

Open Banking and Analytics -

WHITE PAPER

Payment transaction analysis in credit approval and financial management



ALMPARTNERS

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INTRODUCTION

This white paper is intended to describe some of the opportunities the Payment Service Directive 2 (PSD2) will enable when the regulation will be entering into force in autumn 2019. The PSD2 contains the minimum requirements banks have to provide to third party service providers, however banks are currently opening up interfaces to their customer information by providing Open Banking interfaces for accessing the customer data. Thus, banking services will be provided by third party service providers and services for accessing bank accounts and payment transactions will be enabled as well as payment initiation services, which normally have been provided only in banking environment and strictly by banks.

This paper focuses on solutions intending to increase risk management – both for customers and banks. Through Open Banking interfaces data from multiple banks can be combined and used to automate credit granting processes by assessing the customer payment ability. This kind of an assessment tool can be used directly in customer applications such as customer apps or in the net bank user interface and as an additional tool within bank branches connected to the credit preparation processes. The same interface and data capture can be used for adding customer budgeting tools and a better view on money spending. Personal economic knowledge is low according to the Bank of Finland and a budgeting or financial tool could improve the knowledge on the personal financial situation and money spending.

Access to payment accounts and payment transactions is solely based on the customer's consent. The collected information is subject to strict data security and personal data protection should be handled in accordance to regulation and national law. Profiling and automated processes have to be disclosed to the customer and generally the customer data will be used with propriety and responsibly.



TERMINOLOGY

AI – Artificial Intelligence;

API – Application Programming Interface, a messenger enabling information exchanges, taking a request from the TPP, and returning an answer;

AIS – Account Information Service;

AISP – Account Information Service Provider (aggregation of online information for multiple payment accounts in order to offer a global view of the customer's daily finances, in a single place, to help them better manage their money);

ASPSP – Account Servicing Payment Service Provider (provision and maintenance of the customer's payment account). Credit institutions (to put it simply, banks), payment institutions and electronic money institutions can be ASPSP, but also AISP and PISP;

Automated decision-making - the ability to make decisions by technological means without human involvement. Automated decisions can be based on any type of data, for example data provided directly by the individuals concerned, data observed about the individuals, derived or inferred data such as a profile of the individual that has already been created (e.g. a credit score);

CSC – Common and Secure open standards of Communication;

EBA – The European Banking Authority is an independent EU Authority which works to ensure effective and consistent prudential regulation and supervision across the European banking sector. Its overall objectives are to maintain financial stability in the EU and to safeguard the integrity, efficiency and orderly functioning of the banking sector. The main task of the EBA is to contribute to the creation of the European Single Rulebook in banking whose objective is to provide a single set of harmonised prudential rules for financial institutions throughout the EU. The Authority also plays an important role in promoting convergence of supervisory practices and is mandated to assess risks and vulnerabilities in the EU banking sector;

EBA Clearing – The provider of pan-European payment infrastructure solutions. The company manages two Systemically Important Payment Systems, the large-value euro payment system EURO1 and STEP2, a pan-European payment infrastructure platform for mass payments in euro, which provides full reach to all financial institutions across Europe processing credit transfers and direct debits in euro.

TERMINOLOGY

GDPR – The General Data Protection Regulation, which applies from May 2018, strengthens the consumer's protection.

PIS – Payment Initiation Service;

PISP – Payment Initiation Service Provider (facilitation of online banking to make a payment)

Profiling – Any form of automated processing of personal data consisting of the use of personal data to evaluate certain personal aspects relating to a natural person, particularly to analyse or predict aspects concerning that natural person's performance at work, economic situation, health, personal preferences, interests, reliability, behaviour, location or movements;

PSD2 – Payment Service Directive, aims to make payments safer, increase consumers' protection, foster innovation and competition while ensuring a level playing field for all actors, including new ones which were not regulated by the first version of the Payment Services Directive;

PSP – Payment Service Provider, any operator in according to the PSD2;

RTS – The Regulatory Technical Standards for strong customer authentication (SCA) and common and secure open standards of communication (CSC) are a key text for the implementation of the revised Payment Services Directive (PSD2). The role of the RTS is to define specific security measures that were only addressed through general principles in PSD2, and to ensure effective and secure communication between the relevant actors;

SCA – The principle of Strong Customer Authentication is to ensure customer protection via an increased level of security of electronic payments;

TPP – Third Party Payment service provider (a payment institution which does not hold payment accounts for its customers but provides payment initiation and/or account information services). The ASPSP must provide the AISP or PISP a secure communication channel to provide access to the payment account and therefore making it possible for them to propose their services.

