Rows In Banks: Application of The Row Management Method And Proposal of A New Service Discipline In A Correspondent Banking

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Abstract — *This paper developed as a case study aimed to analyze the situation of cash queues within a bank branch and a correspondent bank in the municipality of Cataguases - MG, in order to improve the flow of customers within of the same. To this end, data provided directly by the board of the institution were analyzed, containing the results obtained during December 2018 and their impact. Attendance times were also collected from the correspondent to evaluate the attendance model. The information collected pointed to an unsatisfactory service, with a high average waiting time in line and a high percentage of calls outside the law. Based on the data obtained and analyzed using the Microsoft Excel tool, the study compares the service discipline performed by the correspondent bank, FIFO (first in, first out) with the Shortest discipline. Job First (SJF), which is based on prioritizing the care of the smallest service packages. The results show that the suggested model can provide a service up to 60.60% more efficient and effective, reducing the number of customers served outside the given time and improving the flow in the sector.*

Keywords — *Timeout, Queue, Service, FIFO, SJF.*

I. INTRODUCTION

With the significant increase in competitiveness in the national banking sector, the increase in the quality of services rendered has become fundamental for financial institutions in the search for advantage and profitability. (FIGUEIREDO and ESCOBAR, 2004) Surveys show that waiting for a service can negatively affect customer evaluation by customers: as customers realize that waiting time is increasing, satisfaction tends to decrease, negatively impacting results. company's financial (TAYLOR, 1994; HUI and TSE, 1996; HAKSEVER et al., 2000; NEWMAN, 2001) Imposing the customer to wait too long is even more detrimental to the service company when taking into account the cost of waiting for customers. - opportunity cost, time as a unit of value.

With a view to increasing competitiveness in the financial sector, banks are always looking for solutions to better serve their customers in order to satisfy them and comply with State Law 14.235 /

2002, which establishes that the banking institution is obliged to serve the customer on time 25 minutes on normal days and 30 minutes on peak days from the time he enters the service queue.

Aiming to be the largest financial institution with the largest number of customers, profitability and acceptance, banks have been rapidly advancing their ATM services enabling their users to perform all types of ATM transactions with other ATMs, without having to resort to personal service. Therefore, this alone has not been sufficient to reduce queues in the cash sectors, and the large number of complaints and punishments based on them remain.

As an alternative to this improvement, service outlets outside the institutions were launched with the purpose of conducting these cash transactions, thus dividing the flow that would result in queues and delays within the institutions. Therefore, the method of service of these correspondents has not been shown. so effective and sufficient for user satisfaction.

Given the facts, the article aims to analyze the results generated by the agency's internal queue model, in order to understand whether or not it meets expectations and to study the current model of queues in external service posts, in order to identify the points that can be worked on to optimize the process, and generate a comparative study with another queue management method that meets more effectively and thereby improving cash flow at the financial institution.

II. LITERATURE REVIEW

QUEUES

The concept of queues according to Lovelock and Wright (2002) portrays the representation of a line of users, be they people, vehicles, and other physical or intangible objects that wait their turn to be attended. The authors also highlight that queuing occurs when the number of customers arriving exceeds the capacity of the customer service system, ie, the average arrival time of the customers is less than the average customer service time.

QUEUES AT FINANCIAL INSTITUTIONS

One of the most relevant dimensions that permeates the customer's perception of service effectiveness is directly related to the speed with which the company provides the service requested.

Getting the consumer to wait too long to be served is detrimental to the business, such waiting is "even more damaging to the service business when you consider the cost of waiting for customers - opportunity cost, taking time as a unit of value "(ARAUJO & CARNEIRO, 2008, p. 2).

According to SILVA (2007), with the objective of increasing the speed of execution of the services rendered and, consequently, reducing the waiting time of users, financial institutions are increasingly investing in the technology sector, in order to improve and encourage use by digital channels and ATMs. However, there are a considerable portion of consumers who feel insecure with technology. As a result, banks are increasingly investing in these technologies to improve customer service to increase loyalty and satisfaction with quality service, as maintaining a customer is more profitable than gaining new ones. (ZACHARIAS; FIGUEIREDO; ALMEIDA, 2008).

