicators data source. We will get the dashboard in the report http://bit.do/Dashboard-Tablecy.

3.2 Analysis and prediction of data for the future using machine learning and neural networks

The use of artificial intelligence in the study of economic data is an interesting topic. Machine learning and neural networks allow not only obtain and analyze data, but also make predictions for the future.
Usage of Pandas and Matplotlib packages in stock price analysis.

Based data from the studied repositories [20 - 27], we carried out the analysis of economic data using Interactive visualizations in Python in the Google Colaboratory environment http://bit.do/Google-Colaboratory. An example is shown on the link coded in Fig. 2.

Fig. 2.

Pandas is a Python library for working with a variety of data structures, the library is good for working with structured datasets common for statistics, finance, social sciences, and many other fields. The library provides integrated, intuitive procedures for performing data manipulation and analysis of such datasets.
Matplotlib is integrated with Python in Google Colab to create graphs with, for example, metadata. In order to start working with the library, one needs an installed development environment, for example, Anaconda. In general, Python has many packages that create interactive visualizations in Python, while embedding Javascript code directly into a notebook / page in a browser.
We initialized the model, trained it with all default parameters, and also predicted the data for a year in advance.
We obtained forecast charts with the extracted trend component and the confidence interval of changes in values, as well as charts of changes for different seasons. The implemented code is copied and saved in GitHub repository http://bit.do/Analysis-in-Python, see QR code on Fig. 3.

Fig. 3.

3.3 Possibility of integrating digital platforms for data analysis based on crowdsourcing

The Google Analytics plugin for Unity (beta) was hosted on GitHub in 2014.
With the help of Google technology, you can integrate customer relationship management (CRM), tracking of sales and lead data, develop lead generation strategies, and visualize the data. Based on such analytics, one can more efficiently develop tactics to optimize channels of sales and use the data to make decisions and to attract leads. CRM integration strategies can play the important role in your marketing decisions.
Web presence nowadays is essential for all organizations and businesses. The Internet provides a variety of multimedia functions that allow you to determine the effective-

ness of the interaction of organizations with their customers, suppliers, competitors and employees using Google Analytics [9].
Here we consider an example of using Google Analytics technology and Google Data studio for data visualization. For example, you can check the popularity of nology. We have created a dashboard http://bit.do/youtube-and-site, check the Fig. 4 which will lead you to the tryour website with the data analytics using Google Analytics techaining on Youtube channel and to the analytics of the research website.

Fig. 4.

4 Results

In our research we determine the main directions of modeling systems used for the analysis, visualization and forecasting of economic data in the context of the integration of Google Android and GitHub technologies:
• use of Google Sheets technology for data analysis of various web pages;
•creating dashboards for data visualization using the service https://datastudio.google.com, and by connecting Google Sheets to this service;
•use of Google Analytics and Google Data Studio technologies to visualize marketing data. Website popularity check for data analysis is done using Google Analytics technology;
•Google technologies for Android allow you to work on data processing from a desktop computer and a mobile device at the same time. Fast transfer and efficient synchronization of economic calculations on stationary and mobile devices simultaneously and online improves the conditions for online economic research;
•work with economic data through interactive visualizations using Python in Google Colaboratory, the use of neural networks in the analysis and forecasting of economic data;
•using the capabilities of Google integration of Android and GitHub technologies in analysis, visualization, and forecasting of financial, economic and marketing data using device convergence and data synchronization.
In this work we have identified methods for modeling systems for the analysis, visualization and forecasting of economic data using Google technologies.
We automated the processes of obtaining information with the help of syntactic analysis in Google Sheets. This is how we parsed actual links through the ImportXML (Url; XPath) function implementation - http://bit.do/NSDP.
We have demonstrated a selection of Google spreadsheet functions used for work with Internet resources in order to obtain the necessary data, as well as functions that