PAYMENT SERVICE DIRECTIVE, RTS AND OPEN BANKING STANDARDS

According to the Payment Service Directive 2 banks are obliged to provide customer data to other financial service providers through commonly agreed interfaces. The PSD2 entered into force on January 13, 2018, however, the technical implementation of the PSD2 has to be implemented no later than in September 2019, when customer's accounts and payment transactions are accessible through Application Programming Interfaces (API). Accordingly, payment transactions can be initiated by a third-party payment service provider (TPP).

PSD2 aims to make payments safer, increase consumers' protection, foster innovation and competition while ensuring a level playing field for all actors, including new ones which were not regulated by the first version of the Payment Services Directive. However, PSD2 does not cover any technical specifications of how the integration through interfaces should be implemented. Therefore, EBA has published the technical standards for strong customer authentication and common and secure open standards of communication (RTS). The standards are more concrete than PSD2 and are directly applicable in the Member States of the EU and do not have to be transposed in national law.

In order to communicate securely with the banking system and the data within, there need to be common agreed rules and standards. It is obvious that every operator cannot present their own set of communication channels and rules and require banks to comply with these. Therefore, the banking industry has developed common rules and standards for the communication presenting the Open Banking API.



The standards underpin how regulated third-party providers connect safely and securely to account providers i.e. banks to offer services covered in the PSD2. At the initial stage in September 2019 at least account information or payment initiation services interfaces must be provided to third party providers, however, optional services can be implemented as well.

It is no doubt, that Open Banking will increase the amount of market players and financial services by enlarging the amount of service providers such as Account Information Service Providers (AISP) and Payment Initiation Service Providers (PISP). Among the service providers are banks as well as service providers. Banks utilizing the Open Banking standards towards other banks have already been launched. To this date, banks have not utilized the information stored in the banking system effectively for customer behaviour prediction nor for developing new services. Open Banking will enable analytical approaches and better business decisions based on historical data combined with statistics and analytics.

In the development of the Open Banking standards the driving forces in a customer perspective of view has been money management, lending and payments. Services like personal finance management, where the customer sees where his moneys is being spent, where the money comes from, analysing tools, account accrual and debt management will most certainly be evolved. For businesses account accrual, i.e. aggregated views of accounts in different banks and effective cash flow management services are essential and would improve the liquidity management and the cost effectiveness thus increasing revenues.

Giving access to customer information stored in the banking systems requires secure communication and the customer's consent. According to banking secrecy, customer information cannot be shared to anyone without the customer's permission. Customers must give their explicit consent to the AISP or PISP to share their payment account data or to initiate a payment transaction. The account service provider i.e. a bank needs to authenticate the service provider accessing the customer information through the Open Banking API. Accordingly, the account provider needs the customer's consent for revealing customer related information to a third party. Without going more into details in this document, secure communication channels are covered in the RTS and Open Banking standards and the reader will be referred to that documentation.

Since Open Banking standards give access to customer information such as accounts, account balances and payment transfers, there will be new opportunities to utilize artificial intelligence for new and enhanced banking services. Artificial intelligence can effectively be used both for banks' internal processes and for customer products and applications.

In this document two different use cases are presented, where the same source data can be used for risk management within the bank's own processes and for a customer application providing financial information. It is assumed that the reader is at least somewhat familiar with PSD2, RTS, GDPR and Open Banking.



