

# Technological features of development of the Receipts and Promotions service for the Russian National Payment Card System

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**Abstract** — The concept of the Receipts and Promotions service was developed by the author for the Russian National Payment Card System. The concept is based on collection and analysis of information from the electronic receipts, which are completely identical to printed ones. The idea is innovative and has not yet been implemented in any payment system or mobile application. The service extends the interaction between the "Privet, Mir!" mobile application on the client side and the cloud on the payment system side. The clients of the service are: holders of the Mir plastic cards; stores developing their bonus offers for customers.

**Keywords** — *electronic receipt, cloud service, payment system, mobile application, plastic card Mir, bonus offer, store, customer.*

## I. INTRODUCTION

The development of innovative services for the Russian payment system Mir is one of the contemporary problems actively solved by developers of the Russian National Payment Card System (NSPK JSC). More than 70 million Mir plastic cards have been issued by more than 300 banks since 2015.

The author created and developed the concept of the Receipts and Promotions (R&P) service as a participant of the Mir scientific research seminar held by E.G. Soloviev, the Deputy Director of the Innovation Department of NSPK JSC, in the National Research University "Higher School of Economics" in 2019–2020.

The R&P service to the Mir plastic cards is the universal system of interaction between stores, customers and the Mir payment system. The service is based on the use of information from electronic receipts due to its accumulation and analysis in the Mir cloud.

Customers, the holders of the Mir plastic cards, get access to full information from the electronic receipt of each purchase, similar to printed receipt. They get the opportunity to plan their family budget more efficiently. Shops, in turn, becoming partners of the program, get the opportunity to analyze the accumulated information of electronic receipts for each client, which allows them to create personalized bonus offers. Communication is carried out through the use of the Mir cloud and the "Privet, Mir!" mobile application.

An electronic receipt is completely identical to the printed one. It contains data on the store, date and time of purchase, product, quantity, price of each product, discounted price, total purchase sum, value added tax (VAT), etc.

The receipt identification (ID) codes are stored in the Mir cloud and are linked to the Mir plastic card of each client. Full information from electronic receipts is located in the database on the servers of the fiscal data operator (FDO) and is requested as necessary by the Mir cloud, either for analysis or for uploading to the "Privet, Mir!" mobile application on the client side.

The R&P service should provide the opportunities: to the customers to view the receipts of their purchases and to assess the incoming bonus offers; to the stores to upload bonus offers to the Mir cloud and to use cloud algorithms to effectively personalize bonus offers.

## II. PURPOSES AND OBJECTIVES

### A. Description of problems

The clients – holders of the Mir plastic cards – make purchases daily in stores and receive printed paper receipts with full data on purchases. In the electronic format, they usually receive only information on the bank transaction with a credit card. At the same time, the customers who are interested in the family budget management and in analyses for the costs of certain types of goods purchased are forced to keep paper receipts.

Inconvenience due to paper receipts is as follows: manually transfer of information to the electronic format (Excel, CSV, etc.) for analysis; a receipt may be lost; some stores use low-quality thermal paper for receipts that contain substances that are considered harmful to human health [1, 2]; during epidemics, paper receipts can transmit viruses and bacteria from one person to another.

Stores are forced to create their own bonus cards and loyalty programs, usually taking into account only the age and gender of a customer, without detailed experience of his purchases. The creation of bonus offers for individual customers based on a comprehensive analysis of information on all of his purchases is

not usually conducted by stores. Delivery of bonus offers to customers is carried out by sending them e-mails, SMS messages, additional information on a paper receipt, or through stores' mobile applications.

The above-mentioned stores' tactics are inconvenient for a customer for the following reasons: he has to store many different bonus cards, or save paper receipts, or install many mobile applications on his mobile device; it is difficult to find the most advantageous bonus offer among this stream of disconnected information; there is no communication between the customer and the store – the influence on quality of bonus offers is impossible for the client (he is just waiting for the next offer from the store).

### B. R&P service purposes

The purposes of the R&P service are to provide a holder of the Mir plastic card with electronic receipts and analyze the receipts' information for effective communication between the customer and the store.

The customer gets the opportunities to: view receipts in electronic format; sort, filter and export electronic receipts for the family budget management; receive relevant bonus offers based on his purchases; assess the bonus offers from stores; assess purchased goods.