At bank branches, speed of service and queue size have a considerable impact on clients' understanding of the institution's quality of services. The problem of long lines at bank branches for teller service has taken on legal proportions. According to chwif & medina (2006) the law guarantees the customer a minimum level of service provided.

BANKING QUEUE WAITING TIME REGULATION

Several municipalities have introduced laws limiting the maximum waiting time in queues at financial institutions. It is considered for this time, the period between the arrival of the user to the bank, until it is attended. Failure to do so had led to the payment of fines, as well as blackening the institution's image towards consumers. Law number 3528/2006 requires agencies within the municipality of Cataguases to issue passwords to users to regulate queue waiting times.

Article 1 - The bank branches within the Municipality of Cataguases are obliged to make automatic self-service passwords available to users, the purpose of which is to regulate the length of service within the limits established by this Law.

Article 2 - For the purposes of this Law, it is understood as reasonable time for self-service:

I - up to 15 (fifteen) minutes on normal days;

II - up to 25 (twenty-five) minutes before or after a long holiday;

III - up to 30 (thirty) minutes in the first 05 (five) business days.

Paragraph 1 - Banks or their representative entities shall inform the body in charge of enforcing this Law on the dates mentioned in items II and II.

Paragraph 2 - The maximum service time referred to in items I and III shall take into consideration the normal provision of services essential to maintaining the normal pace of banking activities, such as power, telephone and data transmission.

Paragraph 3 - The agencies are obliged to post, in a place clearly visible to the public, the determinations contained in this Law.

Article 3 - The bank branches have a period of ninety (90) days from the date of publication of this Law, to adapt to its provisions.

Article 4 - Failure to comply with the provisions of this Law shall subject the violator to the following punishments:

I - Warning;

II - Fine of 03 (three) UFM`S

III - Fine of 06 (six) UFM`S, until the fifth recidivism;

Sole Paragraph - The values set forth in items II and III shall be adjusted and corrected in accordance with the provisions of the Municipal Law.

Article 5 - The complaints of the citizens shall be forwarded to the Posture Inspection Agency of the Municipality of Cataguases, which is responsible for ensuring compliance with this Law, for the proper verification of the complaint and application of the applicable penalty.

Article 6 - Revoked the contrary provisions, this Law shall enter into force on the date of its publication.

This law protects users of banking institutions in the municipality of Cataguases, and it is up to them to comply with the requirements, causing customers to be respected with regard to waiting times in line or in case of non-adaptation of banks, answer for it.

EXCEL

In order to archive the collected information in order to study the current model, propose a new service method and compare it, we use the Microsoft Excel tool, which has spreadsheets for mathematical calculations. Excel program functions can be very important for the development of feasibility projects. Tools such as tables, formulas, graphs, give projects a dynamic that can better demonstrate the result obtained.

III. METHODOLOGY

For the elaboration of this article researches were done in books, articles and academic websites. The work can be classified according to its nature, being a quantitative approach, in which the author seeks to generate knowledge through data collection and process simulations through systems to obtain a better method to apply in practice.

The research method applied was the case study. According to Yin (2001), it is the ideal method when it is not possible to make a perfect distinction between the phenomenon and the context in which it occurs. The author considers it especially suitable for

empirical investigations in which the central question is "how" or "why". In order to meet the research objective, data provided by the regional board were analyzed, detailing the agency's results regarding queues and complaints. And from the confirmation that the current method has not met the requirements, the article deals with queue management in the correspondent bank, and brings a study that compares the FIFO (first in, first out) queue modalities means: first to enter, first out) and Shortest Job First (SJF) based on a chronoanalysis to establish the best method.

COMPANY OBJECT OF STUDY

As an object of analysis, a bank branch and correspondent bank were chosen, both located in the city of Cataguases, State of Minas Gerais. The agency service system for individuals and companies consists of 4 different types of cashiers, with FIFO (First In, First Out) service discipline: o Conventional that serves any type of person, client or non-client; Level 1 Customer, for people who pay for faster service than conventional cash; Level 2 Client, which is considered the service between the conventional and Level 1 Client, the best service: and Priority, intended for the care of the elderly, pregnant women, the disabled and people with lap children. The correspondent bank is a company that operates in another commercial branch that has an agreement with the bank to provide basic cash services, which are withdrawal, deposit and bill payment operations. The correspondent has an attendant and a computer in order to serve customers, he also serves in the discipline of FIFO type service.