USE CASE SUMMARY

IN THE USE CASES DESCRIBED BELOW, THE SAME DATA MINING CAN BE USED AND THUS PROVIDE INPUT FOR SEVERAL ENHANCED FUNCTIONALITIES AND SERVICES.



In the use cases described below, the same data mining can be used and thus provide input for several enhanced functionalities and services. The outcome can be used both for automated or manual credit approval and for the banking customer as an informative tool or app on the financial status. For the branch official the same information can be used to predict the customer's payment behaviour and possible future credit loss when the customer is applying for a credit and the tool itself provides input to automated decisions making in credit applications. For the banking customer it is possible to develop a personal finance management tool to be used from a mobile application or as a net bank service.

The expenditures can be collected from the customer's payments and repayments of loans. The classification of the customer's different payments during a certain period and upcoming payments, can be used for making predictions of the customer's outgoing payments during the next period. Periodic incoming payments like salaries, capital income and rent can be used to predict the financial position.

A description of the needed data and the evaluation of it is described further in this document.

PAYMENT BEHAVIOUR SUPPORTING LENDING

For lending purposes, it is not only the credit rating of the customer which is crucial. The customer's payment behaviour and money spending are of importance to evaluate a possible credit risk in the future. Payment behaviour evaluation is time consuming and might include manual processes thus leading to long credit application preparations. With the help of payment behaviour analysis, the application preparation can be speeded up by using existing data. Thus, the credit application could be provided as an automatic process without human interference using customer profiling and automated decision making but also in credit approvals made in branch offices where the manual process of controlling the customer's payments could be done automatically.

The profiling can be further developed by adding information about late payments, payments to instant credit service providers or simply on the type of the customer to the profiling tool to enrich the customer knowledge. Machine learning and AI can provide even more detailed information by the use of probability of default for certain customer groups, gender, social status etc.

FINANCIAL MANAGEMENT

It is obvious, that the use of data from different sources i.e. accounts in different banks will increase the possibility for a banking customer to see his or her financial position and on what the money has been spent when the information is collected and shown in a common user interface.

Upcoming events are also salaries that can be included in the upcoming balance of the customer's accounts. Accordingly, money spent during a certain period can be used to predict the upcoming financial need for the next period like a budgeting tool by using machine learning. Thus, the personal finance management tool would provide a glance of the customer's financial position in a simple way. Any surplus balance could be used as suggestions for investments.

DATA DRIVEN ACTIONS

DATA SCIENCE IS ABOUT USING DATA TO MAKE DECISIONS THAT DRIVE ACTIONS.

The goal of data science is to use data analytic thinking to replace intuition with data driven analytical decisions, to transform raw data to a valuable asset and improvements on data-driven models lead to increased pace since processing speed is higher.

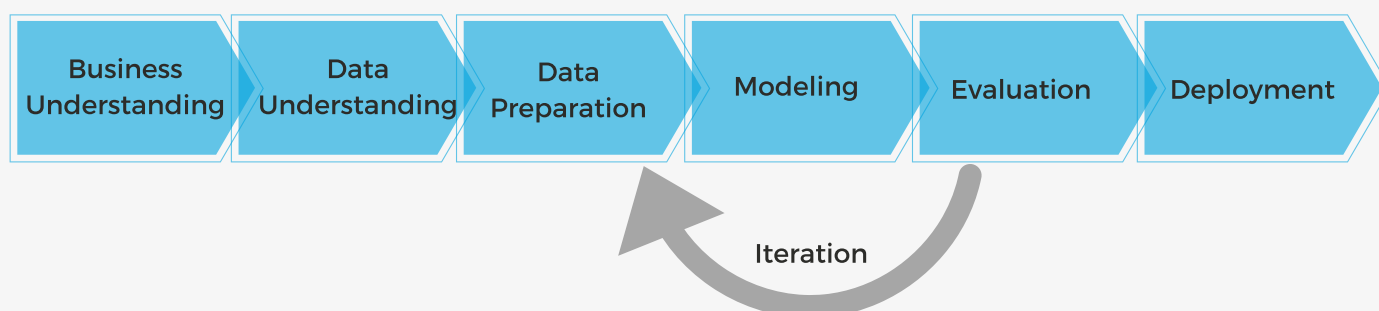
Data analysis is an iterative process where the results of modelling has to be confirmed and probably re-iterated to create a model that can be used for actions and decisions. Therefore, it is assumed that the iterative process is lasting a significant part of the time consumed for developing processes and services based on machine learning.