allow you to interact with sources of dynamic economic data. We have conducted work related to connection of Google Sheets http://bit.do/tabl-Key_Economic_Indicators to the dynamic data of international analytical resources.
We obtained dynamic data of key economic indicators, which were used by students to study the balance of payments of the Russian Federation for the period from September 2019 to August 2020. When this data is updated on the website http://www.eeg.ru/pages/123, the data in our table will change, the information panel of the visualized data will change accordingly, and the system we constructed will allow the use of Google Sheets data in new studies.
The technology of dynamic data visualization is illustrated through methods of creating models of systems for processing numerical data based on connecting Google Sheets to Data Studio https://datastudio.google.com/ to create dashboards for visualizing calculated data http://bit.do/Dashboard-Tablecy. These methods are recommended by us for creating economic and financial reports in economics and finance.
During the research, we demonstrated the capabilities of Google Analytics and Google Data Studio technologies for visualizing marketing data. We tested the popularity of the website for data analysis using Google Analytics technology by creating a dashboard http://bit.do/youtube-and-site, which shows analytics using Google Analytics technology on the Youtube channel and analytics of a research website. These methods are applicable to marketing research of various Internet resources. Using these methods, it is possible to implement real time marketing research: analysis of the audience, effectiveness of methods used for attracting customers, behavior of customers on selling pages, conversion from views to purchases.
We used the general capabilities of Google's Android technologies for processing, viewing and transmission of the obtained data. These methods were used by students for the analysis of data, both in the computer classroom and outside of it, see Fig. 5.
Fig. 5 indicates the following elements:
1 - Google technologies, resources and services;
2 - Android technologies, resources and services;
3 - GitHub technologies, resources and services;
4 - users, developers;
5 - desktop computers;
6 - mobile devices.

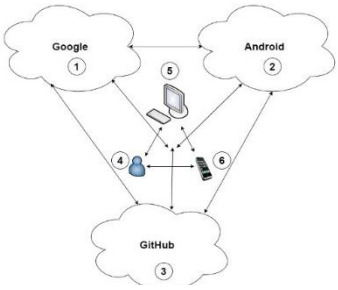

Fig. 5.

We have carried out work with economic data through interactive visualizations using Python in Google Colaboratory http://bit.do/Google-Colaboratory, we applied neural networks to analyze and forecast economic data, this method is efficient since stock price forecasts are carried out automatically using neural networks dynamically.
We would like to highlight some stages of our research in this direction. At the beginning of this research, we have installed the required development environment Anaconda, as well as the necessary modules. Then we figured out how we can work with financial data using the Pandas package and Matplotlib. Next, we imported the necessary libraries. The Datetime library allowed us to work easily with dates, matplotlib to draw plots, pandas to process data, and pandas_datareader, the newest input/output library for pandas, to write the results. After that it was a right moment for initialization. We have defined the style for the graphs. Next, we recorded the start and end dates of the interval for which we were going to load the data, converted the data into a DataFrame object. A DataFrame can be represented as a table from a database stored in computer memory, it has an index and column names. The neural network uses pandas_datareader to download information on Tesla (TSLA) stocks from Yahoo servers for any date stored in the start and end variables. Thus, our DataFrame contains the following information: Date, High, Low, Open, Close, Volume, Adj, Close.
We downloaded Tesla (TSLA) stock information from Yahoo's servers. We have carried out data forecasting using Facebook Prophet. This package allows you to forecast, search for anomalies without diving into the algorithm itself. First, we installed the dependency, then we initialized the data analysis model, trained it with all default parameters and predicted the data for the year ahead. We have constructed the forecast graphs with the extracted trend component and the confidence interval of changes in values, as well as graphs of data changes for different seasons. Neural networks made it possible to predict the TSLA stock prices based on current data, but this method can be used to study changes when the updated data will ne available in future.
We have shown the possibilities of integration between Google Android and GitHub technologies for the analysis, visualization and forecasting of financial, economic and marketing data using device convergence and data synchronization. The data used in the research can be downloaded from the Google Colaboratory platform - http://bit.do/Google-Colaboratory to GitHub platform http://bit.do/Analysis-in-Python, and this process is tracked through the GitHub Android app, see Fig. 5..