The store gets the opportunities to: effectively distribute bonus offers through analysis of customer purchases and estimates of previous offers; receive product ratings from verified individuals who have purchased this product; recognize the customer even without a bonus card.

## III. CONCEPTUAL SERVICE ARCHITECTURE AND MEMBERS' FUNCTIONS

The parties involved in the R&P service are as followed:

- Cash register + Point of sale (POS) terminal;
- The Mir cloud;
- A customer.

### A. Purchase process

The R&P service architecture for the purchase process is presented in Fig. 1, that includes:

- 1 – presentation of purchases and a barcode with a bonus offer by the customer to the cash register scanner;
- 2 – request from the cash register to the Mir cloud for the confirmation the availability of the bonus offers at the moment;
- 3 – response of the Mir cloud to the cash register request;
- 4 – update purchase sum to the customer on the display of the cash register;
- 5 – transfer the updated purchase sum to the POS terminal by the cash register;
- 6 – exchange of information of the POS terminal with the Mir card through a card-reader;

- 7 – request from the POS terminal to the acquirer for a transaction through the Wide Area Network (WAN);
- 8 – the acquirer's response about the transaction result;
- 9 – the result of the payment transaction is shown on the display of the POS terminal;
- 10 – sending the information on the result of the transaction to the cash register by the POS terminal; formation of a receipt in the fiscal memory device;
- 11 – sending the receipt data to the FDO by the cash register;
- 12 – sending the fiscal ID of the receipt to the cash register by FDO;
- 13 – sending the register ID and information on the purchase to the Mir cloud by the cash register;
- 14 – sending the receipt data to the "Privet, Mir!" mobile application for the customer by the Mir cloud.

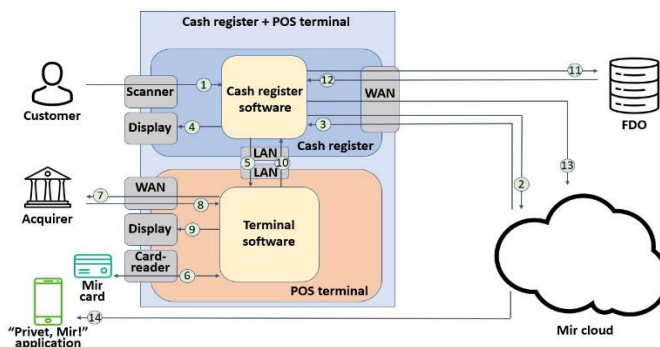


Fig. 1. The R&P service architecture for the purchase process.

A customer pays for purchases in the store using the Mir plastic card or through the NFC chip in the mobile device. He can make two different types of payments: direct payment without using bonus offer; payment with using bonus offers for one or several goods. Direct payment means usual purchase, when the customer can see a total sum of the purchase on display at once.

The payment with using bonus offer is shown in Fig. 1. The customer presents his purchases and a barcode with a bonus offer using the cash register scanner (1 in Fig. 1). The cash register sends a request to the Mir cloud to confirm the availability of the bonus offers at the moment (2) and gets its response (3). The cash register shows the updated purchase sum to the customer on the display (4).

Why a customer should show a barcode with a bonus offer on his mobile device to the cashier? This step allows to start the process of confirmation of availability of this bonus offer through the Mir cloud and to show a new total sum of the purchase to the customer before he makes a payment using the Mir plastic card. It is important because one of the main ideas of the R&P service is based on the producing the measures of family budget economy for each client.

A standard payment transaction is carried out according to ISO-8583 [3]. The cash register transfers the updated purchase

sum to the POS terminal (5 in Fig. 1). The POS terminal exchanges information with the Mir card through a card-reader (6). After that, the POS terminal sends a request to the acquirer for a transaction through the WAN (7).

After receiving a response from the acquirer on a successful purchase (8), a store sends receipt data to the Mir cloud. The result of the payment transaction is shown for the customer on the display of the POS terminal (9).

The POS terminal sends information on the result of the transaction to the cash register; a receipt is formed in the fiscal memory device (10). Also, the customer receives the paper receipt. The cash register sends receipt data to the FDO (11). After that, FDO sends the fiscal ID of the receipt to the cash register (12). The cash register sends this register ID and information on the purchase to the Mir cloud (13). Further, this data is transferred from the cloud to the customer’s “Privet, Mir!” mobile application (14).