DATA PREPARATION

THE DATA PREPARATION CAN BE DIVIDED INTO FIVE STEPS:

1. Business understanding – it is essential to understand the business needs, and identify the objectives and the final outcome of the project before commencing with the analysis.
2. Data understanding – different sources where needed data is available and the relationship between them need to be identified.
3. Data preparation – the data need to be selected and cleansed, missing data should either be deleted or converted to a readable input for the final selection.
4. Modelling – the model to be used is built (regression or classification model), tested and data output is generated with existing data.
5. Evaluation – the outcome of the model is evaluated and accepted if the accuracy of the model is acceptable, otherwise the data need to be iterated once again.

When the model is acceptable it can be deployed for final use.

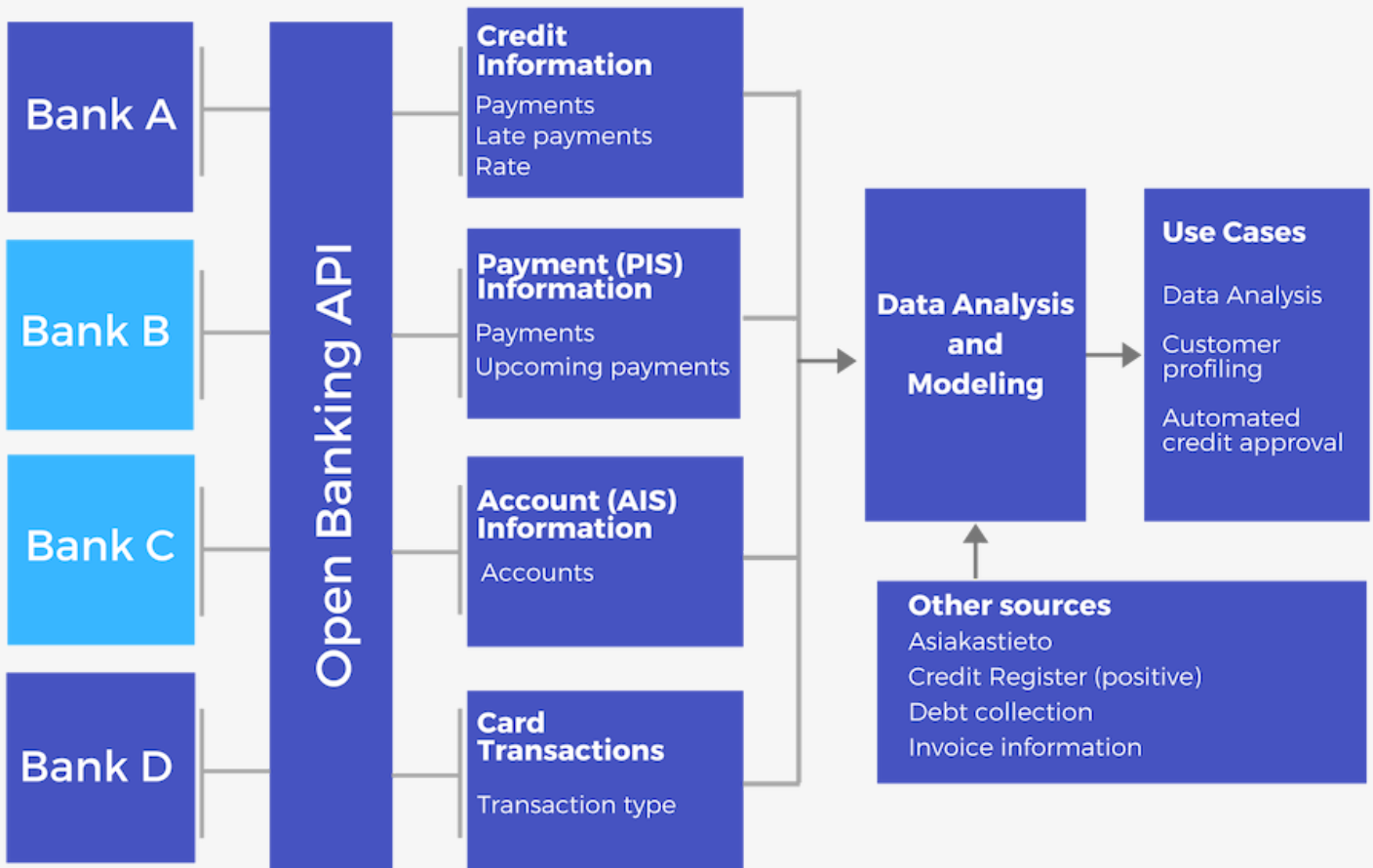


NB! Since most of the information is related to customer information the data used for modelling must be scrambled for data containing any customer information, such as names, addresses, person id's etc. Therefore, aliases or other identifying parameters need to be used for linking information in different sources.