The agency was selected due to the number of complaints and actions that were filed against it in PROCON (Municipal Consumer Protection Agency). According to data provided by the institution, 45% of cases filed against the bank branch in 2018 were motivated by waiting time in line beyond the limit established by law.

Image 1: Representation of the number and types of complaints during 2018

type of complaints	Number of complaints and 2018	Representation
Queue Time	37	44%
Machine malfunction	10	12%
Rate Discount	17	20%
Document Delivery Time	5	6%
Attendance	6	7%
Others	10	12%
Total	85	100%

Source: Author .2019

Image 1 demonstrates the degree of concern of the institution regarding waiting time in cash queues. Since this sector is responsible for 44% of complaints filed by this agency. This information is generated every month by the board to measure efficiency.

DATA COLLECTION

The first data collection was based on a survey within the bank branch itself. We analyzed data provided by the same referring to the system used, and its results based on queues that were formed by customers who were waiting for service, from the moment they arrived at the agency, until the time they finished their service. Data is provided from the board to the agency to show the result over a one-month period of service and its use based on the queue time stipulated by law. As shown in table 1

Table 1: Representation of tickets that were issued and finalized at the cashier terminals at the end of each service during December 2018

Number of Completed Calls	4387	Representation
Number of Calls up to 25min.	985	22,45%
Number of Calls up to 30min.	1403	31,98%
Number of Calls up to 50min.	1368	31,18%
Number of Calls Above 1h.	631	14,38%

Source: Author .2019

DATA COLLECTION AT BANK CORRESPONDENT

The second data collection was carried out at correspondent Banking, which provides cash handling services to the agencies in order to direct the services, giving the client more means to perform services, speeding up the calls and consequently reducing the queues. within the agency.

A cronoanalysis was performed using a digital clock where data were collected from December 2018, from the 1st to the 29th from 9 to 16h. As shown in the table below, we observed the arrival times of each customer, their start and end of service, making it possible to obtain the time that each customer took to be served and also how long it lasted. As shown in picture 2.

Image 2: Demonstrates the data that was collected on one of the workdays.

Arrival	Start of call	End of call	Waiting time	Service time
09:10:13	09:10:13	09:15:01	00:00:00	00:04:48
09:11:25	09:15:01	09:18:23	00:03:36	00:03:22
09:14:56	09:18:23	09:23:19	00:03:27	00:04:56
09:16:19	09:23:19	09:24:22	00:07:00	00:01:03
09:20:11	09:24:22	09:28:50	00:04:11	00:04:28
09:23:44	09:28:50	09:31:16	00:05:06	00:02:26
09:28:10	09:31:16	09:36:08	00:03:06	00:04:52
09:30:01	09:36:08	09:40:02	00:06:07	00:03:54
09:30:52	09:40:02	09:44:34	00:09:10	00:04:32
09:36:18	09:44:34	09:51:01	00:08:16	00:06:27
09:40:24	09:51:01	09:54:10	00:10:37	00:03:09
09:41:02	09:54:10	09:55:17	00:13:08	00:01:07
09:45:11	09:55:17	10:00:36	00:10:06	00:05:19
09:49:12	10:00:36	10:04:04	00:11:24	00:03:28
09:55:39	10:04:04	10:09:36	00:08:25	00:05:32
09:59:05	10:09:36	10:14:54	00:10:31	00:05:18
10:02:31	10:14:54	10:21:18	00:12:23	00:06:24
10:03:56	10:21:18	10:26:11	00:17:22	00:04:53
10:04:16	10:26:11	10:30:04	00:21:55	00:03:53
10:09:21	10:30:04	10:31:35	00:20:43	00:01:31
10:17:03	10:31:35	10:33:02	00:14:32	00:01:27
10:17:22	10:33:02	10:36:28	00:15:40	00:03:26
10:19:02	10:36:28	10:38:04	00:17:26	00:01:36
10:20:33	10:38:04	10:40:03	00:17:31	00:01:59

Source: Author .2019

COLLECTION OF TRANSACTION TIMES

The times that were collected during cash operations in order to time the waiting time and service time of each customer also served to create a database containing the average times for the execution of cash transactions (withdrawal, deposit, bill payment). These times allowed the study to establish how long it took the cashier to execute 1 (one), 2 (two), 3 (three) or more transactions. These times would determine the priority to be obeyed in the proposed model.