5 Discussion

The main result of our research is the definition of information flows of data, within the framework of which analysis, visualization, forecasting of financial, economic and marketing data are carried out by means of integration of Google technologies, Android and GitHub. Also the definition of methods for the formation of information flows of economic, financial and marketing research based on the convergence of devices and data synchronization of the integration of Google Android and GitHub

technologies. These technologies can form the basis for the functioning of various systems for processing numerical data.

Let us consider some of the features of the formation of information flows according to the diagram on Figure 5. This diagram shows the capabilities of analysis, visualization, forecasting of financial, economic and marketing data by means of Google technologies integration, Android and GitHub.

A special attention deserves the integration inside Google of technologies - 1, Android - 2 and GitHub - 3 (see Figure 5). Some of the features of this integration are described above. Here we define the features of the work of a user, a developer - 4 with mobile devices - 6 and desktop computers at the same time - 5. Users and developers - 4 are using the capabilities of Google technologies – 1; Android - 2 and GitHub - 3 can synchronize information flows of devices - 5, 6 (see figure 5). Synchronization of data through the convergence of devices while working with the analysis, visualization, forecasting of financial, economic and marketing data by means of Google integration with Android and GitHub technologies (see Figure 5) allows users and developers - 4 to use both desktop computers - 5 and various mobile devices - 6. Analyzing and processing information received from Internet resources on a desktop computer - 5 (see Figure 5), saving results on Google Drive, users and developers can synchronize the data of various resources - 1, 2, 3, visualize data using Google technologies - 4 (Google Analytics, Google Data Studio), share versions of your developments automatically on GitHub - 3. Having Google Drive on a desktop computer, users and developers - 4 can work with neural networks in Google Colaboratory (see the link http: //bit.do/Google-Colaboratory), save automatically obtained research results and data on the GitHub repository (see. link http://bit.do/Analysis-in-Python).

With the help of Google Drive application, one can store, synchronize data and do the processing [35].

Individual functions of mobile applications complement the capabilities of stationary devices. For example, using a mobile application, you can create, synchronize with various resources on other devices, edit Google Documents, Google Sheets on Google Drive, also scan various documents and images using the scanner function on Google Drive and convert the result into pdf format.

Data synchronization allows user and developers to receive information promptly, it provides the opportunity to control versions of the development, to participate in collaborative work with other developers online.

In the section of the article "Possibility of integrating digital platforms for data analysis based on crowdsourcing" we provide an example of interaction between Google Play and Android through the creation of mobile GitHub applications for Android. For example, the GitHub mobile app for Android - 3 installed on a device - 6 (see Figure 5) will help you do a variety of actions without requiring a complex development environment, i.e, sharing design reviews or looking at a few lines of a code. GitHub for Android gives you an opportunity to collaborate with your team from a mobile device [36].

The development of new computational methods in parallel with other sciences such as statistics, operational research, and computing has revolutionized the world of financial analysis. An example of this are the expert systems, they represent knowledge

in a symbolic way, explicitly programmed in the system. Neural networks is another method of computation that has recently been applied to many problems in the real world [37].

Tölö E. in the Journal of Financial Stability considered the possibility of predicting systemic financial crises on one to five years' window using repetitive neural networks. Forecasting efficiency is assessed using the Jorda-Schularick-Taylor dataset, which includes crisis dates and corresponding macroeconomic time series for 17 countries over the period 1870-2016. Study of the previous research has shown that simple neural network architectures are useful in predicting systemic financial crises. Researchers showed that such predictions can be significantly improved through the use of repetitive neural network architectures, especially efficient for work with time series. They note that the results remain reliable after sensitivity analysis. [38].

6 Conclusion

During our research, we have identified the main directions and methods for modeling information flows for analysis, visualization and forecasting of economic data using Google technologies. The capabilities of Google technologies are growing, the integration of Google technologies with other technologies expands the range of data that can be explored, and it also contributes to the improvement of scientific research methods.