HIGH LEVEL PROCESSES

DATA SOURCES

THE DATA SOURCES NEEDED FOR THE MODEL AND PROFILING CAN BE SEEN IN THE PICTURE BELOW:



This model is mainly intended to be used for automating the credit approval process for credits with or without security but can be used in any manual credit approvals in branch offices as well. The outcome can also be delivered to the financial management tool described below, however, the data must be enriched with beneficiary information and categorization to provide financial information on account transactions.

PAYMENT TRANSACTION INFORMATION

PAYMENT TRANSACTIONS CAN BE USED FOR CREATING SCORING VALUES TO THE CUSTOMER.

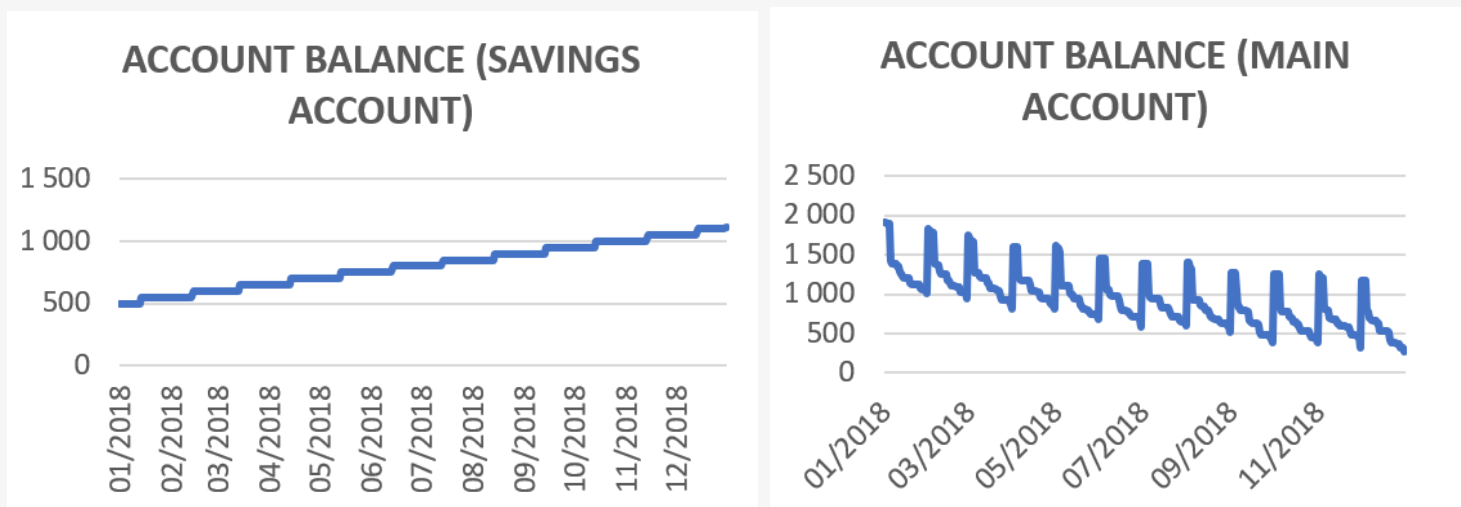


Payment transactions can be used for creating scoring values to the customer. In a business case the value outcome can indicate the amount of credit a customer can be granted. However, it is up to a business decision how different components will influence on the final customer scoring. In this chapter a simple model of the scoring is presented.