Image 3: Demonstrates the average execution time of certain transaction quantities.

Quantidade de Transações	Tempo aproximado
Uma transacão	00:01:15
Duas transacoes	00:02:40
Até três trasacoes	00:04:10

Source: Author .2019

It was considered an average time due to the variety of transactions that can be performed together. Example: set of two transactions (withdrawal + deposit, withdrawal + payment slip, payment slip + withdrawal). Then an average was stipulated to be able to define the execution times and the way of prioritization.

Taking into consideration the whole period in which it was studied, it is observed that approximately 31% of the clients that correspond to the correspondent bank make only one (1) transaction, 29% make two (2) transactions, another 27% represent clients that make three transactions. (3)

transactions and about 13% perform four (4) or more transactions.

STATISTICAL ANALYSIS

Based on the data that were obtained during the month of December, it was noticeable that the way the service is performed, both the agency and the correspondent fail before the law that determines a service up to 25 minutes for all customers. From this survey, other attendance disciplines such as SJF-P and SJF-NP were analyzed to see which one could meet this work model, in order to reduce as many people as possible that exceeded this time, and the tests were performed using actual values that were obtained. The data collection that was conducted at the correspondent indicated that 13% of customers attend to perform 4 or more transactions, are the largest responsible for the queue accumulation, causing the attendant to be tied to a customer for a longer time. This article proposes that the system works with priority on the clients that represent the largest flow of service, that is, prioritize the clients that have the lowest number of transactions.

ANALYSIS OF ATTENDANCE DISCIPLINES

The service model that fits to streamline the process by prioritizing the smallest (shortest) service packages to the largest is the Shortest Job First (SJF).

This customer service discipline will always call customer service who is queued with the smallest service pack and is waiting the longest in line. As indicated in the time analyzes, the percentage of clients attending the correspondent to execute four (4) or more transactions is small relative to the number of clients executing one (1), two (2) or three (3). thus the largest flow will be prioritized.

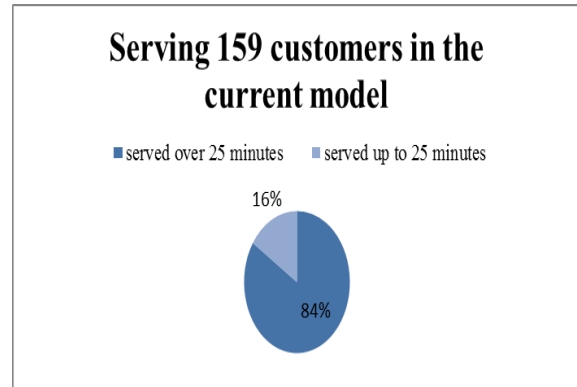### IV. Results and discussions

RESULTS

The system that was proposed in the methodology was tested with the same data that were collected through the corresponding timings, this time they were inserted in Microsoft Excel prioritizing those customers that perform the smallest service package, but respecting their arrival times and time. attendance, making the test run with real data, and delivering true results. To perform the test were chosen 3 different moments that occur during the month.

