Experience of Developing Cloud Service for accounting Sales in installments

V V Barankov, I I Barankova, U V Mikhailova, O B Kalugina

Nosov Magnitogorsk State Technical University, 38, Lenin Str., Magnitogorsk, 455000, Russia

E-mail: Barankov_VV@mail.ru

Abstract. The paper presents the developed and implemented system of accounting sales in installments using tables as a cloud variant of Google services. The main system requirements and the special features of the program implementation such as the multi user data cleaning, the volume and speed of converting the tables, the mechanisms of conditional formatting of cells, the protection of cells and ranges and the data input check are provided. The paper also discusses the functionality of the system of accounting sales in installments, which is implemented by the formulae in the cells, the formulae in the extra options of Google tables and by programming in Google Apps Script, as a cloud variant of Java Script. The safety and security of the customers’ data, as well as staff members’ accountability and responsibility for the input of data in the system, are provided by a number of information security measures.

1. Introduction

The i-cloud services are becoming more popular in various activity spheres of companies, organizations and individuals (e.g. implementation of cloud technologies in libraries [1]). The paper focuses on the use of cloud technologies for creating a system of accounting sales in installments.

Nowadays the Russian commercial business often uses two charts of sales with a deferred payment:

• Sales of goods in credit (with a bank participation);
• Sales in installments.

In case of sales in credit (with a bank participation), two agreements are signed: between the customer and the bank when taking up a loan, and between the customer and the shop for purchasing the goods. The sales in credit with a bank participation are more profitable for a shop as the money for the goods sold in credit are transferred to the shop at once (regarding the commission fee charged by the bank). In future, the customer repays his loan to the bank, and the bank accepts all the credit risks. This is a bank chart of the warehouse-receipt financing supplied by the core banking system.

In case of sales in installments, the shop sells goods on account independently of a bank under the sales and purchase agreement, i.e. no extra loan agreement is taken up in the case. Thus, the customer repays the debt on the loan to the shop and it is the shop that accepts all the credit risks. In this case the shop or trading organisation should have an automatic mechanism of control over the stretched payments.

The "1C Enterprise” configuration is often used for recorging sales. But even the latest versions of the configurations (Trade Governance, Retail, Small Business Management, ERP Enterprise Management, Comprehensive Automation, Accounting, etc.) do not contain an efficient subsystem of
accounting sales in installments. The same situation can be observed in the similar systems of trade recording (e.g. Soft Balance Dalion Store Management).

That is why accounting sales in installments is conducted in a separate system, e.g. such as an online service “Instalment-24” (https://rassrochka24.ru). Under this chart of sales in installments there appears a hybrid IT- environment: a system of recording sales plus a separate system of control over the instalments.

The paper reviews [2] some problems and directions in the automatisation of the service management of the hybrid IT-environments, including cloud technologies. The tools of implementing the necessary functionality of the system can be the popular cloud Google services (e.g. in the educational sphere [3]).

2. Formulation of the problem
In line with the technical project of the network of shopping centers, the authors of the article have developed a system of accounting sales in installments. The major requirements to the accounting system are:

• The system should be standard for all the stores scattered around a large territory (stores having various locations).
• It should be one-off costs for the system creation, excluding the rents for the on-line services such as “Instalment-24” (https://rassrochka24.ru).
• There is an automatic record keeping of the made and dissolved sale on account agreements.
• The payment can be made both by cash and by a credit card.
• There is a convenient monitoring of arrears.
• The calculation of the every day fine for the delay in payment is automatic.
• There is an automatic crediting of a shop assistant by bonuses for the personal sales.
• There is an automatic prohibition to change the data of the signed agreements, to correct or to pay the loans ex post.
• There is summerizing of the main results of sales in installments: the number of the existing and dissolved sales agreements, the amount of the sold and returned goods, the total down payments, the total amount of instalments, the total instalments received, the late amount for the current date, the total amount of penalties for the late payments, etc.

3. Programming results
On analyzing the possible technical ways of developing a system of recording sales on account, tables as a cloud variant of Google service have been chosen as a cheap and relatively simple way of creating the system.

The limit of 15 GB free of charge volume on the Google Disk does not influence the system, as the Google tables do not take the limited volume. In this case, the system has been used by 7 stores for 2 years. During the time about 3,500 sale on account agreements have been made. In the system all the sales agreements are recorded in one row of the table and occupy 96 columns. At present the integral capacity of the whole table ammounts to 450 000 cells. The speed of recalculating the data in the table slightly depends on its volume, as one of the properties of the cloud services is supporting the resources pools, i.e. the more cloud resources the table requires, the more resources are provided. To evaluate the performance of the cloud services, the model of the performance analysis for the rich data applications in cloud calculations is applied [4].