From the payment transactions the transaction amounts for each transaction – positive or negative – is used for modelling the payment behaviour of the customer during the past period up to 12 months. Payment transactions consist of credit and debit transfers and card transactions.

**THE HISTORY
DATA CAN BE
USED FOR
PREDICTING THE
CUSTOMER
BEHAVIOUR IN
THE FUTURE.**

SAMPLES OF CUMULATIVE BANK ACCOUNT TRANSACTIONS CAN BE SEEN IN THE FIGURES BELOW:



From the first figure it can be seen, that there is a negative trend on the customer's payment behaviour, thus this might indicate a decreasing ability to repay a credit and affect the customer credit scoring negatively. On the other hand, a savings account indicates a positive increase in the customer's funds and thus strengthen the scoring of the customer. However, restrictions to the savings account such as monthly or yearly withdrawals from the account might decrease the customer's payment liquidity.

Payment transaction information can be retrieved using the Open Banking API provided by ASPSPs, i.e. banks. Using APIs from several banks enables the possibility of aggregating payment transactions from several banks. However, it is up to the service providing bank, whether APIs shall be developed to other banks or if payment transaction information is used only from customer accounts in one bank.

Payment transactions are generally fetched up to 12 months backwards from the current date. Usually, there is a monthly cycling behaviour of the transactions when sorted according to dates. Salary income, capital income and pensions generate a positive balance and mortgage payments, loan payments or rents decreases the account balance. Other expenses are food, hobby, recreation or equivalent costs.

The history data can be used for predicting the customer behaviour in the future. When the applied credit amount and upcoming loan instalments and rates and future payments predicted on historical payment information are included in the model, the payment ability will also provide information about the customer payment capability in the future. Based on this information the credit can be approved, adjusted to the customer's financial situation or denied.

FINANCIAL MANAGEMENT

For the financial information and management tool, the payment transaction request process as described earlier in this document, can be used for generating the required data outcome for the tool. Again, based on customer consent payment transactions can be requested from different ASPSPs. The collected payment transaction information can be used for displaying money spending by categories such as credits, house maintenance costs, food and living costs to mention a few. By machine learning techniques transactions can be used to generate a prediction of the upcoming money spending of the customer. Enriching the data with upcoming credit instalments and invoice payments will provide a more precise view on the upcoming fund balance.

To predict the payment ability and available future balances, the following information can be retrieved through the Open Banking interfaces and combined to show the customers financial position. However, the detail of the information to be shown to the customer is based on the service providers business decisions.

PAYMENTS

- CREDIT TRANSFERS AND CARD TRANSACTIONS
- BENEFICIARY ACCOUNT
- AMOUNT
- UPCOMING PAYMENTS

ACCOUNT INFORMATION

- TYPE OF ACCOUNT
- BALANCE

INFORMATION ABOUT CREDITS, INSTALMENTS AND UPCOMING PAYMENTS NEED TO BE RETRIEVED FROM OTHER ASPSP SYSTEMS SUCH AS BANKING SYSTEM OR EQUIVALENT.

- CAPITAL
- PAYMENTS
- DUE PAYMENTS
- UPCOMING PAYMENTS

INVOICES (WHERE APPLICABLE)

- BENEFICIARY
- AMOUNT
- DUE DATE
- PAYMENT DATE

The payment transactions can be categorised into different classes (rent, food, beverage, bus tickets, train tickets) and groups (household, travel) based on the account holder of the beneficiary account. Based on the service providers business decision, categories are predefined or the user of the financial management tool, i.e. the customer can add own categories.