Graphs 1: Percentage of attendance of 147 customers in the current model, identifying the degree of efficiency and compliance with the determinations of compliance with the deadline stipulated by law

Serving 147 customers in the current model

■ served over 25 minutes ■ served up to 25 minutes
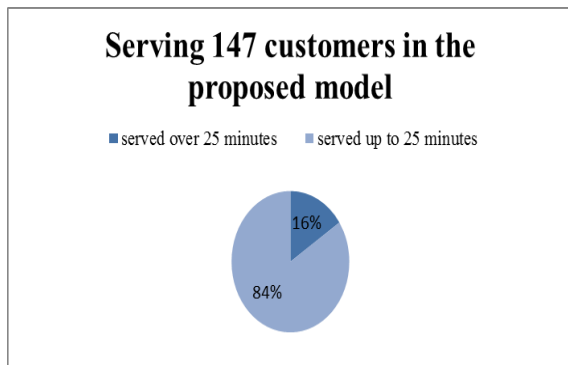
29%
71%
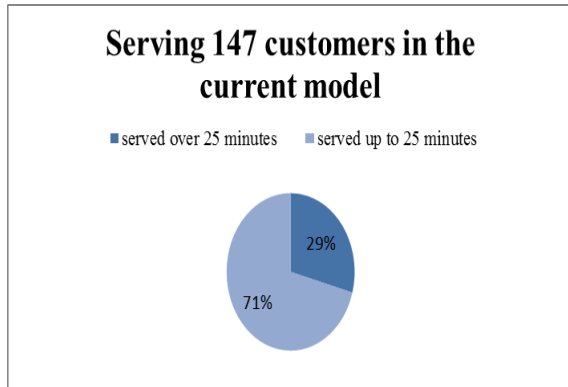
. Source: Author .2019

Graphs 2: Percentage of attendance of 147 customers in the proposed model, identifying the degree of efficiency and respect to the determinations of compliance with the deadline stipulated by law.

Serving 147 customers in the proposed model

■ served over 25 minutes ■ served up to 25 minutes

16%
84%

Source: Author .2019

The first test was carried out on Friday, 07/12/2018, the fifth working day, considered as the busiest day in the branch and correspondent cashier sectors, beginning of the month and corresponding to the last day of benefit payment. from INSS- National Institute of Social Insurance. On this day 147 customers attended and were attended. In the model that runs the service today were 104 customers served above the deadline and only 43 served on time, generating an average waiting time of 19: 42 minutes In the proposed model the numbers were more positive, a total of 124 clients served on time and only 23 over 25 minutes, totaling an average waiting time of 12: 38 minutes.

Graphs 3: Percentage of attendance of 159 clients in the current model, identifying the degree of efficiency and compliance with the determinations of compliance with the deadline stipulated by law

Serving 159 customers in the current model

■ served over 25 minutes ■ served up to 25 minutes
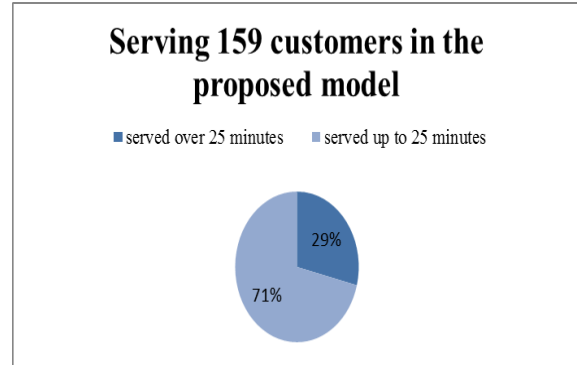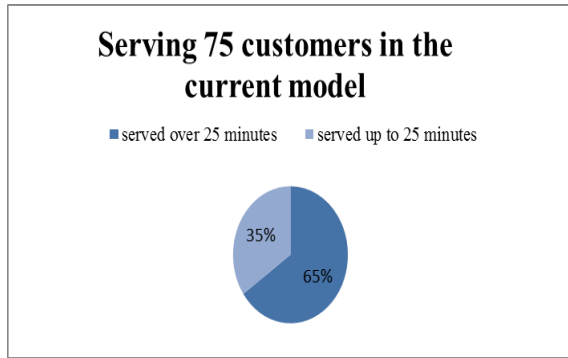
16%
84%

Source: Author .2019

Graphs 4: Percentage of attendance of 159 clients in the proposed model, identifying the degree of efficiency and respect to the determinations of compliance with the deadline stipulated by law.