Each receipt receives its fiscal ID, which is accessible to the Mir cloud. Thus, the cloud can attach each receipt to a specific customer – holder of the Mir plastic card. The cloud collects electronic receipt information for each customer.

For its part, the customer receives full information on purchases through the “Privet, Mir!” mobile application. In the separate tab he can view receipts from all stores where he made purchases by the Mir plastic card. Information from receipts can be sorted and filtered according to all available parameters (store, product category, product type, product price, receipt total sum, purchase date, etc.). The received information can be exported in a convenient format (Excel, CSV, etc.).

**B. Shops’ offers**

The development of the R&P service will allow the Mir payment system to continue cooperation with stores – long-standing partners, as well as attract new ones improving the quality of customer service.

The R&P service is potentially interesting both to large retail chains and to individual stores ready to generate a significant number of bonus offers for customers. First of all, these are grocery and home goods stores, shops of household appliances, cosmetics, goods for children, pet care products, etc. A separate sector covering the most remote corners of the country is gas stations and the sale of car accessories. The service is relevant for stores interested in the possibility of flexible customization of bonus offers for each customer and access to a large amount of data for analysis.

A store can periodically request and receive an array of ClientData objects from the Mir cloud of the Mir payment system. Further, the obtained data can be analyzed by the store independently, after that the store sends personalized bonus offers for each customer to the Mir cloud. These bonus offers come to customers from the cloud through the “Privet, Mir!” mobile application, without any changes in the cloud by the payment system.

The second variant of interaction between the store and the Mir cloud is that all bonus offers come from the store to the cloud without taking into account personalization for individual customers. Analysis and personalization of these offers are

carried out in the cloud by the Mir algorithms. Then, customers receive personalized bonus offers, as in the first version.

**C. Assessment of bonus offers and goods**

In the “Privet, Mir!” mobile application, the customer also sees a list of bonus offers from previously selected stores. He has the opportunity not only to use these offers, but also to assess them. The assessment results are sent to the Mir cloud. Further, during selection of the suitable bonus offers, the algorithms will take into account the categories of goods and the particular products which the customer liked or did not like.

It is also possible to assess the type of bonuses: someone likes direct discounts, someone likes bonus offers in the form of discounts and gifts, someone evaluates offers for certain holidays and dates, etc. Stores can also send the surveys about customer preferences, for example, “Choose bonus offers for the goods of interest to you for a specified period”.

In order to collect customer’s feedback, a store or a manufacturer of the goods must conclude a contract with the Mir payment system. For its part, the store or manufacturer must pay to the customer for passing their surveys in the form of bonus points that can be charged off for future purchases.

On its part, the Mir payment system will guarantee the store or the manufacturer that the received feedback was made by the authorized customer who actually bought this product. The store or manufacturer can independently formulate the criteria and characteristics by which the customer will assess the goods.

**IV. ENDPOINTS**

The architecture of the R&P service is decomposed into three main parts: receipts, promotions, and recommendations. Each of these parts is represented as the endpoint of the service API. Endpoints of the R&P service are presented in the Table 1.

TABLE I. ENDPOINTS OF THE R&P SERVICE.

Endpoint	Http Method	Grant Type	Idempotency Key	Request Object	Response Object
POST/receipts	POST	Authorization Token	Yes	Receipt-Info	Receipt-Creation-Response
GET/receipts	GET		No	N/A*	Receipt IdArray
GET/receipts/{receiptId}	GET		No	N/A	ReceiptInfo
POST/promotions	POST		Yes	Promotion-Info	Promotion-Creation-Response
GET/promotions	GET		No	N/A	Promotion-IdArray
GET/promotions/{promotionID}	GET		No	N/A	Promotion-Info
PUT/promotions	PUT		No	Promotion-Info	Promotion-Info
DELETE/promotions	DELETE		No	N/A	N/A
GET/recommendations	GET		No	N/A	RecommendationInfo

\*N/A – not applicable.

#### A. Endpoint: receipts

1) *POST/receipts*: The POST request to the endpoint/receipts, which allows the store to create a new instance of the receipt resource in the R&P service. The store must make this request after a successful customer's purchase. In the request, the store passes the ReceiptInfo data. In response, the service returns the ReceiptCreationResponse response.

2) *GET/receipts*: The GET request to the /receipt endpoint, which allows the store or customer's mobile application to receive all receiptID identifiers of receipt resources, that are available to the request sender. In response, the service returns ReceiptIdArray data.

