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INFORMATION SYSTEM ASSESSMENT OF THE CREDITWORTHINESS OF AN INDIVIDUAL

Nowadays enterprise information systems of banks provide modules for calculating creditworthiness of the business. Such systems are complex and it is difficult to maintain and develop them. Moreover, it requires the involvement of large teams. In addition, systems are complicated to change and update in accordance with changes in current legislation. From another point of view, demand for consumer loans is high, and creating a separate module for calculating the creditworthiness of an individual is appropriate in case of increasing the adaptability to changes and updates of the system. Calculating the creditworthiness of an individual is relevant not only for the banking system, but also for other spheres such as logistics and marketing.

The work describes the created information system for calculating the creditworthiness of an individual, which calculates the class of the borrower based on data from credit history, credit rating, quality characteristics, financial indicators of the person and characteristics of the credit transaction.

The use of the Asp.Net Core platform and the Vue.js framework to build a software module that can be used both independently and easily integrated into other corporate systems is demonstrated.

In this work the major steps of designing and developing the system are described.

Keywords: information system, ASP.NET Core, Vue.js, creditworthiness.

Introduction

Creditworthiness is the borrower's availability of prerequisites for conducting credit operations and his ability to repay the debt in full and within the terms specified by the contract. An assessment of the creditworthiness of an individual is performed to determine the ability to repay the loan on the terms established by the loan agreement [2]. Modern banking systems are usually focused on calculating the creditworthiness of the enterprise. Such systems are more difficult to support, maintain and improve. The assessment of the creditworthiness of an individual could be separated into an independent system to increase adaptability and mobility. The need for such a system exists not only in the banking sector, but also, for example, in the fields of marketing.

Analysis of recent research and publications

The assessment of the creditworthiness is often the object of research in various works. Stechyshyn T. justifies the advantages and disadvantages of modern methods used in bank systems [3]. O. Terentiev [4], P. Bidyuk, A. Hasanov, A. Basarab, K. Sverdel, O. Myronova, I. Okhrimenko [1] in their works propose new methods for improving the assessment of the creditworthiness based on the decision tree,

the Monte Carlo method and the application of a differentiated approach to borrowers.

Methods of assessment of the creditworthiness

In the system there are two methods of credit scoring.

The first one proposed by David Durand consists of eight questions related, in particular, to a person's age, gender, work. During assessment the individual scores some number of points. Durand's method of credit scoring has a threshold value of 1.25 points. A person who scores more than a threshold is considered creditworthy.

The second method is based on the minimum legal requirements established by the law of Ukraine "On the approval of the Regulation on the procedure for the formation and use of reserves by banks of Ukraine to compensate for possible losses from active banking operations". The method uses quantitative and qualitative characteristics of an individual such as information about financial sources of loan repayment, terms of credit operation, general information about marital status and position in society.

The result of the method is the assignment of the borrower class to the individual based on the number of points scored (table 1).

Table 1. Correspondence to the borrower's class and the number of points scored

Class	Scored points
Class "A"	from 210
Class "Б"	from 175 to 209
Class "B"	from 140 to 174
Class "Г"	from 90 to 139
Class "Д"	from 0 to 89

Architecture of the system

The system consists of three main parts: a bureau of credit histories, a server for calculating creditworthiness and a client part. The schema of the system architecture is shown in figure 1.

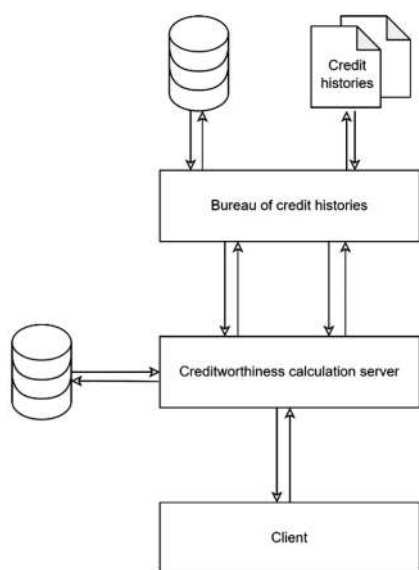


Figure 1. Schematic representation of the system architecture

The bureau of credit histories simulates the operation of a real system that provides services for storing and obtaining credit histories. The Ukraine bureau of credit histories is a prototype of the subsystem. The main tasks of the subsystem are user authentication and providing credit histories.

The server for calculating creditworthiness provides endpoints for user authentication, retrieving the history of previous requests of the evaluated person, calculating the creditworthiness and saving the results of the request. The subsystem communicates with the bureau of credit histories to get the credit history and credit score of the person. The main task of the subsystem is to calculate creditworthiness using two methods.

The client part is represented by a website that provides user authentication to the subsystems, output of credit history, input of additional information, review of a person's previous applications, calculation of creditworthiness and saving of the result of a loan request.

Data model of the system

The bureau of credit histories

Credit history files are stored on the Amazon S3 Bucket in XML format. Database of subsystem consists of two tables: Users and CreditData. The schema of the data model is presented on the figure 2.



Figure 2. Credit history bureau data scheme

The User table stores information about users of subsystems used during authentication. The Credit-Data table stores information about the individual whose credit history is stored in the system. Every record in the table contains a link to the file of the individual's credit history file.

The server for calculating creditworthiness

Database of the server for calculating creditworthiness consists of three tables: Users, History and TemporaryResult. The schema of the data model is presented on the figure 3.

