

# Development of internet marketing model in banking industry based on big data technologies

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**Abstract**— The subject of this paper is use big data technologies in banking sector. The key issue, which has been presented in the paper, is the research and development of internet marketing models that are based on clients' movements on the bank's digital portals. The goal of the research done is to improve the communication between the bank and its clients and to contribute to portraying particularities in behavior, interests and wishes of clients by developing and applying new models of internet marketing. The aim of the research is to increase the quality and efficiency of marketing and sales strategies of the Bank in order to integrate relevant processes such as data collection and analysis, CRM banking system, with the intention of improving the design and usability of the system when posting content on bank portals.

**Keywords**—big data, e-banking, internet marketing, CRM

## I. INTRODUCTION

With the increase in the number of users, services and channels of communication with clients in banking systems, there is an increase in the amount of data available to banks [1]. The large amount of data allows banks to continuously monitor customer behavior and their habits in the use of banking services, with aim of developing personalized and adaptive services that can be customized to the user in near real time [2]. To implement such systems, it is necessary for banks to provide appropriate infrastructure and services for storage, search, analysis and management of large amounts of data (big data). Big data technologies enable banks to identify and initiate problem solving, as well as to make better business decisions.

Numerous research and experience from banking practice show that establishing long-term relationships with customers is a prerequisite for achieving better business results [3]. The main tool for achieving quality and long-term customer relationships are customer relationship management systems (CRM). CRM systems are one of the main sources of data needed to create personalized banking services as they contain numerous customer data. Except in the CRM system, customer data is located within various portals of the bank, in server logs and other databases. it is possible to analyze the behaviors, characteristics, experiences, needs and expectations of users by integrating this data.

The subject of research described in this paper is the analysis and development of innovative models of internet marketing in banking based on big data technologies. The development of an innovative internet marketing model is based on monitoring the movement of users on banks' digital portals. The result of the research is an innovative model for anticipating the needs of users, planning and implementation of activities, all with the aim of making fast and quality business decisions.

## II. METHODOLOGY

The subject of the research is the development of innovative internet marketing models based on big data technologies in the banking sector. The model is based on the analysis of the behavior of users of the bank's digital portals in order to improve existing and develop new bank services. The main goal of research is to define a personalized approach that will respond to the specific requirements of clients and increase satisfaction in the use of banking services.

There are a large number of data management and analytics applications in the banking sector. Banking applications use data in order to better personalize the bank's offer and thus enable real-time offers of products and services tailored to individual users.

Big data solutions for data analysis have led to changes in many sectors in the last few years. These technologies are increasingly used in the financial industry to identify and harness the potential for better collaboration with clients, to better understand and mitigate risks and reduce costs.

### A. Big data technologies in banking

In recent decades, the big data concept has been the focus of the modern business world. Due to the increase in the amount of data collected and stored by companies around the world, the ability to access and analyze this data is becoming increasingly important. Big data refers to data sets that are too large or too complex for traditional data processing applications [4]. The importance of the big data concept is not only based on how much data the company has, but how the company uses the collected data. Different companies use data differently, but the more efficiently a company uses its

data, the more potential a company generates will grow [5]. The benefits of a big data concept for one company are [6] :

- Costs reduction
- Saving time
- Responding to market changes in the short term
- Control of the company's image on the Internet
- Increasing the quality and efficiency of client portfolio research
- Detection of malicious behavior
- Better sales conditions

### B. Development of internet marketing model in banking based on big data technologies

Business banking portals contain a large amount of data on users of banking services, starting from the number of clients and their visits, the pages they visit, all the way to the keywords they enter when searching the bank's portal.

The implementation of the model was performed in the following steps:

- Data collection and aggregation using Azure EventHubs
- Data storage using HDFS (Hadoop Distributed File System)
- Structuring data using Hive
- Data processing using Spark
- Visualization of the obtained results using SAS Visual Analytics

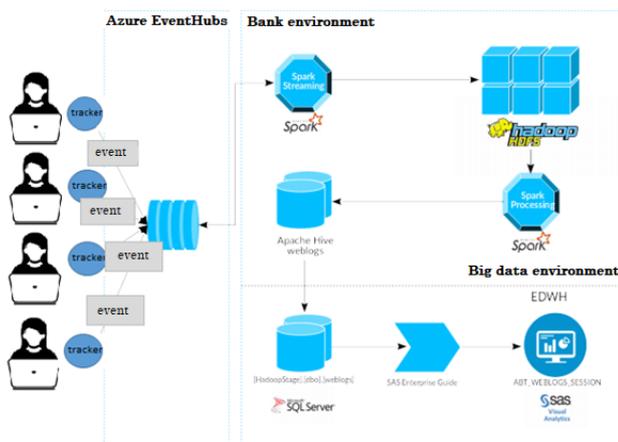


Fig 1. Data processing flow

### C. Evaluation of the developed model

For identification and collection of events on digital channels, a component (tracker) was used, implemented as

JavaScript Tracker, according to the principles of implementation of Google Analytics tracker. This component identifies two types of events from the bank's digital portals: pageview - visit the bank's portal and pageevent - invoking an action on a web page that is initiated by selecting a specific button on the page, filling out a form, entering values in certain fields, etc.

Events from the portal are collected and structured as messages in JSON format and forwarded via HTTP protocol to the Azure Event Hubs component of the system. The tracker component uses browser cookies to identify and store information about the user accessing the portal.

Raw events are permanently stored on the HDFS component within the big data environment. Data collected on the HDFS layer is used by analytical applications in order to identify and analyze parameters for monitoring user behavior on the bank's digital portals. The implemented analytical component aggregates user visits and activities at the portal and user session level and calculates various session parameters for analytical needs and visualization of results. The result of data processing is strictly structured data in an appropriate format, in the form of tables.

Aggregate user sessions in the form of final results are entered into the bank's data warehouse environment, from where they can be used for various analytical purposes. Data from the bank's data warehouse environment is used to generate various reports using the SAS Visual Analytics platform.

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