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CUSTOM CRM SYSTEM FOR A LEGAL DEBT COLLECTION COMPANY

(Спеціалізована CRM-система для юридичної компанії зі збору заборгованості)

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Introduction

Importance of a CRM system in Legal and Debt collection industry.

With the development of banking services in Ukraine, significant part of population is utilizing a possibility to get a consumer loan to cover their daily needs. That means, that inevitably, some part of those people at some point in time may face problems with paying off their loans. These problematic loans and processes of their repayment are the core of business model for companies who operate in Debt collection industry. And this business model cannot work properly without suitable software, specifically a CRM system.

In the legal and debt collection industry, a Customer Relationship Management (CRM) system plays a crucial role in streamlining operations, enhancing client relationships, and ensuring efficient management of cases and collections. The importance of a CRM system in this sector, especially within the context of Ukraine's legal and business environment, is dictated by the following factors that are common in the industry:

Client management and communication. A CRM system is essential for managing client information and communication. In the legal and debt collection industry, keeping track of client interactions, understanding their history, and maintaining accurate contact details are vital. This ensures timely follow-ups and personalized communication.

Case and debt management. CRM systems provide an organized platform to track the progress of legal cases and debt collection activities. They allow firms to document every action taken, from initial contact to final resolution. In Ukraine, legal proceedings and debt recovery can be complex, and having a detailed record is necessary for compliance and effectiveness.

Workflow automation. Automating routine tasks such as appointment scheduling, reminders, and document generation is a significant benefit of CRM systems. This automation increases efficiency and reduces the chances of human error, which is particularly useful where bureaucratic processes can be time-consuming.

Data analysis and reporting. CRM tools enable firms to analyze data and generate reports on various aspects such as case outcomes, client satisfaction, and financial performance. This analysis is crucial for strategic planning and decision-making.

Regulatory compliance. In the Ukrainian legal and debt collection industry, adhering to legal regulations and data protection laws is critical. CRM systems help in ensuring compliance by securely managing client data, maintaining records of communication and transactions, and keeping track of regulatory changes.

Integration with other systems. CRM systems can often integrate with other software used by legal and debt collection firms, such as accounting systems, document management tools, and email platforms. This integration streamlines operations and ensures a cohesive workflow. In Ukraine, where firms might be dealing with international clients or complex legal frameworks, such integration is particularly beneficial.

Typical tasks in the legal and debt collection industry that a CRM system supports include:

- managing client inquiries and consultations
- tracking case progress and deadlines
- documenting all communications and transactions with clients
- automating routine communications like payment reminders etc.

- creating reports for internal use and client updates
- ensuring secure storage and handling of sensitive client data

In Ukraine, which has a dynamic legal landscape and quite a complex business environment, a CRM system not just a tool for efficiency, but a critical component for the success and growth of legal and debt collection businesses. The ability to adapt to local business practices, regulatory requirements, and cultural nuances through a flexible and comprehensive CRM system is therefore invaluable.

Transition from manual operations to CRM system for small companies.

Usually, when a small company starts its journey in debt collection business, their volume of cases to handle is quite small. So, it's common when a new company with just a few employees starts their work with the most often used and broadly available general-purpose office software, such as Microsoft Excel (the most frequent choice), Goggle Sheets or, in more rare cases, Microsoft Access database. Small legal companies often start their operations by using Excel spreadsheets for various tasks, including client contact management, case tracking, and document organization. Excel provides a simple and cost-effective solution for managing limited data and tasks. This is a great starting point for kicking-off business processes and work with fairly low number of cases (up to 1000).

As the company grows, it begins to handle a larger client base, more cases, and additional staff members. Increased complexity in managing client interactions, cases, and deadlines may lead to inefficiencies and errors in spreadsheet-based processes. Also, it becomes much more time-consuming.

Data in Excel spreadsheets is often stored in isolated files or on individual computers, making it challenging to maintain a centralized and shared repository.

As the company handles more cases, the complexity of managing case information, deadlines, documents, and communication escalates. Manual tracking and document management in Excel becomes time-consuming and prone to errors.

Collaboration and real-time access to critical client and case information become increasingly difficult.

At some point, the company recognizes the need to improve client relationship management to provide better service. They require a system that allows for comprehensive client profiles, history tracking, and efficient communication management.

As the volume of information grows, the company recognizes the importance of generating reports and analytics to assess performance and make data-driven decisions. Excel by itself (without using external data sources) may not provide the necessary tools for robust reporting and analysis. Also, Excel does not provide the scalability and integration capabilities needed for future expansion.

Also, legal and debt collection companies must prioritize data security and compliance with legal and ethical standards, which require more robust security measures than Excel or other general purpose office software can offer.

So, at some point, the company decides to invest in dedicated CRM software designed for legal firms or general-purpose CRM software with customization options. To summarize, this transition is driven by the need for improved efficiency, scalability, data security, collaboration, and advanced features. It enables small legal companies to provide better client service, manage cases effectively, and position themselves for future growth.

Custom-made CRM systems vs Industrial solutions.

When the company realizes the necessity to invest in CRM system, they need to make a decision whether to use an out-of-the box industrial CRM solution available on the market or create a custom-made system designed to address specific needs of the company.

Small debt collection companies typically have specific needs and may find some features in industrial CRMs excessive or not relevant to their operations.

Industrial solutions usually offer a big number of different features, many of which will most likely not be used, if a company's processes are fairly simple. For example, complex marketing automation, inventory management, e-commerce integration, advanced project management, internationalization and multi-currency support, enterprise-level scalability are not needed for small companies with simple and straightforward processes. At the same time, these features are usually included in the price of a solution, and nobody wants to pay for what will not be utilized.

For small debt collection companies, it's essential to focus on the core functionalities required to manage debt collections efficiently, maintain compliance, and enhance client relationships. A streamlined CRM system that addresses these specific needs can be more cost-effective and user-friendly compared to industrial CRMs with an abundance of features that may go unused.

On the other hand, custom-made systems can be designed to precisely match the unique requirements and workflows of the debt collection business, offering greater flexibility and adaptability. They also allow owners to implement robust security measures tailored to their data's sensitivity, reducing the risk of breaches and data leaks.

As per costs, while the initial development price may be higher, the company will have better control over ongoing maintenance and upgrade expenses, potentially resulting in long-term cost savings.

Another benefit is that custom solutions can be seamlessly integrated with existing tools, databases, or third-party services, streamlining operations.

Finally, the owner of a custom-made CRM will have full ownership and control over the codebase, ensuring that the system can evolve and adapt as their business needs change.

At the same time, there are some cons of using a custom-made solution. Building a custom CRM system can take longer compared to implementing an off-the-shelf solution, potentially delaying its deployment. Custom development often involves higher upfront costs, including design, development, and testing expenses. Another downside is that the company will need resources for ongoing maintenance, updates, and support for a custom system. Also, custom solutions may not have pre-built features that come with commercial CRM software, potentially requiring additional development effort. Finally, custom solutions suffer from lack of vendor support and updates available in commercial CRM software.

Anyway, considering all pros and cons, for a small company that is growing and can no longer operate in Excel, but at the same time wants to avoid using complex and expensive systems and wants something fairly simple, straightforward and cost-effective, developing their own CRM is usually the best decision in this situation.

Goal of the Capstone project.

The goal of this project is to create a custom-made CRM system named **eAttorney** that can be used by a debt collection company and will have a basic functionality suitable for the company that wants to stop keeping information in Excel spreadsheets and get a centralized system to use in their business processes.

The system should be able to store loans data in the database, have a way for the user to import, export and search for data in the CRM via both desktop and mobile interface, and generate basic reports.

The main purpose of this system is to be a low-cost solution, but at the same time to be able to scale if needed. It should be operating fully in cloud and cover all the above-mentioned needs. This CRM will be suitable for debt collection companies that operate up to 200 000 cases, and have the following main entities in their business processes: loans, borrowers, payments, legal inscriptions, trials, borrower contact information.

Another feature of the eAttorney system is that it should have a payment prediction mechanism that will use machine-learning techniques to predict the next payment for a loan.

The goal is to use an open-source software to build a solution as much as possible, but some parts might be paid and some costs are inevitable, specifically cloud services costs.

Structure of the Capstone project.

In further chapters, the following sub-topics will be described:

Software requirements. This chapter outlines the specific functional and non-functional requirements that guided the development of the eAttorney CRM, ensuring a clear understanding of its purpose and scope.

Overview of similar software. In this section, we conduct an overview of existing similar CRM solutions in the market, highlighting key differentiators and advantages.

Software architecture, design, and technology stack. This chapter delves into the architecture and design principles of the eAttorney CRM, including an in-depth description of the chosen technology stack and the rationale behind using these technologies to meet project objectives.

User guide and documentation. The final chapter offers a comprehensive user guide and documentation for the eAttorney CRM, empowering users and stakeholders with the knowledge needed to effectively use the system.

Chapter 1. Software requirements

The clear identification of the requirements for eAttorney system is very important for a debt collection legal company's business. These requirements serve as the foundation upon which the entire CRM system is built, and they have a significant impact on the company's operations, efficiency, and ability to achieve business goals.

Detailed requirements refining ensures that the system is tailored to the unique needs and workflows of the debt collection industry. In the debt collection business, accurate and up-to-date information is paramount. Well-defined requirements guarantee that data is entered correctly, securely stored, and easily retrievable, minimizing errors and compliance risks.

We need to remember that users can access the system securely, interact with it effortlessly on various devices, and receive timely responses. This will help to boost productivity, reduce training time, and increase user satisfaction.

Informed decision-making is a key part of every business model, especially in bad debt collection activities. That’s why we need to be sure that the system can generate actionable data to support this decision-making process and tracking of key performance indicators.

The debt collection industry is subject to stringent data security and compliance regulations. Clearly defined requirements for data encryption, company differentiation, and secure storage in the cloud are imperative to safeguard sensitive client information and maintain regulatory compliance. Failure to meet these requirements can lead to legal consequences and reputational damage.

We need to be sure that the system can grow with the company's needs. As the business expands, the system should be able to accommodate a larger client base and more extensive loan portfolios without compromising performance or data integrity.

Another integral part of the debt collection business is the client-centric approach. Effective borrower and counterparty information management is essential for maintaining strong client relationships. Well-defined requirements in this regard allow the company to provide personalized service, track communication history, and address client needs efficiently.

Based on the above arguments, the following list of requirements was defined for eAttorney CRM system:

Functional requirements:

User interface (UI). The system should have an intuitive and responsive web-based user interface accessible on both desktop and mobile devices. Users should be able to access and interact with the system seamlessly on various screen sizes and devices.

Data processing. The system should be capable of efficiently managing and storing up to 500,000 loans. It should ensure data integrity and performance even as the database grows, allowing for effective debt collection management.

User authentication. The system should implement a secure user authentication mechanism based on the user-password principle. Users must log in with unique credentials to access the system, ensuring data security and access control. Passwords should be stored encrypted.

Data import. The system should provide users with the ability to import data via Excel files using a user-friendly interface. This functionality simplifies the process of entering and updating loan and borrower information. For each file, there should be a possibility to import all possible columns or only part of them. This import mechanism should provide a possibility to update data as well.

Data search. Users should be able to search for loans based on various criteria, including the borrower's name, Social Security Number (SSN), and loan number. This search functionality enhances data retrieval and navigation within the CRM.

Data display. For every loan found using search, there should be a possibility to display all available information about the loan and all related actions for the loan and the corresponding borrower.