However, in free Google account, the speed of recalculating the table data (regardless of the volume) is not very high, approximately 5-15 sec. If several people input changes in the table simultaneously, the speed of recalculating of the data can increase by 30 sec. The radical increase in the recalculation speed can be achieved by appling the table row cleaning. When constituting an agreement, a shop assistant works only with the data of one customer. Every shop assistant can set his/her own filters, not interfering with the other shop-assistants’ work.

The visual appearance of the system on the main bookmark “Shoppers” is shown in figure 1. All
the reference tables that are used for recording sales on account (the list of stores and their addresses, the list of shop-assistants and their powers of attorney to sign sales on account agreements, the status of the agreements (made, dissolved, a merchandise return, a replacement of goods, a mistake), the type of the purchase return (a product failure, a new product return for the indicated reason), the status of a customer (a debtor, a prohibition to any agreement), the amount of a day penalty for the late payment, the credit limit) are put together on the bookmark “Directories”. On the bookmarks “Contract” and “Dissolution”, the copies of the sales agreements and the early terminations of agreements are stored. The summerized data for any period are stored on the bookmark “Result”. Here the information about the number of the existing agreements, the amount of sold and returned goods, the total amount of instalments, the amount of the initial instalment and the payments, the amount of the unpaid sum, the interest on late payments and the amount of penalties for the late payments is stored.

![Image](image_url)

**Figure 1.** The interface of the subsystem of recording sales on account.

On the bookmark “Bonuses” (fig.2), there is a reference table for automatic bonus crediting of shop assistants for making sales agreements. The amount of bonuses depends on the status of the agreement, the type of the returns, the terms of returns (comment), the type of the agreement, the month of sale and return. The saved bonuses are applied to the salaries of the shop assistants regarding their personal sales. 0.5 or 1 mean earnings benefit, -0.5 and -1 mean deductions from the earnings, 0 – no influence on the earnings.
The table cells change the colour of the background regarding their status: the white and blue background means that a shop assistant inputs the data in the cells (the text, the date and the drop-down list); the yellow background is for the non-editable cells to calculate the data, shadowed background is for inoperative agreements. In Google tables, it is put in practice through the mechanism of conditional formatting of cells.

In the upper right-hand corner of a Google table, the buddy avatars of the system users are seen in real time. The cells, every user of the system is working with, are automatically highlighted and identified by the avatars’ names (the first name, the second name and the surname of a shop assistant or a manager). In a Google table, the shopassistants and the managers can use two real time communication services: a general chat room in the table and comments (dialogue) in any cell accessible for editing. Next to the name of the bookmark “Shoppers” (fig. 1), there is a reference that 32 cells in the system contain a dialogue about the data in these cells.

Almost the whole functional of the system of recording sales on account is implemented by the formulae in the cells and the formulae in extra options of the Google tables. Some utility functions (e.g. elimination of old inoperative agreements) are created by programming in Google Apps Script – a cloud variant of Java Script (https://developers.google.com/apps-script/guides/services/#basic_javascript_features).

4. Security measures
In the cloud calculations environment, the electronic data privacy and protection is a serious problem, requiring a special solution. Paper [5] presents a review of the modern methods and perspectives, used for solving the problem of the data privacy and protection nowadays. Thus, the developed system is provided with the tools of the Google table protection.

The system is supplied by a flexible system of protection from incorrect actions of shop assistants and managers due to the two mechanisms of Google tables: the protection of cells and ranges and the input data check in the cells. For instance, shop assistants cannot edit any cells except those that are
accessible for the data input; they also cannot change the input data of the agreement (the ex post facto changes are prohibited); the date or the sum of the payment beyond the plan period of the payment; checking of the data input correctness is also provided.

To protect the personal data of customers, a number of security measures is included. Thus, personal official accounts of shop assistants are used to log in the system; there is no chance of logging on using a common for all account. Hence, there is a personal responsibility for the violations (when working in the system) and the leakage of the personal data of customers. A shop assistant must not only indicate his/her name, but log on using his/her personal account. The history of all the changes in the system for every user of the system is recorded automatically. The depth of the list of changes is practically unlimited. One can open any backup archive system data at any moment of changes in the system and look up what the user was doing in the system.

The users of the system of recording sales on account are divided into three groups: shop assistants having the minimum rights, empowered managers and top managers and a system administrator (in Google account – an author of the system) having unlimited rights. For instance, the bookmarks “Directories”, “Result” and “Bonuses” (fig.1) are hidden from the shop assistants.

5. Conclusion
The capabilities of the Google tables are enough to implement a complicated system of recording sales on account. It took a month to develop the system and implement it into the network of shopping centers. Now it has been operating efficiently for two years. There are plans for further development of the service features of the system for its commercial replication.

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