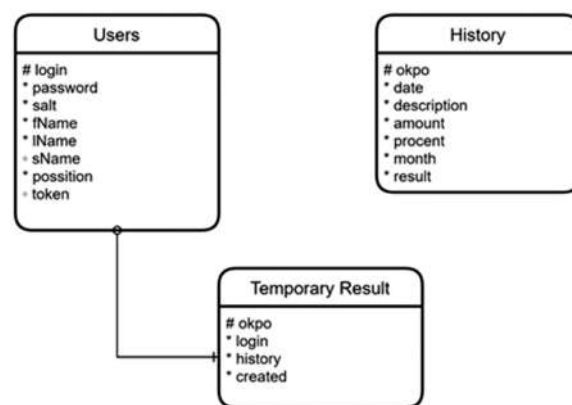


Figure 3. Data schema of the creditworthiness calculation server

The History table is used to store the results of an individual's requests for credit and brief information about the credit transaction. The User table is used to store information about users of the system. The TemporaryResult table ensures that credit history inquiries are minimized during processing an applicant. Each entry in the table is connected with the user who created it.

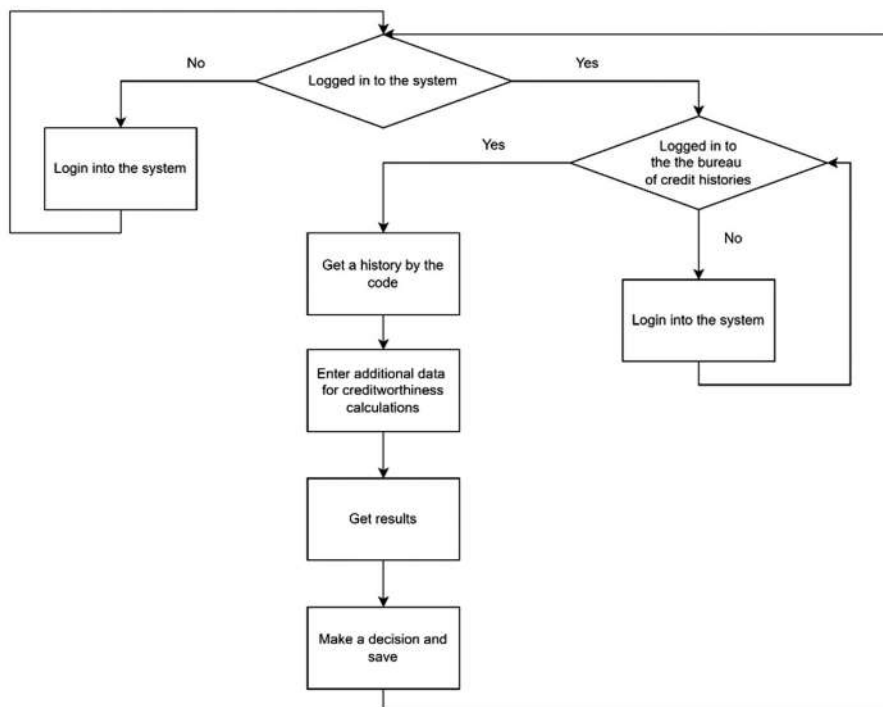


Figure 4. User interaction with the system

User interaction with the system

The main stages of the user interaction with the system shown on the figure 4.

On the first step the user must log in to the system using a login and password. Then, if the login is successful, the system checks whether the token is valid for the credit bureau. If the token is not valid, the user must log in to the bureau of credit histories.

On the next step the user has the ability to get the credit history of the individual. When receiving a history, the system will save a temporary file of credit histories and the date of creation of the request to the database.

The next step involves the user entering additional data (amount of loan, total income, etc.) about the individual, which are required to calculate creditworthiness.

After that, the user receives the result of the calculation and the class of the individual. At this step, the user also gets the person's previous requests, if any.

The last step is making a decision on lending and saving it. When the system saves the results, it deletes the temporary credit history file from the database.

Software tools

For implementing the system was used database management system PostgreSQL and Amazon S3 Bucket for storing credit history files. The access

technology Entity Framework Core with Code First approach and Npgsql.EntityFrameworkCore.PostgreSQL provider are used to connect and operate with databases. The backend part is implemented on the Asp.Net Core 5 platform. The Vue.js version 2 framework is used for the client part.

Conclusion

In the course of the work, the system for assessment creditworthiness was designed and implemented, consisting of three subsystems: a credit history bureau, a server for calculating creditworthiness, and a website as a client part.

The system can calculate the creditworthiness of an individual based on credit history, quality characteristics, information about financial state and information about credit operation.

The main advantages of the system are mobility, ease of support and improvement, the method of calculating creditworthiness, which is based on the minimum requirements of the NBU and can be considered universal.

Further work and improvement of the system can be implemented in various directions, in particular, supplementing the system with a module for automatic processing of questionnaires, using optical mark recognition technologies, expanding the system with administration functionality, and creating a module for setting up the methods of creditworthiness assessment.

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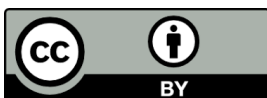
ІНФОРМАЦІЙНА СИСТЕМА РОЗРАХУНКУ КРЕДИТОСПРОМОЖНОСТІ ФІЗИЧНОЇ ОСОБИ

У роботі описано створену інформаційну систему розрахунку кредитоспроможності фізичної особи, яка на основі даних із кредитних історій, кредитного рейтингу, якісних характеристик, фінансових показників особи та характеристик кредитної операції обчислює клас позичальника.

Продемонстровано використання платформи Asp.Net Core та фреймворку Vue.js для побудови програмного модуля, що може як застосовуватися самостійно, так і просто інтегруватись в інші корпоративні системи.

Ключові слова: інформаційна система, ASP.NET Core, Vue.js, кредитоспроможність.

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