Data export. The system should offer the capability to export loan and payment data in a user-friendly format, such as Excel files. This feature facilitates data sharing, reporting, and external data analysis.

Data entities. The system should maintain various essential data entities, including detailed loan information, borrower profiles, payment records, activity logs, counterparty (counteragent) data, borrower addresses and phone numbers, trial details, and loan expenses. These entities enable comprehensive debt collection management.

Basic reporting. The system should include basic reporting capabilities, allowing users to generate and view key performance indicators (KPIs). Users can access reports that provide insights into debt collection activities, client interactions, and financial performance.

Company differentiation. To distinguish data imported from different companies, the system should include a mechanism that tags or categorizes records by their source company. This feature ensures proper organization and separation of data for compliance and analysis.

Payment prediction. The system should employ predictive analytics to estimate the date and amount of the next payment for each loan. This prediction enhances financial forecasting and cash flow management, aiding in decision-making.

Non-functional requirements:

Hosting. All elements and layers of the solution (UI, back-end, database) should be hosted in the cloud environment, which allows scalability, accessibility, reliability, security and cost-efficiency.

Storage. The system should use cloud-based storage to ensure data accessibility from anywhere with an internet connection. Cloud storage offers scalability, redundancy, and simplified backup and recovery processes.

Encryption. Data stored in the cloud and during transmission should be encrypted to protect sensitive client and financial information. Encryption ensures data security and compliance with privacy regulations.

Response time. The system should provide short response times for user interactions, ensuring that users can navigate, input data, and retrieve information without experiencing significant delays. Quick response times enhance user satisfaction and productivity. For website navigation it should be under 1 second. For search, import and export operations it should be under 30 seconds.

Low-cost. The total monthly cost for the cloud services needed for all solution components should be no more than 100$.

All these requirements outline the specific features and capabilities expected from the CRM system, as well as security, user-satisfaction and budgeting constraints that need to be addressed.

In complex, these requirements provide a comprehensive framework for the CRM system, ensuring that it not only meets specific functional needs but also operates within the defined budgetary constraints, thereby aligning both technical and financial aspects of the project.

Chapter 2. Overview and comparison of similar software

The market for CRM systems dedicated for the legal and debt collection industries is competitive and diverse, offering a variety of solutions to meet the specific needs of these sectors. The eAttorney CRM system which is being developed in this project, with its focus on core functionalities like login/logout, loan search and view, data import/export through Excel, and basic reporting, places itself within a niche that prioritizes straightforward, essential tools over complex and extensive feature sets.

The market is characterized by a range of products that vary significantly in terms of features and complexity. While some systems offer basic, others are far more complex, integrating advanced analytics, AI-driven insights, and comprehensive case management tools. The level of sophistication often correlates with the price, making simpler systems more accessible to smaller firms or those with limited IT resources.

A key trend in modern CRM solutions is the emphasis on integration capabilities. Many systems are designed to seamlessly integrate with a range of other software, including accounting platforms, email services, and document management systems. Customization is another critical factor. High-end CRM systems are highly customizable, allowing companies to adjust the software to their specific workflows and processes. Scalability is equally important, with many systems designed to grow with the firm, adapting to increasing data volumes and more complex operational needs.

Most modern CRM solutions offer mobile accessibility, ensuring that users can access critical information and perform essential functions on the go. This feature is particularly valued in today's fast-paced work environment and is almost

a standard expectation. The focus on user experience (UX) is also a huge factor in the CRM software market. Systems are increasingly designed to be intuitive and user-friendly, reducing the learning curve and increasing adoption rates.

Finally, given the sensitive nature of data handled by legal and debt collection firms, compliance with data protection regulations and robust security features are critical. Advanced CRM systems offer features like encrypted data storage, audit trails, and compliance with industry-specific regulations.

There are a several CRM systems available on Ukrainian market, that are specifically developed for debt collection and legal processes, offering a range of features that can be compared with your CRM system. Here's an overview of some of them:

Latitude by Genesys (https://www.genesys.com/collateral/latitude-by-genesys).

This product is designed to address accounts receivables challenges from early delinquency through to charge-off and debt sale. It integrates seamlessly with business servicing platforms, offering an end-to-end solution for debt collection. Compared to out eAttorney CRM, which focuses on basic functionalities like loan search, view, and data import/export, Latitude by Genesys offers a more integrated solution tailored to manage the entire debt collection lifecycle. Detailed pricing information for Latitude by Genesys is not readily available and may depend on the specific needs of the business, but evidence shows that it costs at least several thousand dollars per month and may be expensive for a small business.

Pros. Offers an end-to-end solution for the entire debt collection lifecycle, which is more comprehensive than basic CRM systems. Seamlessly integrates with

business servicing platforms, providing a unified approach to managing accounts receivables.

Cons. Is quite complex and may have a steeper learning curve due to its comprehensive nature. Pricing information is not readily available, which may be a concern for budget planning.

RecoveryPro (www.recoveryprosolutions.com).

RecoveryPro is a specialized database program for Judgment Recovery and Collections. It's designed by a professional with extensive experience in judgment recovery and offers features like local and online synchronized databases for access anywhere with an internet connection. It includes over 1000 user fields, customizable mail merge options, and a powerful phone dialer. RecoveryPro is suitable for managing various account statuses and supports Microsoft Word for document creation. It provides free updates and support, and pricing is based on the number of accounts managed, with a free tier for up to 5 accounts and various pricing options as the number of accounts increases.

Pros. RecoveryPro's use of both local and online databases that synchronize ensures access to data anywhere with an internet connection, enhancing flexibility and data reliability. Designed by a professional with extensive judgment recovery experience, it includes over 1000 user fields, mail merge, and customizable phone dialing campaigns, making it highly specialized for judgment recovery and collections.

Cons. Requires Windows Vista or greater and Microsoft Word, which could limit users who operate on different platforms or prefer alternative software. With extensive features and capabilities, it may have a steep learning curve, particularly for users new to such specialized software.

Also, there are some general-purpose CRMs on the market that can be adapted to be used in debt collection business. Below is a review of some of them.

Salesforce Sales Cloud (https://www.salesforce.com/).

Known as a leader in CRM software, Salesforce offers an essentials-level platform ideal for small and growing businesses. It includes features like workflow builder, a mobile app mirroring the desktop experience, and integration capabilities with platforms like Mailchimp, QuickBooks, Dropbox, or Google Workspace.

This product offers robust CRM functionalities like lead management, opportunity tracking, email integration, and detailed analytics.

It is more comprehensive than eAttorney CRM, with a wide range of features beyond basic loan management and reporting.

Pros. Highly customizable, robust analytics, excellent integration capabilities, scalable for any business size, AI-driven insights.

Cons. Can be expensive, complex to set up and maintain, might be overkill for smaller businesses. Pricing: Starts at $25 per user/month for the Essentials plan.

Quickbase (https://www.quickbase.com/).

Ideal for businesses seeking a customizable CRM solution, Quickbase is a low-code platform that requires some coding knowledge but allows you to build a CRM to exact specifications. It's adaptable to changing business needs and includes common CRM tools like workflow automations, file attachment space, and business app integration. The pricing and specific details would require direct inquiry as it's tailored to business needs.

Quickbase allows building unique CRM solutions tailored to specific business processes, offers real-time data insights, and supports cross-platform integrations.

This is a flexible CRM platform allowing custom development of CRM solutions, including workflow automations and extensive integration capabilities.

It offers more customization and development options compared to eAttorney CRM functionalities.

Pros. Highly adaptable and customizable, ideal for unique business processes, real-time data insights, supports cross-platform integrations.

Cons. Requires technical expertise to set up and manage, potentially time-consuming setup, pricing can be high depending on the customization.

Pricing is not openly available, one needs to contact the company for specific pricing details, which highly depend on requirements.

Keap (https://keap.com/)

This CRM is best for small businesses and offers easy automation implementation with nearly every feature available on both plans. Priced at $159 per month, Keap offers a good value-to-cost ratio, with limitations related to the number of contacts, users, and custom fields allowed.

Simplified CRM focusing on automation, sales, and marketing tasks, with features like email marketing, appointment scheduling, and invoicing.

This system is more marketing-focused compared to your eAttorney's debt collection and loan management functionalities.

Pros. Ideal for small to medium-sized businesses for its ease of use and automation of routine tasks.

Cons. Less suited for larger businesses or those requiring advanced CRM features.

This system is more affordable for small businesses but may lack the depth of features provided by more expensive CRMs. Also, adapting it to debt collection specifics could be a significant effort.

In summary, for a relatively small company, a custom-made CRM like eAttorney could be more suitable due to several reasons.

First, it is specifically designed for debt collection in legal firms, ensuring it meets niche requirements more effectively than general-purpose CRM systems.

Second, unlike complex systems like Salesforce or Quickbase, which might be overwhelming for small teams, this custom CRM focuses on essential features, making it easier to use and manage.

Also, custom CRM will be more cost-effective, especially when compared to comprehensive but expensive solutions like Salesforce.

Additionally, custom CRM's emphasis on loan management and Excel-based data handling is directly relevant to small companies business operations, unlike broader systems which include many unnecessary features.

Finally, a simpler, more focused CRM means a shorter learning curve for the team, unlike more complex systems which require extensive training.

Overall, for a small company with specific needs in debt collection, a custom-made CRM can provide the necessary tools without the complexity and cost of larger, more general CRM systems.

Chapter 3. Architecture, design, and technology stack

In this chapter, we will review the integral parts of the eAttorney CRM system, which satisfies basic needs of a legal firm specializing in debt collection. This CRM stands serves as a tool, that helps to connect data storage and analysis tasks, complex data management and user-centric operational efficiency. Following three sections will be reviewed: Architecture, Design, and Technology Stack, each offering a unique perspective on how the system is structured, implemented, and powered.

Explaining the architecture, design, and technology stack of this software system is crucial for several reasons, as these elements collectively offer a comprehensive understanding of how the system operates, performs, and adapts to various needs. Each aspect plays an important role in the overall functionality and usability of the system.

In the architecture section, we will explore the high-level structure that defines how different components of the CRM interact and operate harmoniously. This section is dedicated to illustrating the system’s layout, focusing on its scalability, reliability, and maintainability in the context of debt collection processes.

While architecture gives us the blueprint, the design aspect translates this blueprint into specific, functional elements. This section will uncover the internal workings of the CRM, showcasing how the system's features and components are crafted to meet both user needs and technical requirements.

The final section is dedicated to the technological underpinnings of the eAttorney CRM. Here, we will catalog and elucidate the specific technologies, frameworks, and tools employed in building and maintaining the system. This

section not only highlights the technical choices made but also provides rationale for these choices in the context of the system's requirements.

Architecture. This section acts as the cornerstone of our exploration, offering a bird's-eye view of the system's structure. It illustrates the high-level arrangement of the CRM's components and the interplay between them. This is where we delve into how the system is conceptualized to ensure not only seamless operation but also scalability and adaptability to evolving business needs.

First of all, based on the list of requirements (both functional and non-functional), we may define the list of characteristics of the system, that should be satisfied:

Modularity. The architecture should be modular, allowing different components to be developed, tested, and deployed independently. This aids in isolating issues and makes the system more manageable. Also, this allows to change or upgrade the modules independently without having to change other parts of the system.

Performance. The system should offer fast response times and efficient processing, even under heavy load. This includes optimizing database queries, efficient data processing and UI responsiveness.

Reliability and availability. The system must be reliable, minimizing downtime and ensuring data integrity. High availability should be a priority, but some downtimes are acceptable. So, we may define the desired availability at the level of two nines (99%).