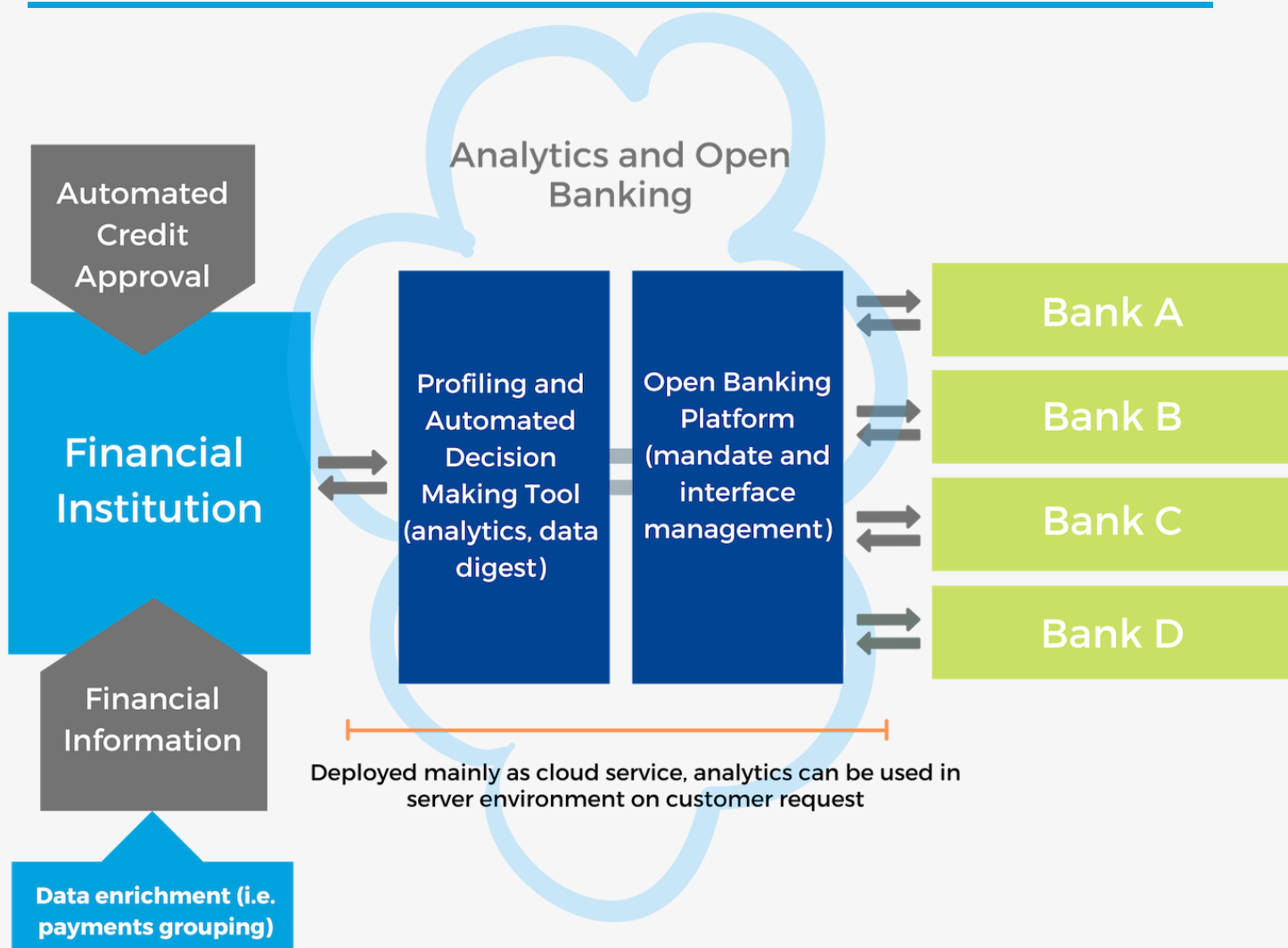


TECHNICAL ARCHITECTURE AND INTEGRATION TO BANK ENVIRONMENT

Access to the analysis tool is provided through a single API from the service user side. In this case the user can be an application user, a web service or a bank branch clerk. Based on the use cases described in this document there will be two different service requests available; one will return the scoring of the customer (credit approval based on customer profiling) and the other will provide categorised payments and future spending prediction. Since there is no common Open Banking interfaces standards the API's of banks might differ based on which services and information are provided through the interface.