Serving 159 customers in the proposed model

■ served over 25 minutes ■ served up to 25 minutes

29%
71%

Source: Author .2019

The second test was carried out on Monday, 12/12/2018, which is considered to be one of the biggest days of movement in the branch and correspondent cashier sectors, due to the large volume of maturities on the day. On this day 159 customers were served. In the model that is performed today, there were 134 clients served above the deadline set by law and only 25 served on time, generating an average waiting time of 37: 19minutes in the model that the article proposes, the numbers were much more satisfactory, a total of 113 customers served on time and 46 over 25 minutes, totaling an average waiting time of 22: 33 minutes.

Graphs 5. Percentage of attendance of 75 clients in the current model, identifying the degree of efficiency and respect to the determinations of compliance with the deadline stipulated by law

Source: Author .2019

Graphs 6. Percentage of attendance of 75 customers in the proposed model, identifying the degree of efficiency and compliance with the determinations of compliance with the deadline stipulated by law
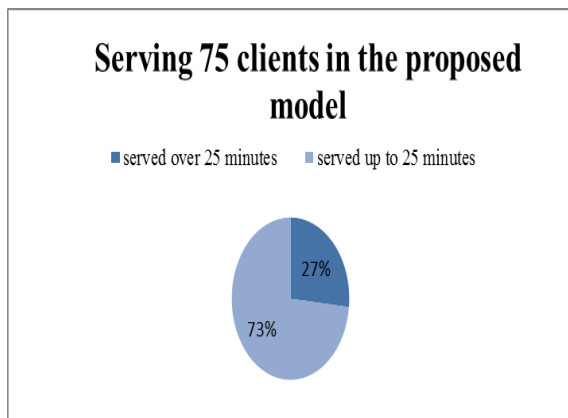
Source: Author .2019

The third test was carried out on Saturday, December 29, 2014, because it is an end-of-month date, and it did not have a big movement, so that the test is also observed on days of small customer flows. On this day 75 customers attended the venue. In the discipline of service perform today were 49 clients served above the deadline stipulated by law and 26 served until 25minutes determined, generating an average wait time of 30: 36 minutes in the proposed model even if it did not reach 100% of calls within 25 minutes, numbers were significant, a total of 55 customers served on time and only 20 customers over 25 minutes, totaling an average waiting time in queue. from 16: 07min.

DISCUSSION

Following the authors Lovelock and Wright (2002) cited in the literature review, queues start when the number of arriving customers is greater than the system's service capacity, this happens when the average service time is less than the service time. arrival of them. Based on this statement, the intention was to change the discipline of service in the correspondent sector, given that this model no longer ensured the provisions of Law No. 3528/2006, which

would guarantee the customer a minimum level of service provided.

	Queue Average (min)	customers served over 25 minutes	Customers served under 25 minutes
Actual model	29:21	59,36%	40,64%
Suggested model	17:11	23,35%	76,64%

Table 2: Demonstrates the averages obtained in the 3 days of testing by both models.
Source: Author .2019

As shown in the table above, the average recorded in this test period has significant results, a 12: 10 minutes decrease in queue waiting time, in the previous process, the on-time service was satisfactory to around 40.64% while in the proposed model. The numbers show efficient service for approximately 76.64% of users.

V. CONCLUSION

Analyzing the previous topics, highlighting the initial problem of queues within a bank intuition, and its cash correspondent. The purpose of the article was to identify a way in which customer service would be more effective and satisfying, since external service directly influences the flow within the agency,

Through the results obtained in this study it was possible to verify that the service model currently implemented in the agencies and correspondents are not satisfactory, since they serve respectively up to 22.45% and 40.64% of clients up to 25 minutes, causing this to increase the flow within the agency, leading to great delay and consequently numerous complaints about the industry, since the vast majority of clients are served beyond the deadline set by law. The proposed model showed a significant improvement in the testing period, in relation to the number of clients served within the stipulated time by law it was possible to achieve an improvement of 60.60%, while in the average waiting time in queue, a decrease of 12: 10 minutes.Verifying the objective of the study that would be to find a new service proposal to improve cash flow, this new proposal was a service through the prioritization of smaller service packages, which had significant improvement in correspondence that directly influences the service within the agency.

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