Scalability. The architecture should support vertical scaling, which means enhancing the capabilities of existing hardware or software. No need for horizontal scaling since user-base and data volume are not expected to grow much. Vertical

scalability should handle increasing workloads and user numbers without degradation in performance.

Maintainability and flexibility. The system should be easy to maintain and update, with a well-documented code base and architecture. It should be flexible enough to adapt to changing business needs or integrate new technologies.

Usability. The user interface should be intuitive and user-friendly. Since interface requirements are pretty straightforward and simple, there is no need in complex interface techniques. Also, it should offer a seamless experience across various devices (responsive design) to be used on both desktop and mobile devices.

Data management. Efficient handling of data, including storage, retrieval, and backup. Capability to handle large volumes of data (up to 500 000 loans) without performance degradation. Database backups should be daily. Backups for the last week should be kept.

Disaster recovery. There should be a solid plan for disaster recovery to handle data loss scenarios. Regular backups of the all system components should be done.

Security. Given the sensitive nature of legal and financial data, security is paramount. This includes data encryption, secure data transmission, solid authentication and authorization measures.

Cost-effectiveness. This is one of the key characteristics of the eAttorney CRM. While ensuring quality and performance, the architecture should also consider cost-effectiveness (both capital and operational costs and reasonable development and deployment effort).

Having defined the architecture characteristics list, we now may define all needed logical components, that eAttorney CRM will contain:

- application (responsible for interaction with users, handling the data import workload and payment prediction logic)
- database (stores data, contains reports logic, mapping information for Excel files import, and user information)
- user interface (a cross platform simple web-site that allows to interact with the system: search for information, view information, import and export data)

For my project, I have chosen the layered architecture style, where we have following layers:

- presentation layer, in the form of a web UI, responsible for interaction with the system. It should satisfy following quality attributes: usability, responsiveness, accessibility.
- business layer, in the form of the application itself, responsible for all business logic. It should satisfy following quality attributes: performance, reliability, security, maintainability.
- database layer, in the form of the database server, responsible for storing application data and containing reports definitions. It should satisfy following quality attributes: data integrity and management, availability, backup and recovery, performance.

In the context of eAttorney CRM architecture, adopting a layered architectural style helps in organizing the system into distinct layers, each with a specific role and responsibility. This approach not only simplifies development and maintenance but also enhances scalability and reliability.

In the case of our requirements, a layered architecture is particularly preferable due to several reasons. Firstly, it promotes separation of concerns,

allowing different aspects of the CRM – user interface, business logic, and data storage – to be developed and maintained independently. This separation enhances maintainability, as each layer can be updated or modified without significantly impacting others. Secondly, a layered architecture aligns well with the diverse functionalities required by the system, such as user interaction, complex business processing, and data management. Each layer can be optimized for its specific tasks – for example, the application layer can focus on efficient data processing and business logic, while the user interface layer can concentrate on delivering a seamless and responsive user experience. Additionally, this approach supports scalability in a situation where the volume of data and number of users can grow over time. Lastly, the layered architecture facilitates better security management, as each layer can implement its security protocols, crucial for handling sensitive legal and financial data. This architectural choice, thus, provides a balanced approach, addressing all the CRM's needs and yet staying simple and not overwhelming.

The presentation layer is simple and consists of several webpages, through which a user can interact with the system. In a chosen client-server layered architecture pattern, it is the only component which is on the client's side.

However, the business layer is much more complex and is composed of multiple sub-components, such as:

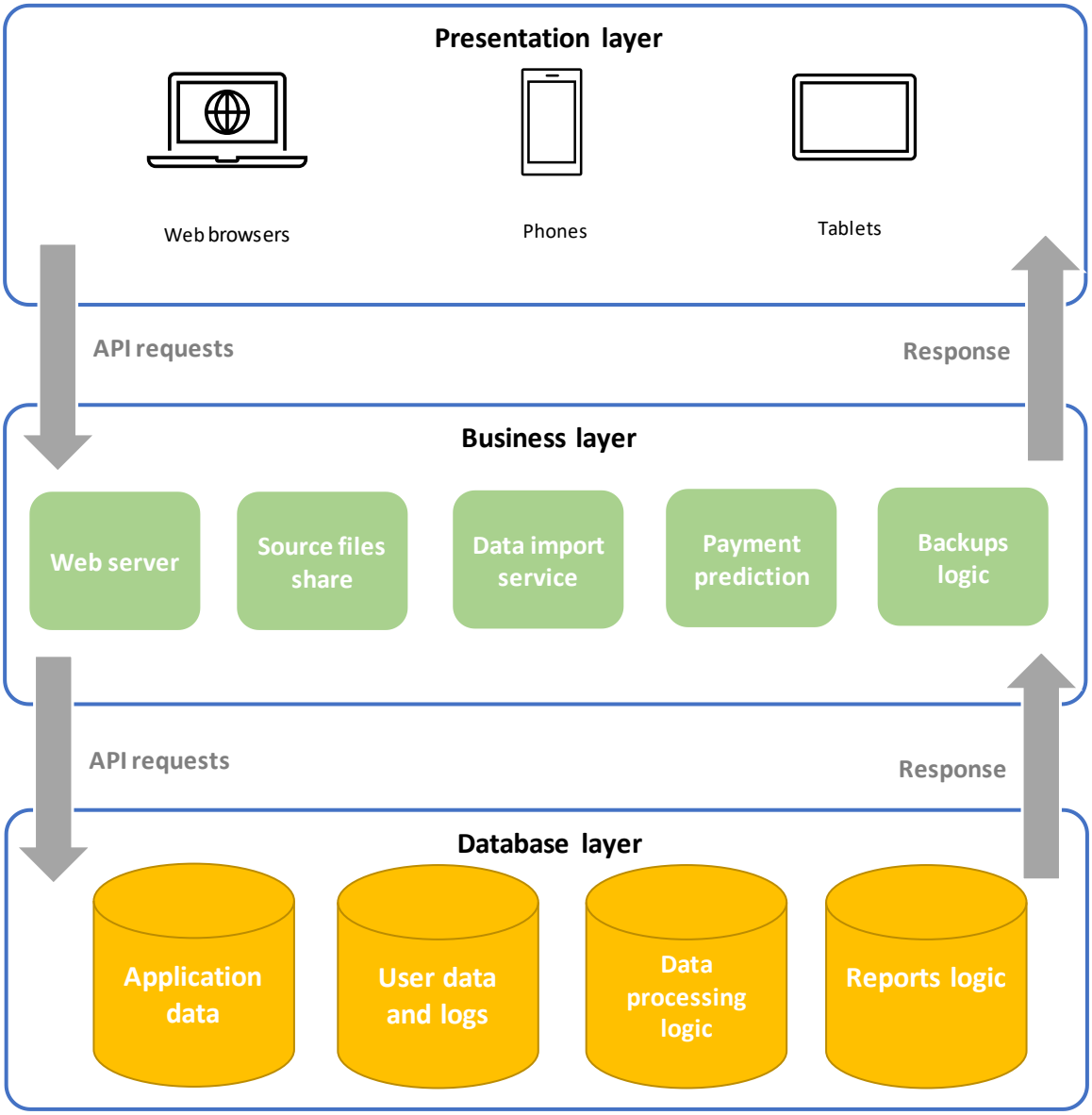
- web server, with is responsible for handling web requests send from the client, interacting with the database, rendering web pages, sending emails, perform authentication and authorization logic, upload files to source shared location, export data from the system.
- source files shared storage, which is dedicated to accepting and storing archived source files being imported to the database

- data import service, which is responsible for data import logic (checking source files, validation of their structure, pushing source data to the database and notifying users about import process results)
- payment prediction module, responsible for periodical analysis of payments history and predicting the next payments for a loan with the help of ML techniques
- backups logic, responsible for periodical database backups creation and infrastructure snapshots

Database layer also has some complexity and not servers as just a data storage. It has following sub-components:

- application data (actual data about loans, borrowers, payments etc. used in company's business processes)
- user data and logs (user names, roles, encrypted credentials, logs for data importing and processing activities)
- data processing logic, responsible for correct processing of the imported Excel files data, validating, denormalizing it and putting into the correct database structures
- reports logic, responsible for generating datasets for basic reports requested by business users

The following diagram represents a high-level overview of the eAttorney CRM architecture.



Solution design. In this section, we will review the solution components in more details and describe how they interact with each other.

We will describe the use cases of the eAttorney system and for each workflow explain, how different components are involved and interact.

Data import

Data import scenario is probably the most complex and expected to be the most highly used in the system. It provides the main benefit compared to storing data in Excel spreadsheets or other sources not designed to handle big volumes of data. The system is designed to import data from Excel spreadsheets of the predefined structure. There are multiple source file types that can be imported in the system: loan and borrower information, counteragent information, loan expenses information, appeals, trials, payments, addresses, phones.

All loans in the system are distinguished on the company level. So, for each of the company we need to define the structure of source files (fields, data types and other attributes). This structure is stored in the database, along with other necessary mapping information, which makes possible to put imported data into the correct database structures.

Data import process flow consists of the following steps:

1. User prepares source files with correct names and structures

2. User uploads files to the source files storage via web interface, choosing the right Company and necessary files with the file picker

3. Data upload service, which constantly runs on the background, picks files from the source files storage, checks them for the correct structure and validates data. In case of errors it logs details to the log and notifies user via email about the failed import and provides error details. In case of successful validation, the

service puts data from Excel files to the database staging storage, kicks-off the data processing process, notifies user about successful import and archives source files.

4. Data processing process initiated on the previous step takes place. This is a set of ETL processes that take imported data from staging storage and put it into corresponding database structures. After successful processing, the user is notified. In case of errors, the user is notified and provided with the details in the email.

This functionality allows not only to insert new data to the database, but also to update necessary data for already inserted records.

Data search

In data search scenario, the user performs loans search on the website. It is possible to make search by using the following criteria: Customer SSN, Full name and Loan number (or combination of them).

Search process involves following steps:

1. User inputs search criteria on the webpage, and press Search.

2. Web server sends request to the database with corresponding search parameters

3. Search results returned from the database are rendered on the web page in the results section. Each loan in the results section has a clickable link that allows user to view loan details if necessary.

Loan data display

In this use case scenario, the user performs detailed exploration of loan data for the loans, found during the search. The process is as follows:

1 Each loan in search results provides a link, clicking on which opens the loan details web page and initiates a database query for the details of the specific loan together with all related information.

2 After the data is returned from the database, it is loaded and rendered on the web page. This web page contains several tabs: basic info, loan details, borrower details, counteragent info, payments, addresses, phones, activities, trials and loan expenses, which provide all available information in the database, related to this particular loan. Also, Basic info tab contains the links to the other loans of this same borrower, which is very important to have in debt collection processes.

In current implementation, all data here is read-only. Updating of loan data is possible only by importing Excel file(s) with correct information.

Data export

In this use case, the user can export information from the system. There are two types of information available for export: portfolio information and payments information. Each of the types has its corresponding web page, from which the export is being done. The process is as follows:

1 On the web page, the user chooses Company(s) for export and inputs search criteria for the data they want to export (for example, for payments it can be payment date range)

2 By pressing Download button, a search query is sent to the database, considering criteria from user input.

3 Search results return from the database to the webpage by the web-server. They are displayed on the webpage

4 Now users has 2 options: by pressing the Copy button, search results are simply being put to the clipboard, and by pressing the Excel button corresponding code in the browser is run that allows user to define export file name and destination via file dialog window, and finally export search results to Excel file.