3) *GET/receipts/{receiptId}*: The GET request to the /receipt endpoint, allowing the store or customer's mobile application to receive the existing resource receipt by receiptId. In response, the service will send the ReceiptInfo data.

#### B. Endpoint: promotions

1) *POST/promotions*: The POST request to the /promotions endpoint allows the store to create a new instance of the promotion resource in the R&P service. The store transmits the PromotionInfo data in this request. In response, the service returns the PromotionCreationResponse object.

2) *GET/promotions*: The GET request to the /promotions endpoint allows the store or customer's mobile application to receive from the R&P service all promotionId resources that are available to the request sender. In response, the service returns the PromotionIdArray data array.

3) *GET/promotion/{promotionId}*: The GET request to the /promotions endpoint, which allows the store or customer's mobile application to receive from the R&P service an existing copy of the promotion resource for promotionId available to the sender. In response, the service returns the PromotionInfo object.

4) *PUT/promotions/{promotionId}*: The PUT request to the /promotions endpoint allows the store to modify the sender's existing copy of the promotion resource by promotionId. In the request, the store passes the new PromotionInfo data for the promotion resource. In response, the service returns a modified PromotionInfo object.

5) *DELETE/promotions/{promotionId}*: The DELETE request to the /promotions endpoint allows the store to delete the existing promotion resource copy (previously created by the store) by promotionId.

#### C. Endpoint: recommendations (experimental)

1) *GET/recommendations*: The GET request to the /recommendations endpoint, allowing the store to receive from the R&P service the last recommendation resource formed for it. In response, the service returns the RecommendationInfo data array.

The development of the R&P service will be based on the above-mentioned descriptions of the API requests. The list of API requests is the basis of the specification, but it can be expanded during the service development.

As far as the R&P service deals with the personal money and banking, the security aspects are very important, including authorization token technology and its protection from hacking. The close attention will be given to these issues during development of the service.

## V. R&P SERVICE MARKET AND MARKETING

### A. Target audience

The target audience of the R&P service are as follows: customers – holders of the Mir plastic cards; shops – partners of the program.

1) *Customers*: Customers are represented by the holders of the Mir plastic cards who make purchases in the stores – the program partners.

Customers can be divided into two main groups: ones who are interested in electronic receipts; ones who are interested in bonus offers from stores. At the same time, a customer can belong to both groups.

a) *The first group* includes mainly adults who deal with the family budget management and are interested in budget saving on the certain types of goods. Using the Mir plastic card and the "Privet, Mir!" mobile application, the customer will be able to receive receipts of all his purchases in electronic format. This option is fundamentally different from existing plastic card services when the total sum of a transaction on a bank card arrives on a client's mobile phone as the SMS message (or in a mobile application).

Today, many purchases are made in supermarkets, where all categories of goods are presented (from food and clothing to household appliances and furniture, etc.). Receiving the total transaction sum, the client cannot allocate the price of individual goods in the receipt, while the electronic receipt contains full data on the purchase. Based on this information, it is convenient to manage a family budget, especially for the large families.

It should be noted that in small families, as a rule, all expenses are already obvious, there is no constant need to analyze the budget in order to save, especially if each member of the family is an active working citizen. Whereas in the families with many children, with non-working family members living on welfare payments, as well as in families with low incomes, it is often necessary to save on a certain type of purchases.

Information from receipts can be viewed, sorted, filtered and exported in a convenient format for further processing (for example, in Excel). This feature is convenient for the family budget management for certain periods of time and forecasts in order to save money.

b) *The second group* consists of the customers interested in bonus offers from stores – people of all ages. Someone needs bonus offers for daily savings on everyday goods, and someone likes to buy elite categories of goods at a discount (for example, weekend offers in expensive wine or clothing stores). One of the customers is waiting for percentage discount, the others are interested in bonus gifts. The proposed service will allow implementing different types of bonuses.

2) *Stores*: The R&P service clients can be both large retail chains and single stores. It is especially relevant for grocery stores, cosmetics stores, pets supplies stores, etc., ready to generate a large number of bonus offers for customers. The service will bring the greatest benefit due to the ability of flexible personalization of bonus offers for each customer, as well as a large amount of data for processing.