To avoid the maintenance of several slightly different Open Banking interfaces, one standardized interface is provided to the financial operator or institution using the analysis tool. The service scope contains also the management of the customer consents, i.e. mandates to account information. The Analytics and Open Banking tool is planned to be launched as a cloud service, however, data analytics results can be stored in a physical server environment if requested.

The technical description of the architecture is kept on a high level at this point, due to the fact that the technical implementations of banks' APIs will differ and features available vary.



The integration of the tool to the customer bank environment is described below in two different cases.

PROFILING AND DECISION TOOL

The profiling is initiated either by an automated credit application tool, i.e. a mobile application or web page or the request can also be initiated from a branch office manually to support the credit application preparation. The customer information in banks is requested based on a secured token or mandate id issued by the ASPSP. The mandate id contains the customer consent for requesting his account information from the ASPSP. Therefore, a customer might possess several mandate id's depending on the amount of accounts and bank relationships. Additionally, the requested credit amount and interest rates need to be passed to the tool for profiling purposes.

Profiling is executed in the profiling tool using the scoring model based on the bank's business decision and the results are returned to the requester. The result for the automated process is simply an approval or denial of the application.

FINANCIAL MANAGEMENT

The financial management for a customer can be executed in the same manner as for the profiling and decision process. The payment transaction data is requested from several banks with the consent of the customer. Bank-wise information is aggregated through a common Open Banking gateway, where customer mandates to banks are managed. Requests will be processed back to the requester and enriched with the classification of payment transactions. Thus, the financial management tool can display payment spending and incomes for different categories. With the use of machine learning upcoming payments can be estimated based on payments historical data.

PROFILING AND AUTOMATED DECISION-MAKING

The General Data Protection Regulation (the GDPR), specifically addresses profiling and automated individual decision-making, including profiling. Profiling and automated decision-making can be very useful providing benefits such as increased efficiency and resource saving. Within the finance industry profiling and automated decision-making could be used based on the model described above to provide a fully automated customer profile categorisation in consumer credits applications. However, the profiling and automated decision making need to be in line with the rules set by the GDPR.

The general principle of the GDPR states that the personal data must be processed lawfully, fairly and in a transparent manner, collected and processed for a specific and lawful purpose, collected only to the amount necessary with regard to the purpose of the processing and updated when required – inaccurate personal data must be erased or rectified without delay and kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data are processed.

A person has the right to not be subject to a decision or binding agreement solely based on automated decision-making. However, profiling and automated decision making is allowed if the decision is necessary for entering into or executing a contract between the person and the service provider and the person gives his consent to the profiling and automated decision-making.

The service provider is obliged to inform the credit applicant about profiling and automated decision making. Profiling cannot be executed without the applicant's consent.

The used model is continuously evaluated that it is accurate and not leading to false decisions. The person being profiled has the right to present his own opinion or correct used information if it is distorting the outcome of the profiling.

The profiling and automated decision-making should be disclosed, and the service provider must inform the subject to the profiling about the principles and parameters used in the profiling. For customer credit rating the following information could be disclosed:

- Why automated decision-making is employed (e.g. the responsibility of loan decisions)
- Which factors are weighted in the decisions and what their weighting is
- The origin of the data (e.g. data provided by the data subject, the data subject's payment history or public data files)
- That the rating methods are verified on a regular basis in order to ensure their fairness, efficiency and equality and
- Contact details for requesting the reprocessing of a decision.

Before initiating a profiling automated decision-making, it is essential that the profiling model is clearly documented and explained. Since the use of profiling is based on the customer consent, all relevant sources used for categorizing the customer have to be disclosed.

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