Payment predictions

In this scenario, a scheduled task periodically runs on the application server. During this task, the payment prediction process runs with following steps:

1. All available payments in the database are queried and analyzed using the machine-learning tools to populate and train prediction model.

2. For each loan that has at least 3 historical payments, the date and amount of the next payment is predicted by the model.

3. The predicted date and amount are stored in the database and then are displayed on the loan details page and are available for reporting.

This process runs once a day in the evening non-business time.

Reporting

Reporting functionality allows end users to retrieve consolidated information about different KPI's that allow to evaluate the effectiveness of business processes and make business decisions.

In current version of the system, the code of the reports is implemented on the database side. This allows more efficiently process big volumes of data and get ready-to-use data sets from the database. A very simple and basic Microsoft Excel interface is being used at this point, but this architecture allows to plug-in any other reporting system for displaying enhanced reports in case of need.

Reporting process works as follows:

1. User has an Excel file with configured reports pages. The file contains several reports displayed as pivot tables. Each pivot table is connected to the database and utilized corresponding report's view on the database side.

2. User just needs to press Refresh button in the file and wait for the data to be retrieved from the database and the report to be refreshed.

Technology stack. In this section, we will explore the technology stack of the eAttorney CRM system. We will define the rationale behind choosing each of the technologies, highlighting how they collectively contribute to a robust, efficient, and user-friendly system.

The entire solution is hosted on a single Windows virtual machine in Azure Cloud. One of the key requirements for the solution is its cost-effectiveness. By opting for a cloud-based solution like Azure, we benefit from a reduction in upfront infrastructure costs. Azure's pay-as-you-go pricing model allows for cost control and optimization based on actual usage.

Hosting all components on a single Windows VM simplifies the system architecture, reducing the complexity associated with managing multiple hosting environments.

Azure Cloud offers reliable, scalable cloud computing services. Hosting all components on a single Windows virtual machine also simplifies deployment and management while Azure's scalability ensures the CRM can handle varying workloads. Azure's extensive security features and compliance certifications are critical for handling sensitive legal and financial data.

For the database, I chose MariaDB database server. MariaDB is an open-source relational database management system (RDBMS), which makes it a cost-effective solution for managing the CRM's data. It is known for its high performance. It has been optimized to handle many concurrent connections and complex queries, which is essential for a CRM system dealing with extensive and varied data sets. MariaDB also includes features not available in standard MySQL, such as advanced indexing techniques, which can improve query performance and speed up data retrieval.

For the web server, Apache Web Server was chosen. Apache is a widely used, open-source web server known for its stability, reliability, and flexibility. Its compatibility with a wide range of modules and extensions makes it a very good choice for this CRM. Apache's robust performance under different loads and its ability to integrate with other components in our stack, like PHP, adds to its suitability.

Data upload service, that handles Excel files import logic, was written in C# language on .NET platform. Implementing the data upload service as a Windows service in C# offers several advantages. C# is a powerful, object-oriented language with extensive libraries, making it well-suited for developing robust services. Integration with Windows allows for reliable and secure handling of background tasks like data upload, crucial for a system that regularly processes large volumes of data. Implementing data upload as a background service allows for efficient handling of big data sets without impacting the performance of the user-facing aspects of the CRM. This approach ensures that data uploads can occur seamlessly in the background, avoiding any blocking or slowdown in the interactive parts of the system. Running the data upload as a separate service allows for better resource management. The service can be allocated resources

independently of the main application, ensuring that it has sufficient capacity to handle the data processing load without competing with the front-end application for resources. This separation is also beneficial for scaling, as the data upload service can be scaled independently based on the volume of data being processed. With the data upload logic encapsulated in a background service, it can be maintained, updated, or replaced with minimal impact on the rest of the CRM system.

Web application logic was written in PHP language. PHP is a popular server-side scripting language, particularly effective for dynamic web content. Its ease of integration with the Apache server and widespread support makes it a practical choice for developing the CRM’s web application logic. PHP's wide range of frameworks and libraries facilitates rapid development and maintenance.

To ensure cross-platform user-friendly interface, Bootstrap framework was used for front-end side. Bootstrap is chosen for its responsiveness and mobile-first approach, ensuring that our CRM's user interface is accessible and user-friendly across all devices. It provides a consistent framework for UI development and speeds up the design process with its pre-built components.

The use of open-source technologies such as Apache server, PHP, and Python significantly cuts down on software licensing costs. These technologies are supported by large communities, providing reliable and cost-effective solutions.

Bootstrap, being open-source and widely used, reduces the front-end development time, thereby lowering development costs.

For payments prediction module, Python was used. With its extensive libraries for data analysis and machine learning, this choice is ideal for implementing the payment prediction logic. Its simplicity and efficiency in

handling complex data operations make it suitable for scripting predictive analytics. The execution via scheduled tasks ensures regular updates to the prediction models without manual intervention. Specifically, the sklearn library is used to utilize machine-learning techniques. For prediction calculation, linear reqression model is used, that accepts 6 different features of the payment history data.

Database backups are performed using PowerShell scripts. Utilizing PowerShell for backup processes leverages its powerful scripting capabilities in the Windows environment. It allows for the automation of complex backup tasks, ensuring data integrity and consistency. The use of scheduled tasks for execution guarantees regular, timely backups, an essential aspect of data management in a CRM system.

VM backups and snapshots are implemented with out-of-the box Azure functionality. Regular VM backups are crucial for disaster recovery scenarios. Also, since it's a backup of the whole solution, this type of backup makes it very easy to deploy the whole solution at once to another VM in case of need.

To conclude, the chosen technology stack for eAttorney CRM reflects a balance between performance, reliability, and usability. Each technology brings specific strengths that align with the requirements of a legal company's debt collection processes. The selected technology stack not only meets the functional requirements of the CRM but also aligns with key strategic considerations such as cost-effectiveness, simplicity, and maintainability. These considerations are essential for small companies, ensuring that the system remains robust, efficient, and adaptable, with manageable operational costs over time.

Chapter 4. User guide.

System overview.

This eAttorney CRM system is specifically designed to facilitate the management and analysis of extensive loan portfolios within debt collection organization. Serving as a centralized repository, the CRM system is able to manage a vast array of loan-related data, including in-depth borrower profiles, detailed payment records, and comprehensive loan activity logs.

Our CRM system is engineered to enhance operational efficiency through its sophisticated data handling and retrieval capabilities. It enables users to effortlessly navigate through large datasets, providing advanced search tools for pinpointing specific loan information with precision. Beyond data storage, the eAttorney CRM is dedicated to support business decision-making process. It provides features for data export and report generation, offering critical insights for strategic planning and risk management.

This guide provides an overview of the eAttorney CRM system, outlining its key functionalities and demonstrating how it can be optimally utilized for informed decision-making and streamlining loan management processes. As a step-by-step guide, this document will assist users to utilize the full potential of the system and to satisfy their requirements in the field of loan management.

System audience.

Potential users of the system are the following members of the teams that conduct debt collection business processes:

- back-office specialists (import and export data, search for loans)

- lawyers that work with specific loans (search and display, export data, reports generating)
- private executors that work with specific loans (search and display, export data, reports generating)
- call center specialists (import data, loans search and display)
- debt collection managers (reports generating, search and display data).

System requirements.

Internet connection. A stable and reliable internet connection is required to access and use the eAttorney CRM system. This ensures seamless data synchronization and real-time access to features.

Desktop access.

Supported browsers. The CRM is compatible with all major web browsers, including Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge. For the best experience, users should ensure their browser is up to date.

Operating system. The system is browser-based and OS-agnostic, it can be accessed from operating systems such as Windows, macOS, and Linux.

To use reports from Excel file, a MySQL db connector must be installed (https://www.mysql.com/products/connector/). Also, Microsoft Excel 2013 or higher must be installed.

Hardware. A standard desktop or laptop with the ability to run the latest versions of web browsers is sufficient. No specific hardware requirements are necessary beyond what is required to run your operating system and browser efficiently.

Mobile access.

Mobile browsers. The system is accessible via mobile browsers and is optimized for a responsive mobile experience. Users can access the system on both iOS and Android devices using browsers such as Safari on iOS and Chrome on Android.

Operating system. The latest or recent versions of iOS or Android are recommended for the best performance and user experience.

Hardware. Any modern smartphone or tablet capable of running the latest versions of a mobile browser should be able to access and use the CRM system without issues.

Additional recommendations.

Screen resolution. For optimal viewing experience, a minimum screen resolution of 1024x768 is recommended.

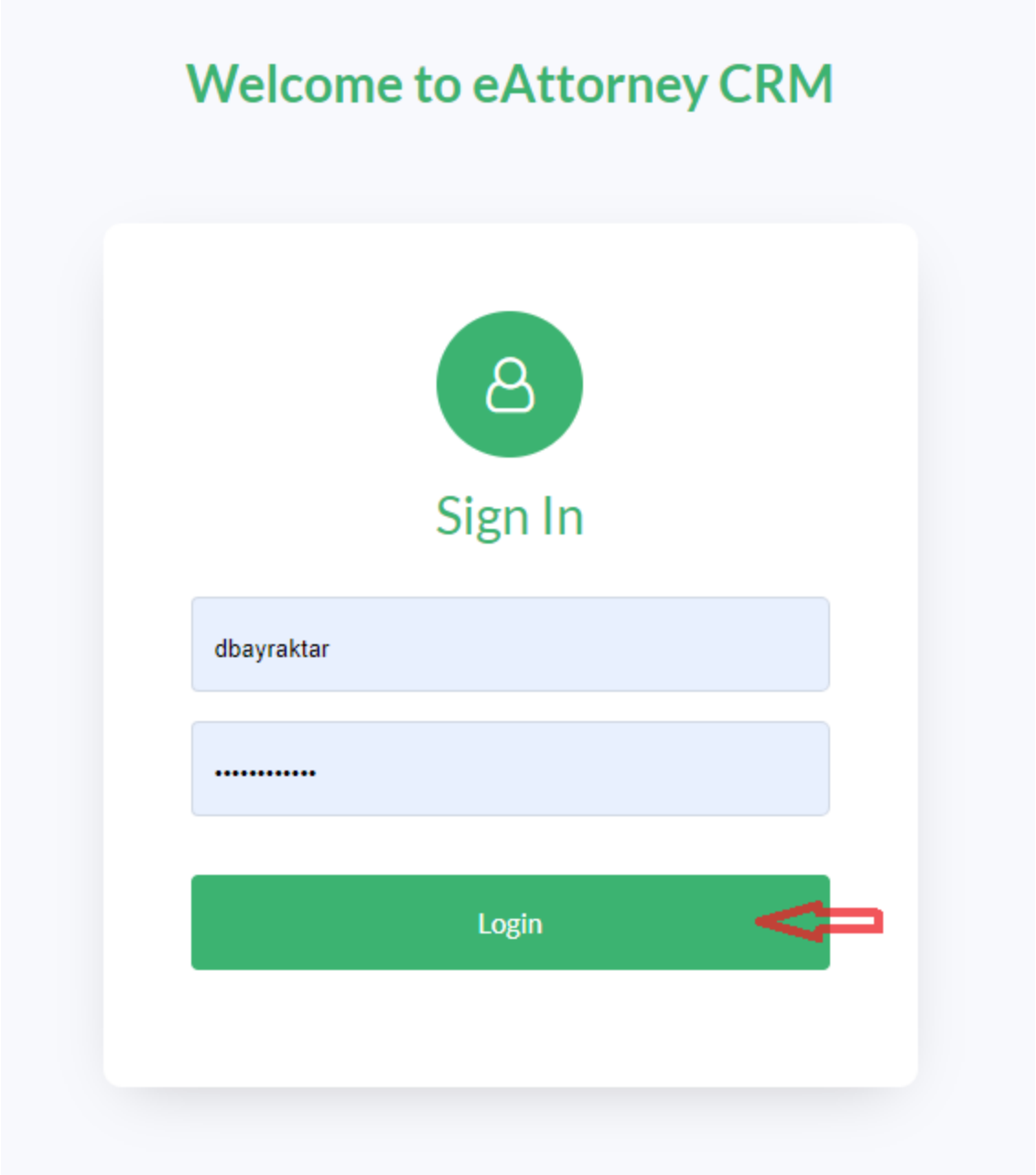
JavaScript and cookies. Ensure that JavaScript is enabled, and cookies are accepted in your browser for full functionality.