Obtaining and analysis of big data from the Google friendly resources allows you to process this data without buying powerful private local servers of large capacities, which is relevant for projects that do not have a commercial component.

Device convergence has become a new driving force for IT industries suffering from market saturation, as it creates new needs, radically changes market structures, requires new standards and regulations, inspires companies to conduct research and development or improve business strategies, that impacts the whole society in general. The ability to use the computing power of mobile devices allows you to process data permanently online.

The technologies, which we have considered for the construction of information flows, can be used by small businesses and developers of crowdsourcing platforms to solve various problems of interaction both within the company and outside of it.

For small businesses this is an opportunity to improve work with electronic document management, increase the efficiency of CRM, ERP systems. For developers this is the ability to implement different projects online using the synchronization of data obtained from different sources, and using different technologies on different devices (see Figure 5). A dynamic business environment requires partners to share knowledge and capabilities while conducting their activities. Beyond internal operations, information and communications technology (ICT) accelerated data flow empowers organizations to distribute data to their partners, contractors, and customers. IT integration has made a significant contribution to the development of new directions in all areas of organizational development, including the work with systems for processing numerical data using the convergence of stationary and mobile computing devices.

The competitive status of any organization is based on the use of its capabilities. The introduction of the proposed technologies can bring competitive advantages to organizations, for example, by reducing the cost of purchasing additional resources, computing power, software and equipment for solving problems of analysis, visualization, forecasting of financial and marketing data.

The proposed methods of analysis, visualization, and forecasting of financial, economic and marketing data contribute to broader interaction of the users and developers with other developers and with potential customers.

7 References

1. Google Chrome browser, https://play.google.com/store/apps/details?id=com.android.chrome&hl=ru
2. Nof S. Y., Silva J. R. Perspectives on manufacturing automation under the digital and cyber convergence //Polytechnica. – 2018. – Т. 1. – №. 1-2. – С. 36-47 DOI: 10.1007/s41050-018-0006-0
3. Ma H., Wang F., Ye F. The design of personal knowledge management system based on Web2. 0 //2011 International Conference of Information Technology, Computer Engineering and Management Sciences. – IEEE, 2011. – Т. 3. – С. 336-339 DOI: 10.1109/ICM.2011.351
4. Wang W., Gan C., Zheng D. Study on construction of enterprise knowledge portal based on Web2. 0 //2008 IEEE International Symposium on IT in Medicine and Education. – IEEE, 2008. – С. 621-625 DOI: 10.1109/ITME.2008.4743940
5. Piao C., Han X., Jing X. Research on web2. 0-based anti-cheating mechanism for witkey e-commerce //2009 Second International Symposium on Electronic Commerce and Security. – IEEE, 2009. – Т. 2. – С. 474-478 DOI: 10.1109/ISECS.2009.222
6. Website which stores research results - https://sites.google.com/view/msavfed
7. Blackman C. R. Convergence between telecommunications and other media: How should regulation adapt? //Telecommunications policy. – 1998. – Т. 22. – №. 3. – С. 163-170 DOI: 10.1016/S0308-5961(98)00003-2
8. Kim Y., Lee* J. D., Koh D. Effects of consumer preferences on the convergence of mobile telecommunications devices //Applied Economics. – 2005. – Т. 37. – №. 7. – С. 817-826 DOI: 10.1080/0003684042000337398
9. Build anything on Android - https://developer.android.com/.
10. Crowston K., Scozzi B. Open source software projects as virtual organisations: competency rallying for software development //IEE Proceedings-Software. – 2002. – Т. 149. – №. 1. – С. 3-17 DOI: 10.1049/ip-sen:20020197
11. Linares-Vásquez M. et al. API change and fault proneness: a threat to the success of Android apps //Proceedings of the 2013 9th joint meeting on foundations of software engineering. – 2013. – С. 477-487 DOI: 10.1145/2491411.2491428
12. Guerrouj L., Azad S., Rigby P. C. The influence of app churn on app success and stackoverflow discussions //2015 IEEE 22nd International Conference on Software Analysis, Evolution, and Reengineering (SANER). – IEEE, 2015. – С. 321-330 DOI: 10.1109/SANER.2015.7081842