#### *B. Consumer properties of the R&P service*

The R&P service is useful for clients: the stores make a profit by improving the quality of customer service; the customers receive the benefits of personalized offers and the convenience of optimizing the family budget management based on information from electronic receipts.

Simplicity and easiness of use – all the interaction of the customer with the stores is transferred to one mobile application – “Privet, Mir!”. He can refuse numerous bonus cards of various stores.

Satisfaction from consumption: it is beneficial for the store that customers buy more; customers are pleased to receive personalized bonus offers.

Positive impact on the emotional state of the consumer – the customer likes to receive discounts on the goods he planned to buy.

Continuity of delivery – bonus offers are regularly updated. The bonus offers are available from all stores in which the customer made purchases. The store, in its turn, may at any time request information about the purchases of its customers.

#### *C. Competition environment analysis*

1) *Electronic receipts*: The “Proverka kassovogo cheka” mobile application [4] has more than 100,000 installations, the average rating is 2.6 (out of 5). The popularity of this mobile application confirms the high demand for the provision of receipts in electronic form. At the same time, judging by the reviews, it works extremely unstable and has a lot of bugs. Users complain that the functionality is very limited. This mobile application is a positive example demonstrating the usefulness of the service.

2) *Bonus offers*: The “Koshelek. Skidochnye i bonusnye karty” mobile application [5] has 10,000,000 installations, rating is 4.2 (out of 5). The largest application for working with bonus cards of stores. It works well, but does not offer communication between the customer and the store. The promotions are identical for all customers, there is no personalization of bonus offers. This example is both positive and negative for the service. On the one hand, there is a huge audience interested in bonus offers, on the other, it will take some time to attract customers into the new R&P service.

3) *Mobile applications from banks*: Banks operating in Russia are actively developing bonus programs in mobile applications for their clients. For example, the “Spasibo ot Sberbanka” mobile application [6] deals with bonuses received by a client for payment with any plastic card (VISA,

MasterCard, Mir) issued by Sberbank. This application gives the data in electronic format on client’s purchases by categories of goods and services, but not the information of electronic receipt. So, this is convenient for assessment of the overall picture of expenditures, but not for clear management of family budget by on costs for certain types of products. Another example is the “Credit Europe Bank” mobile application [7], where a client receives bonuses from 1% to 10% for the card payments in the stores and services of different categories. But this type of bonuses for a client is available depending on a type of card issued by this bank. A person can be a bank’s client, but, in the same time, he cannot use all bonus possibilities if he uses a card without bonus program. Thus, there is not a universal mobile application from banks that gives a client information on electronic receipts and a lot varieties of bonus offers that is planned to develop in the R&P service.

After development and testing for the Mir plastic cards, the R&P service can work with other cards (VISA, MasterCard). Thus, the initial development of the R&P service for the Mir cards is not its limitation for work in the future.

#### *D. Competitive advantages of the R&P service*

The competitive advantages of the R&P service are as follows:

a) *Utility*: The service will benefit all its consumers: the profit – for shops, the benefit – for customers;

b) *Uniqueness*: The system for assessment and flexible personalization of bonus offers has not been implemented by any competitor. The display of electronic receipts is also not implemented in a user-friendly way;

c) *Protectability*: The proposal assessment system is an innovation in the sphere of relations between the store and the customer and can be patented;

d) *Value*: Personalized bonus offers for customers will have the greatest value;

e) *Security*: All information is stored in the Mir cloud. The customer gives consent to the use of some his information through the mobile application. The shop receives only the information provided by customer’s agreement.

#### *E. R&P service positioning and SWOT analysis*

The preliminary study of the R&P service positioning was conducted in the form of a questionnaire survey. The age of participants is from 18 to 75 years old, men and women; students, university employees; representatives of urban professions (managers, sellers, technical specialists, etc.). According to the questionnaire survey results, the R&P service is modern, innovative, useful, and recommended by a lot of respondents.

The SWOT analysis performed for the R&P service allows to identify its Strengths and Weaknesses, as well as Opportunities and Threats. The SWOT analysis with the business screen matrix gives the results presented in Table 2.

TABLE II. THE SWOT ANALYSIS WITH THE BUSINESS SCREEN MATRIX FOR THE R&P SERVICE.