System usage.

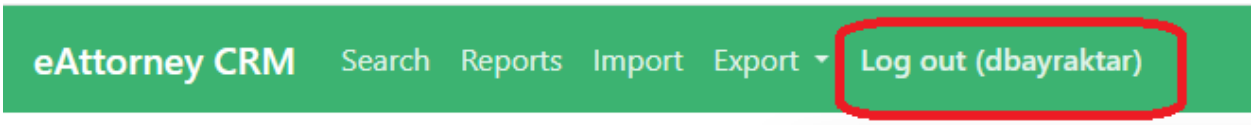
Login/logout.

To login to the system, user must open the homepage URL (https://auk01eattorney.westeurope.cloudapp.azure.com/), enter username and password, provided by system administrator, after that they should press the Login button.

In case of inactivity, the session expires in 30 minutes and the user is forced to log out, so login process should be repeated.

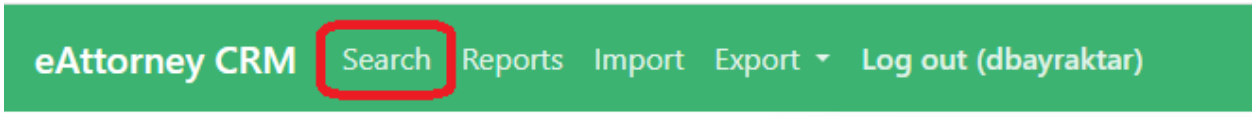


To log out of the system manually, user should use the “Log out” link in the navigation bar menu on any page of the system

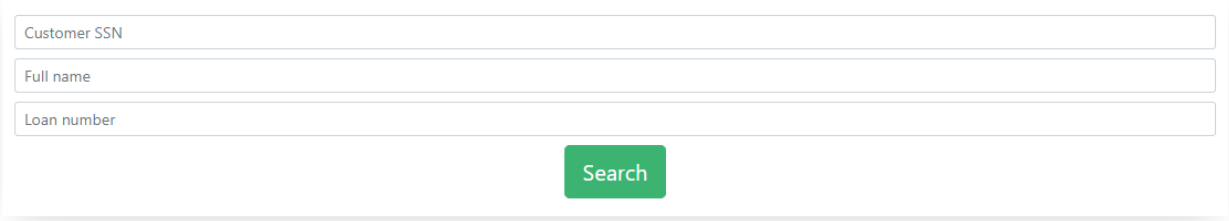


Loans search.

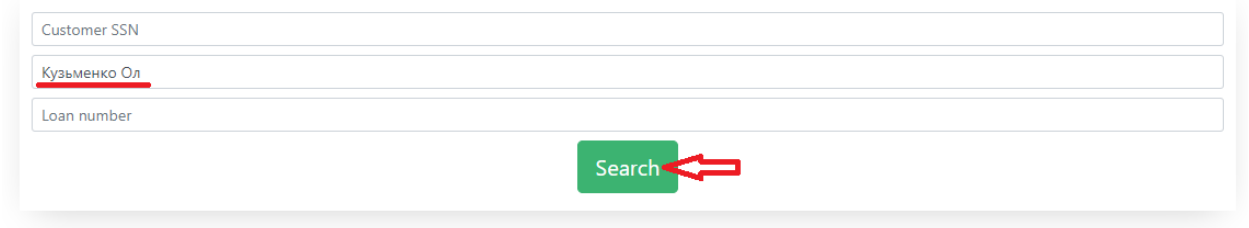
Loans search page is the first page that is opened after user login. It also can be accessed from the navigation bar using the “Search” menu



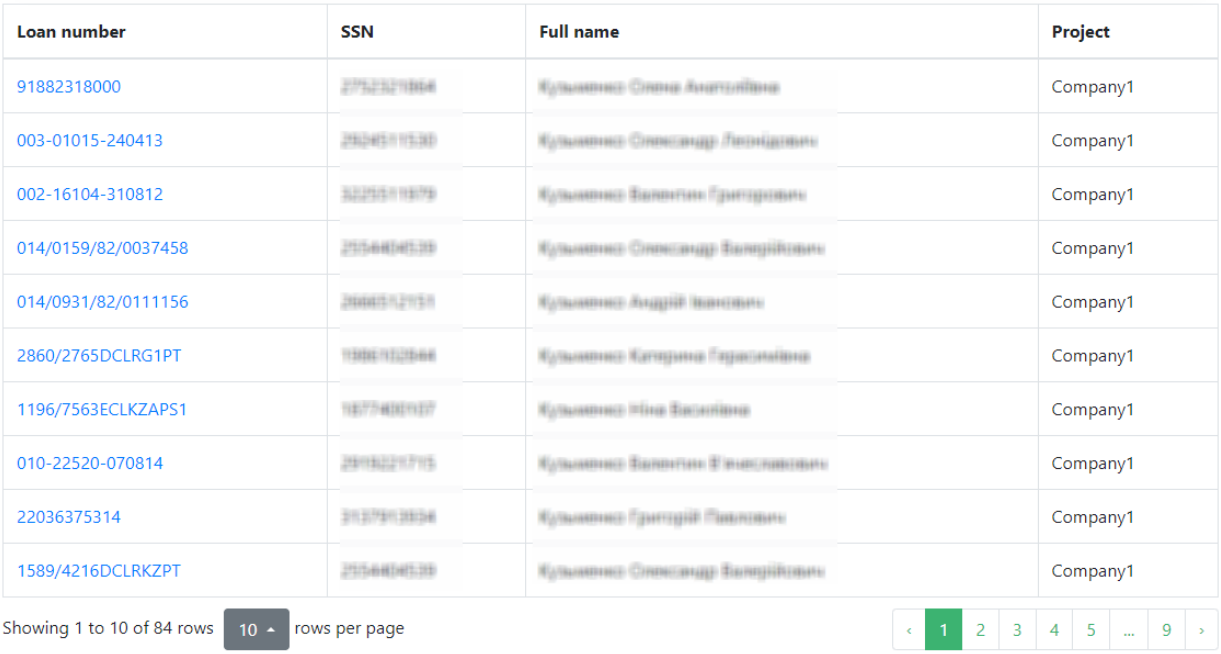
In the Search form, there are three parameters that may be used for the search: Customer SSN, Full Name and Loan number.



User can use either one of those parameters or a combination of them. They need to enter full or partial value of a search parameter(s) into the search form and click Search button or press Enter.



Search results will be displayed below the search form as a paginated list of loans.



Loan number	SSN	Full name	Project
91882318000	[redacted]	[redacted]	Company1
003-01015-240413	[redacted]	[redacted]	Company1
002-16104-310812	[redacted]	[redacted]	Company1
014/0159/82/0037458	[redacted]	[redacted]	Company1
014/0931/82/0111156	[redacted]	[redacted]	Company1
2860/2765DCLRG1PT	[redacted]	[redacted]	Company1
1196/7563ECLKZAPS1	[redacted]	[redacted]	Company1
010-22520-070814	[redacted]	[redacted]	Company1
22036375314	[redacted]	[redacted]	Company1
1589/4216DCLRKZPT	[redacted]	[redacted]	Company1

Showing 1 to 10 of 84 rows 10 rows per page

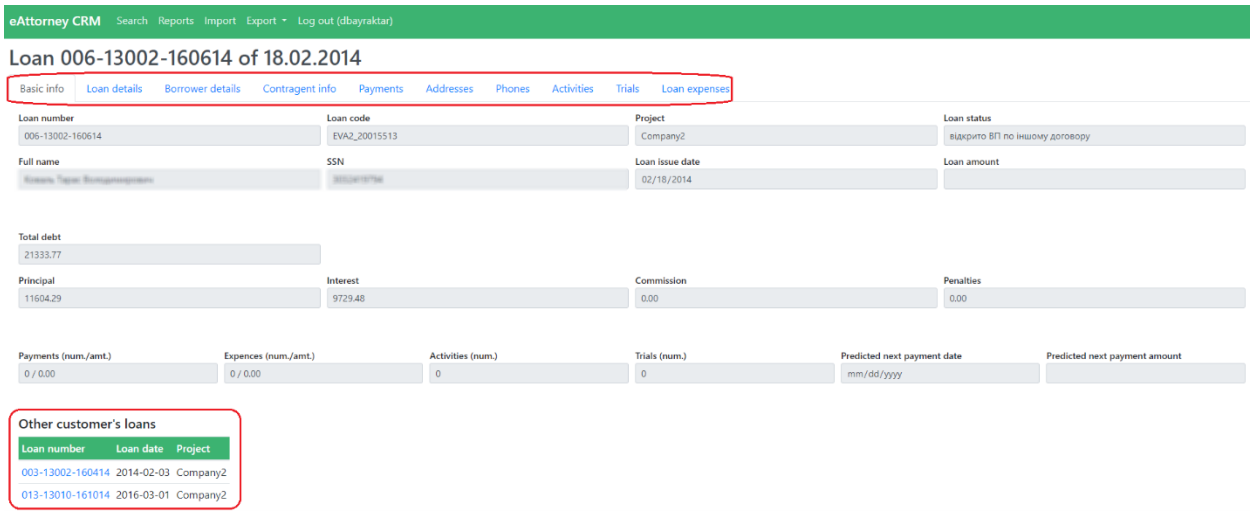
‹ 1 2 3 4 5 ... 9 ›

Loan data display.

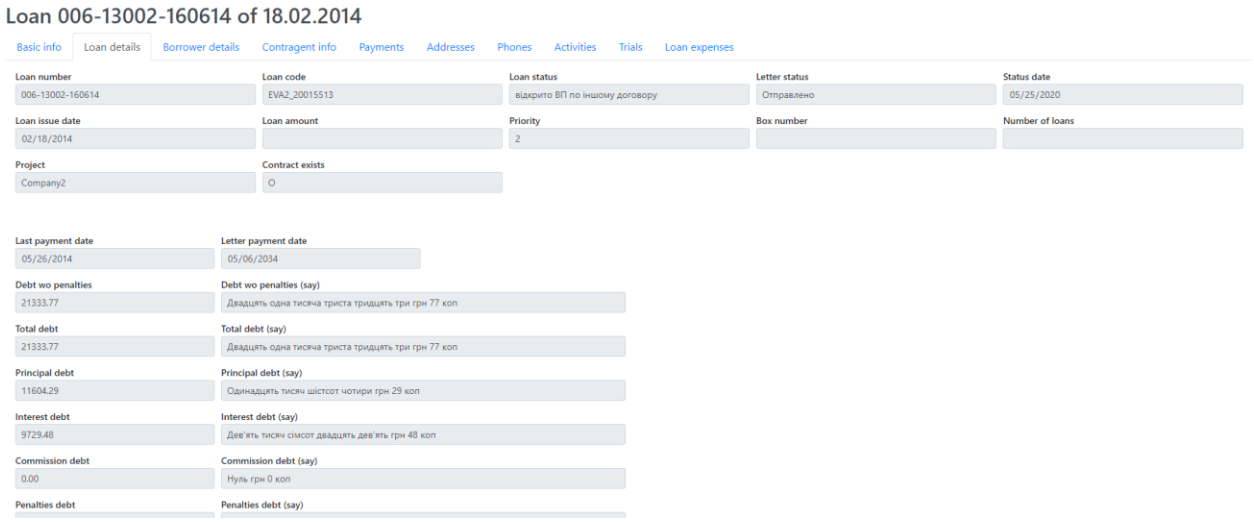
Each loan number in the list of search results contains a clickable link. By clicking on that link, the loan details page is opened, displaying the details of a selected loan.