13. Bavota G. et al. The impact of api change-and fault-proneness on the user ratings of android apps //IEEE Transactions on Software Engineering. – 2014. – Т. 41. – №. 4. – С. 384-407 DOI: 10.1109/TSE.2014.2367027
14. Lu X. et al. Prado: Predicting app adoption by learning the correlation between developer-controllable properties and user behaviors //Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies. – 2017. – Т. 1. – №. 3. – С. 1-30 DOI: 10.1145/3130944
15. PHP Framework Prado - https://github.com/pradosoft/prado.
16. Shen S. et al. Towards release strategy optimization for apps in Google play //Proceedings of the 9th Asia-Pacific Symposium on Internetware. – 2017. – С. 1-10 DOI: 10.1145/3131704.3131710
17. Repository «Google Google Cloud» - https://github.com/GoogleCloudPlatform
18. Community Google Cloud - https://cloud.google.com/community.
19. Google Cloud tutorials - https://cloud.google.com/community/tutorials.
20. Repository «Simple Stock Analysis in Python» - https://github.com/LastAncientOne/SimpleStockAnalysisPython
21. Repository «Stock Analysis» - https://github.com/Vaibhav/Stock-Analysis.
22. Repository «Surpriver - Find High Moving Stocks before they Move» - https://github.com/tradytics/surpriver.
23. Repository «Stocksight» - https://github.com/shirosaidev/stocksight.
24. Repository «Quant_stock» - https://github.com/ltnguyen14/Quant_stock.
25. Repository «Trendet - Trend detection on stock time series data» - https://github.com/alvarobartt/trendet.
26. Repository «StockRecommendSystem» - https://github.com/doncat99/StockRecommendSystem.
27. Repository «StockInsider» - https://github.com/charlesdong1991/StockInsider.
28. Edelman B. Using internet data for economic research //Journal of Economic Perspectives. – 2012. – Т. 26. – №. 2. – С. 189-206 DOI: 10.1257/jep.26.2.189
29. Pintaric Z. N., Kravanja Z. Selection of the economic objective function for the optimization of process flow sheets //Industrial & engineering chemistry research. – 2006. – Т. 45. – №. 12. – С. 4222-4232 DOI: 10.1021/ie050496z
30. McAliney P. J., Ang B. Blockchain: business' next new "It" technology—a comparison of blockchain, relational databases, and Google Sheets //International Journal of Disclosure and Governance. – 2019. – Т. 16. – №. 4. – С. 163-173 DOI: 10.1057/s41310-019-00064-y
31. Dunbar L. The Other Part of the Job: Rapid Data Analysis with Excel and Sheets //General Music Today. – 2020. – Т. 33. – №. 2. – С. 83-86., DOI: 10.1177/1048371319880873
32. Oualline S., Oualline G. Using Google Sheets //Practical Free Alternatives to Commercial Software. – Apress, Berkeley, CA, 2018. – С. 389-404 DOI: 10.1007/978-1-4842-3075-6_18
33. International Monetary Fund website - https://www.imf.org/external/index.htm
34. Russian Federation national statistics web page - https://minfin.gov.ru/en/key/macroeconomics/national_summary/

35. Description of the mobile application functions of Google Drive https://play.google.com/store/apps/details?id=com.google.android.apps.docs&hl=ru.
36. Description of the mobile application GitHub for Android https://play.google.com/store/apps/details?id=com.github.android&hl=ru.
37. Martin-del-Brio B., Serrano-Cinca C. Self-organizing neural networks for the analysis and representation of data: Some financial cases //Neural Computing & Applications. – 1993. – Т. 1. – №. 3. – С. 193-206 DOI: 10.1007/BF01414948
38. Tölö E. Predicting systemic financial crises with recurrent neural networks //Journal of Financial Stability. – 2020. – С. 100746 DOI: jfs.2020.100746