Strengths	Weaknesses
Big target audience	The need to convince stores to send receipts
Easiness of use of the service for the customers (all functions in one mobile application)	
Multifunctionality of the service	The laborious implementation of service software in cash registers
Benefit for customers and stores	
Threats	Opportunities
Refusal of the Federal Tax Service in the law on the mandatory transfer of receipts	State influence on the Federal Tax Service in replacement of printed receipts with electronic ones
	The introduction of the law on the mandatory personification of electronic receipts
Conflict with the concept of bonus cards	Creation of new algorithms for analyzing data from receipts
	The combination of service features and bonus cards

1) *Strengths*: According to the SWOT analysis, the R&P service has the following parameters that are better than competitors' ones: connection to the service (on the part of the customer); consumer qualities (utility); functional; loyalty; brand perception; design; technologies used.

Connection to the service on the part of the customer is carried out by pressing a single button in the "Privet, Mir!" mobile application, while competitors do not offer a single standard system, you need to store many bonus cards or interact with dozens of mobile applications.

Consumer qualities (utility) are high because they increase the benefits for stores and customers, based on individual settings for each user. The functionality of the R&P service is innovative; there is no similar product that has all the potential capabilities of a new product.

Loyalty is expected to be high, since there are already more than 70 million plastic cards from more than 300 banks and the number of clients of the Mir payment system is growing steadily, in particular due to attracted youth. The higher the percentage of the younger generation among users, the higher the interest in using the various functions of the "Privet, Mir!" mobile application and, correspondingly, the demand for the R&P service.

The perception of the Mir brand is already at a high level and is growing steadily. The competitors are mobile applications from many of stores, a lot of which are poorly known to such a wide range of users as the Mir brand can offer. Moreover, a store or a manufacturer of goods may have a good image, while its mobile application is often incomplete and only causes irritation among customers, which negatively affects the image of the entire store.

Design will act as one of the competitive advantages, as it will be distinguished by convenience, the ability to combine all the offers in one mobile application. The customer can refuse to use various mobile applications with different designs at the same time. The technology of Mir plastic card guarantees high standards of information security.

2) *Weaknesses*: The problematic aspects of the R&P service are as follows: connection to the service (from the side of the store); consumer qualities (understanding the idea).

Connection to the service from the side of the store will require, firstly, prior interaction with the Federal Tax Service of Russia in order to oblige stores to send electronic receipts to the Mir cloud. Further, interaction with shops is carried out on the basis of a standard contract, the features of which must be worked out by the Mir payment system. However, the conclusion of contracts with specific stores will require the work of managers who have to convey the idea of the benefits of the service to the management of these stores.

Consumer qualities (understanding the idea) of the R&P service, on the one hand, do not raise doubts about their usefulness, but on the other hand, since the service is innovative, it will take time to distribute it. The B2B advertising company from the Mir payment system for stores will be needed, as well as a notification to the masses of users who hold Mir plastic cards in order to familiarize them with the new feature of the "Privet, Mir!" mobile application.

Sending electronic receipts to the Mir cloud requires the latest equipment (terminals). According to Federal Law 54-FZ [8], all retail chains with annual revenues of over 40 million rubles must update the cash register equipment, in connection with which the cash register will be connected to the POS terminal. Thus, sending electronic receipts to the Mir cloud will be a technically simple process.

## VI. CONCLUSION

The proposed R&P service is potentially able to become a new standard of interaction between the store and the customer. Today, during the time of the active use of electronic information, machine learning and smart targeting, many more stores are left out of innovation and are losing a lot of customers and profits. The R&P service through the use of information from electronic receipts will allow stores to effectively distribute bonus offers and make this process convenient for the customer.

The system of flexible personalization of bonus offers and their assessment by customers is currently not implemented in other software products and is unique. The display of electronic receipts in a user-friendly presentation has also not yet been implemented, despite some attempts, so the "Privet, Mir!" mobile application will be the first.

For the customer, the R&P service will solve the problem of the family budget management. Previously, it was necessary to store paper receipts and then transfer data to the electronic worksheet, while using the R&P service a table is generated automatically. Moreover, it is easy to sort and filter information from receipts before exporting. This aspect of the service has received many positive reviews from adults who deals with family budget management.

The R&P service will also solve the problem of irrelevant offers, urgent for both the customer and the store, offering the opportunity to generate offers relevant to a particular customer based on the analysis of his preferences and ratings made by him. Also, the customer can refuse to carry a lot of bonus cards

with him, making payments using a smartphone or the Mir plastic card, which is very important for the younger generation.

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