Loan details page contains multiple tabs, that are accessible from the tabs navigation section.

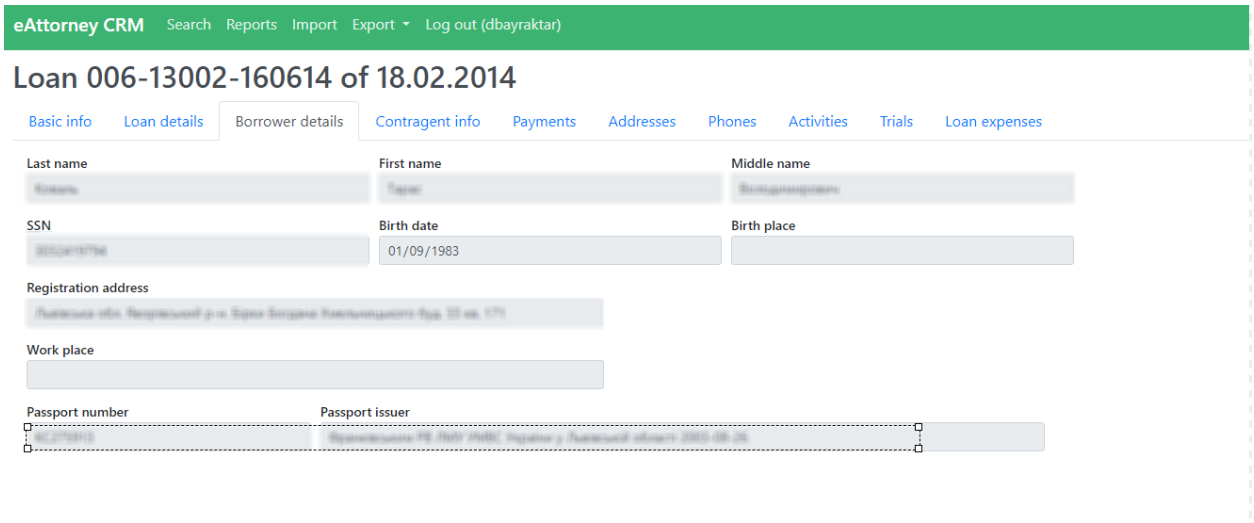
Basic info tab is opened by default and contains basic information about the loan. Also, at the bottom of the page, there is a section Other customer's loans, that contains the list of other loans related to the same borrower as the loan being displayed.



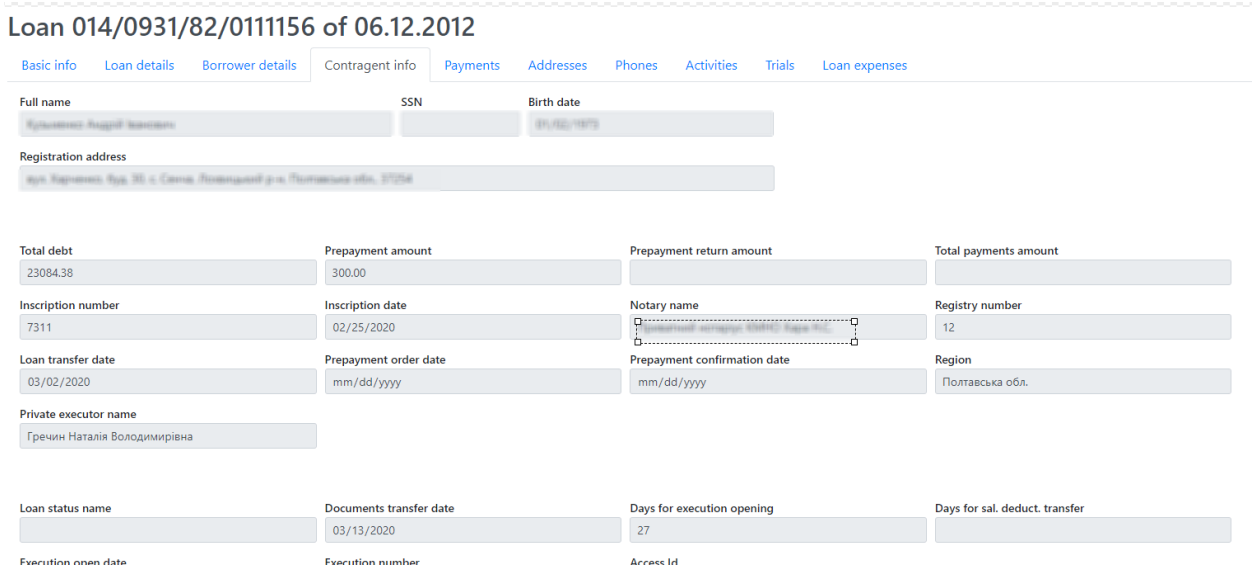
Loan details tab contains the detailed information about the loan



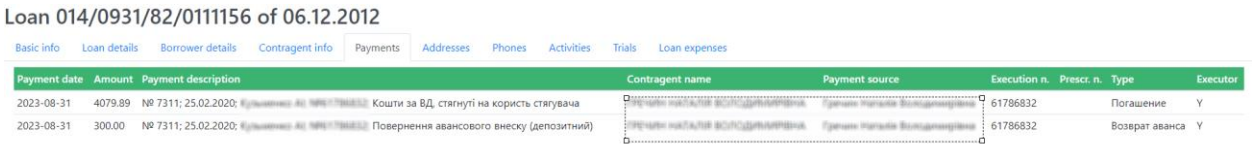
Borrower details tab contains personal information about the borrower



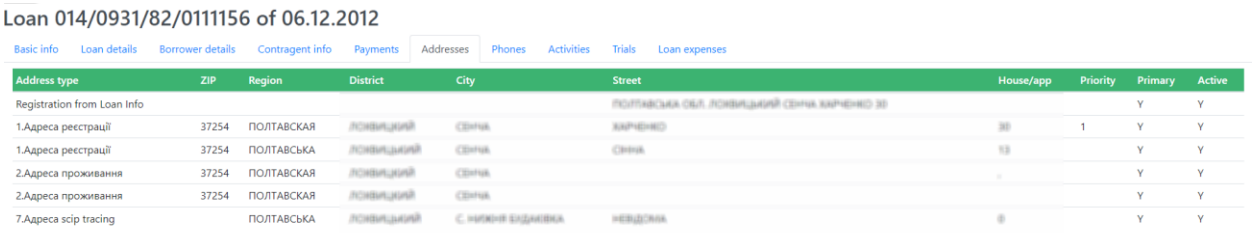
Contragent info tab contains all detailed information about the loan received from the counter agent (lawyer, notary etc.) that handles the loan



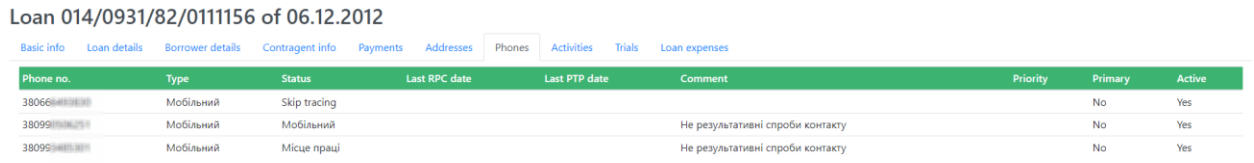
Payments tab contains the list of all historical payments for the loan with their details



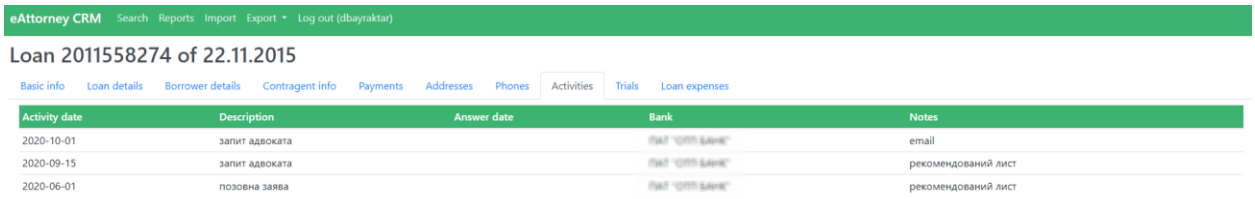
Addresses type contains the list of client's addresses received from different sources, and additional information like source, priority, whether the address is active or not.



Phones tab contains the list of client's phones with their statuses, comments and activity attributes.

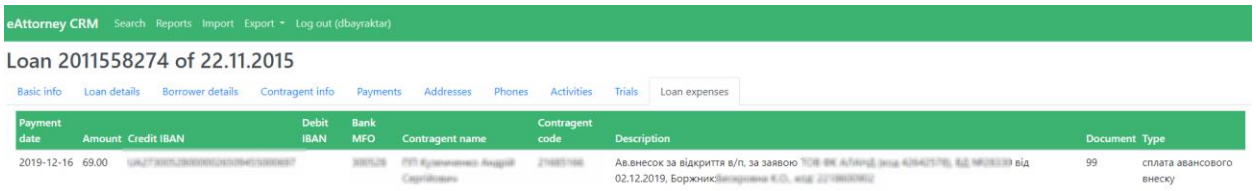


Activities tab contains the list of all actions made against the loan during the debt collection process and their details.



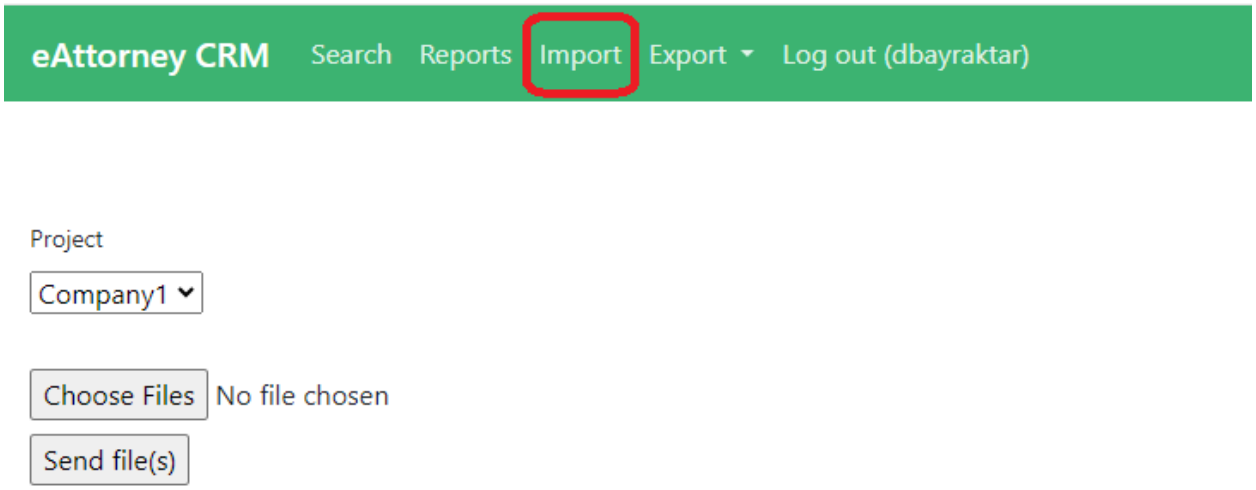
Trials tab contains the list of all trials initiated against the loan, and their details.

Loan expenses tab contains the list of transactions that have been made in order to support the debt collection process against the loan, together with their additional details.

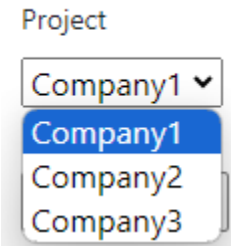


Data import.

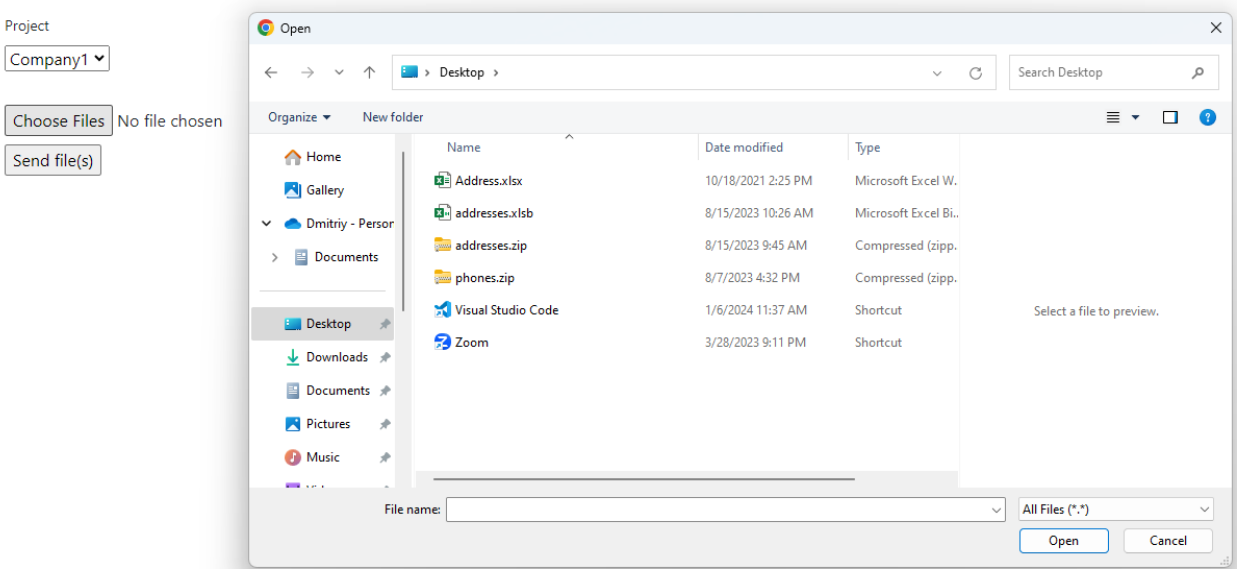
Data import process is performed from the Import page, which can be opened by clicking on the Import link in the navigation bar.



User selects a project from the dropdown list in the Project section. All available projects in the system will be displayed there.



Then, by clicking on the Choose files button, user opens a file picker dialog, where they can choose one or multiple files to be imported, and press Open



Following file names are designed to be uploaded to the system:

Address.xlsx

Appeal.xlsx

BorrowerUpdateInfo.xlsx

ContragentInfo.xlsx

LoanExpenses.xlsx

LoanInitialInfo.xlsx

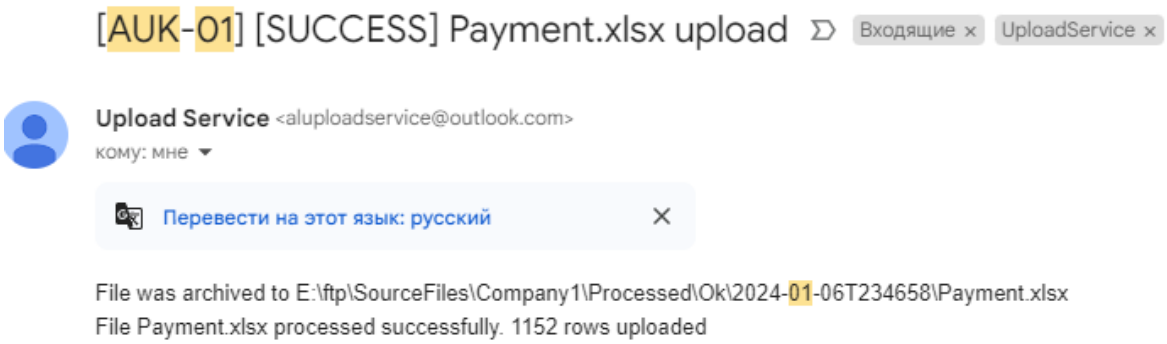
Payment.xlsx

Phone.xlsx

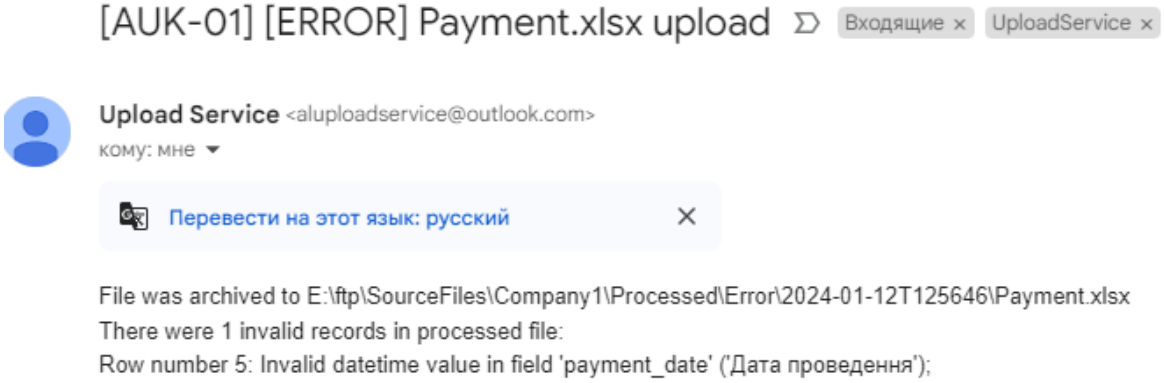
Trial.xlsx

Finally, by pressing Send Files button, the files are sent to the system and import process is initiated.

In case of success upload, user will receive an email notification with the details of import.

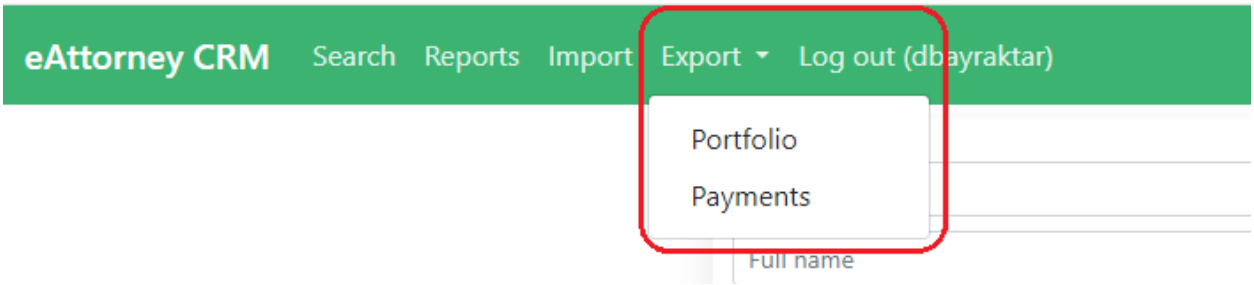


In case of errors, user will receive an email notification with error details



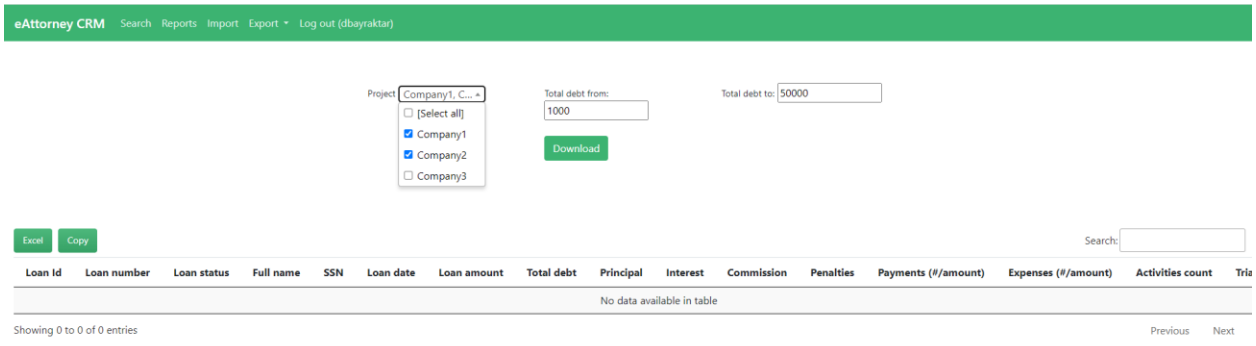
Data export.

User can access data export functions from Export menu in the navigation bar. There are two types of information that can be exported from the eAttorney CRM: Portfolio and Payments.

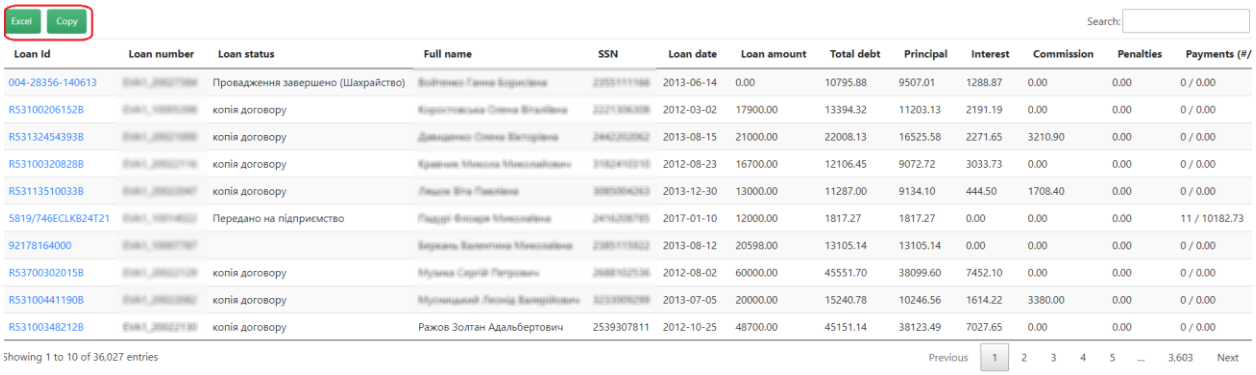


Portfolio export page contains parameters section in the upper part of the page. Here, the user can define following parameters: one or several projects from the list, and the range of loan debt to be exported

After choosing portfolio export parameters, user should click on Download button to initiate data download process.

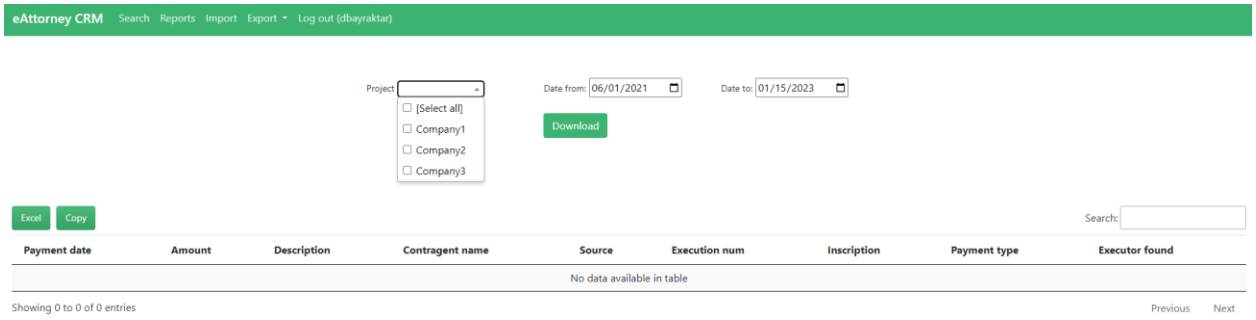


Download results appear at the lower section of the page. User can either copy results to the clipboard by pressing Copy button, or export them to Excel file by pressing Excel button and choosing export file name and location in the dialog window.



Payments export page contains parameters section in the upper part of the page. Here, the user can define following parameters: one or several projects from the list, and the range of payment dates to be exported

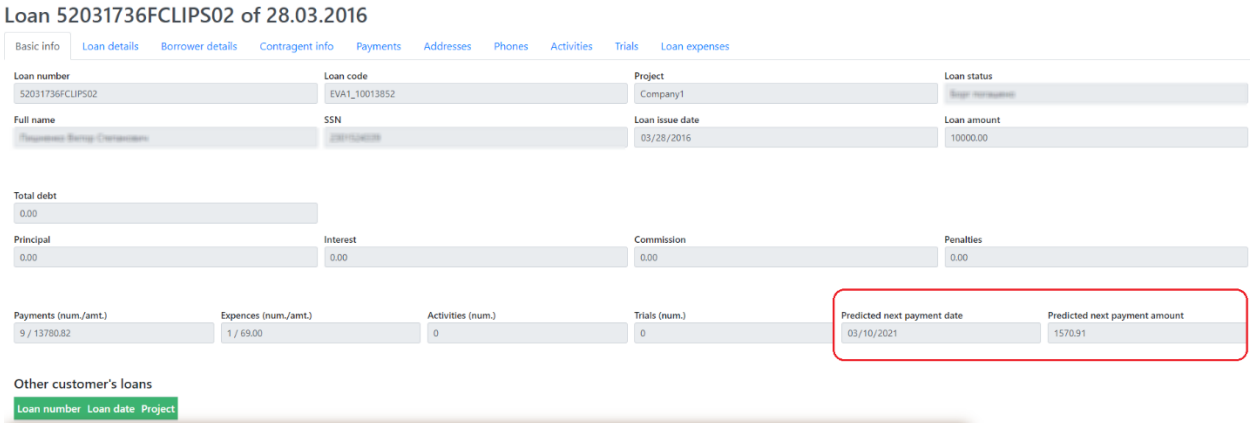
After choosing payment export parameters, user should click on Download button to initiate data download process.



Download results appear at the lower section of the page. User can either copy results to the clipboard by pressing Copy button, or export them to Excel file by pressing Excel button and choosing export file name and location in the dialog window.

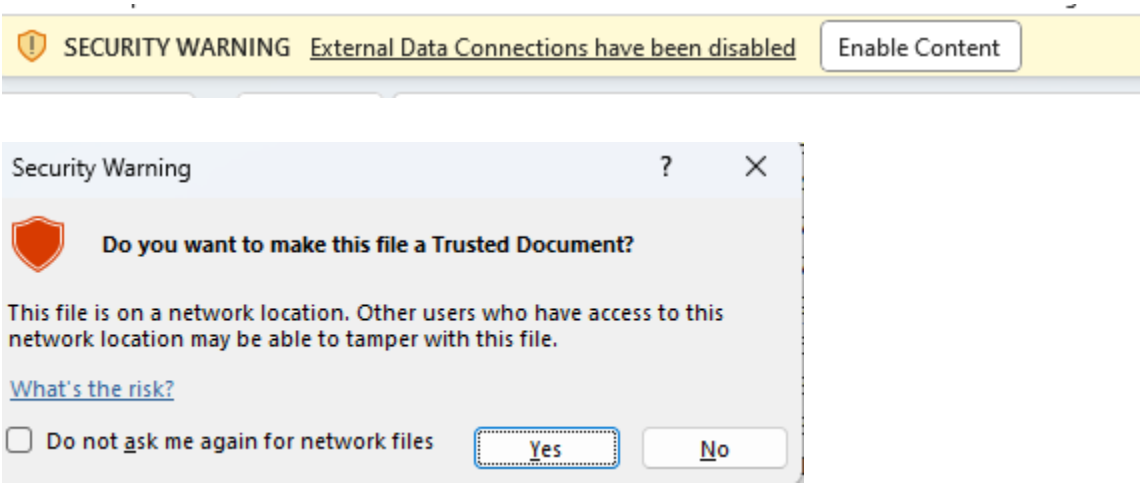
Predicted next payment.

Predicted next payment is calculated daily without user intervention. Predicted next payment and amount are displayed on loan details page (basic info tab) in the below section.

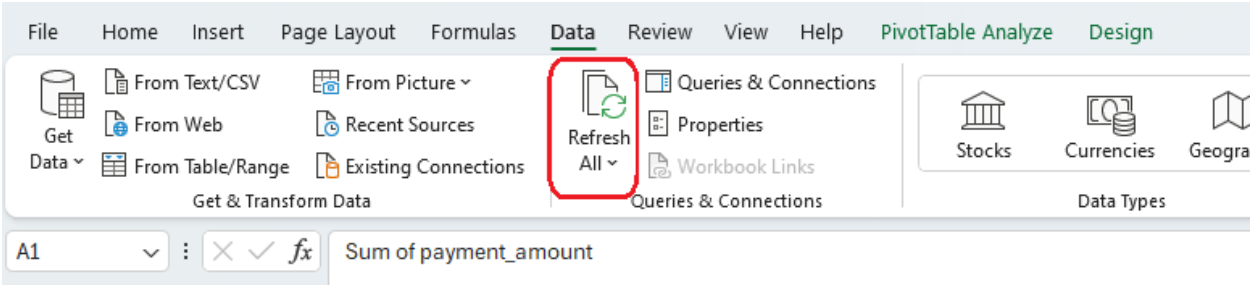


Reports generating.

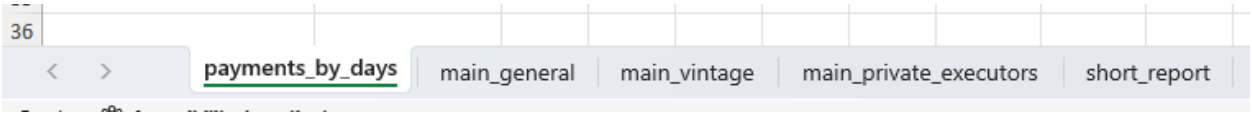
In the current version, reports may be generated from the Reports_DB_eAttorney.xlsx file, which is connected to the CRM's database. After opening the file, user should access the external content warning and enable external content, and make the document Trusted if needed.



All reports are predefined and pre-configured. To get the latest report data, user must press Refresh all button on Data tab and wait until reports are refreshed.



There are 5 different report tabs available in the file. Each tab contains one or more report displaying different metrics and KPI's of debt collection process.



Conclusions

This Capstone project focused on the development of the eAttorney CRM system, a solution tailored for small legal companies engaged in debt collection. The project's core aim, as established in the Introduction, was to transition from manual, spreadsheet-based operations to a more streamlined, efficient CRM system. This transition addresses the growing complexity and volume of data management and the need for a more robust, secure, and compliant system.

The eAttorney CRM system is designed specifically to the unique needs of the debt collection process in legal companies, emphasizing usability, data security, and efficient client and case management.

In Chapter 1 both the functional and non-functional requirements were outlined, ensuring the CRM aligns with the operational, security, and usability needs of small companies. This thorough detailing was vital in developing a system that is not only technically but also practically relevant.

In Chapter 2 the market analysis was provided. This helped to identify valuable insights into the existing CRM solutions, positioning the eAttorney CRM as a cost-effective, user-friendly, and specialized alternative. This understanding is crucial for carving out a niche in a competitive market.

The discussions in Chapter 3 about the CRM's architecture, design, and technology stack reveal a system built on solid technical foundations. The layered architecture approach ensures scalability, security, and performance, while the choice of technologies like MariaDB, Apache, PHP, C#, and Azure Cloud reflects a balance of cost-effectiveness and functionality.

Chapter 4's detailed user guide demonstrates a deep understanding of the end-users' requirements. It provides clear instructions and support, ensuring the system is accessible and valuable to its target audience.

The project successfully transitioned the target user base from manual, error-prone methods to a more streamlined, automated CRM system. This shift significantly impacts operational efficiency and data accuracy. The system was specifically tailored to meet the needs of small legal companies. It successfully integrates crucial functionalities like data import/export, client management, loan tracking, and predictive analytics, thus fulfilling the foundational goals set in the Introduction.

One of the primary objectives was to develop a cost-effective CRM solution. The eAttorney CRM, with its emphasis on open-source technologies and cloud-based deployment, meets this objective by offering a budget-friendly yet robust system. In configuration that is suitable for handling 500 000 cases, it’s monthly cost is around 80 USD.

The project also places a high emphasis on user experience, aligning with the initial goal of creating an accessible and user-friendly CRM. The responsive design ensures accessibility across various devices, and the intuitive UI minimizes the learning curve, enhancing user satisfaction. Additionally, simplicity of the UI helps users to concentrate on their business goals and not being distracted and overwhelmed by unnecessary complexity.

Addressing the critical need for data security and regulatory compliance in the legal and debt collection domain, the eAttorney CRM incorporates robust security measures, including data encryption and secure user authentication. This

aligns with the foundational requirement of maintaining client confidentiality and industry compliance.

The system's architecture is designed to accommodate future growth, ensuring that as the company expands, the CRM can scale accordingly without sacrificing performance. This corresponds to the project's aim of creating a long-term, sustainable CRM solution.

The eAttorney CRM system successfully bridges the gap between the need for a sophisticated data management system and the operational realities of small legal companies. By focusing on essential functionalities, user-centric design, and cost-effective technology choices, the eAttorney CRM becomes a niche solution that addresses the specific challenges faced by its target users. Its flexibility in mapping Excel import data to database structure allows it to be customized and used in different companies.

The project not only achieved its set objectives but also laid a foundation for continuous improvement and adaptation to the evolving needs of the debt collection industry. The scalability and flexibility of the system's design ensure that it can evolve to satisfy various needs of debt collection businesses in the future.

In conclusion, the eAttorney CRM system is an example of successful integration of technical proficiency with understanding of industry-specific requirements. It shows how targeted solutions can significantly enhance operational efficiency, data accuracy, client service, and decision-making processes in specialized domains. This project, in its entirety, serves as a valuable model for future endeavors in custom CRM system development for niche markets.

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