

The paper considers the form of taking into account the specialization of information needs. An analysis of the work of modern call centers has been carried out. The authors noted the effectiveness of using IVR devices, operators, and consultants for differentiated customer service and the need to take feedback into account when forming the revenue stream of applications. The models make it possible to determine the leading indicators of the quality of service for applications arriving at the call center. Formal expressions for descriptions are derived from the input parameters' values and the model's stationary probability. The relationships between the characteristics of the call center that regulate the intensity of incoming and outgoing calls, call processing through 3CXPhone, corporate mail, and social networks were obtained using Global Statistic. The developed methodology for organizing information and reference systems makes it possible to consider modern trends in the development of call centers. The paper presents the results of research using the IP IVR system. The results of calculating service characteristics are given for two different types of calls with mixed order $\omega = (0.5; 0.7; 0.9)$. The presented results were obtained by using experimental data of the JSC Kazakhtelecom's call center. For the calculations, the authors used the formulas of the teletraffic theory for a mixed service system. It also assesses the extent of combined service model effects for the contact center's call quality. It is shown that the probability of lost calls depends on the incoming load. The obtained results show that the mixed order for incoming calls servicing affects the probability of service failure

Keywords: Interactive Voice Response – IVR, service quality, call probability, queueing theory, teletraffic theory, communication systems

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QUALITY ASSESSMENT OF THE CONTACT CENTER WHILE IMPLEMENTATION THE IP IVR SYSTEM BY USING TELETRAFFIC THEORY

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1. Introduction

The call center plays an essential role in the development of business and state-owned companies. The call center is a single point of access to free or paid information about the availability and characteristics of products and services for sale. The availability of a call center is a critical factor if the company tries to take a leading position in the market. For this reason, the number of employees working in call centers and the list of services they provide are constantly growing. Determining the optimal number of operators using a key performance indicator is essential in optimizing the communication system [1].

Call centers have different areas of activity. They are used in technical support services, telecommunications companies, insurance companies, marketing research and sales, and are the basis for developing private and public security centers (situational centers).

Interactive Voice Response (IVR) is a service that plays voice messages and processes calls using various scenarios. In other words, IVR helps the client to transfer the call to the extension number of the necessary department or employee using the phone or voice buttons.

Depending on the type of service, the number of call center operators can vary from ten to several thousand people. In the latter case, the operators can be divided by specialization or qualification and serve different customer needs. The help services themselves can be distributed geographically within one country or even several countries. Taking these features into account makes it difficult to study the call center as a single access point to customer reference and information services.

Call centers are divided into call centers and outgoing calls, depending on who is calling. Sometimes call centers also make incoming and outgoing calls. Another way to classify call centers is based on whether they are single-user or multi-contact centers. Many specialized call centers have agents with different skills, and other agents may specialize in answering different types of calls. In a typical call center, there is only one type of agent designed to answer one or all types of calls.

With a single IP IVR, you can create applications to perform the following tasks:

- interpret voice data (including keyboard data);
- translate the text into a conversation;
- send and respond to HTTP requests;

- sending e-mail;
- enable unified CCX for direct interaction with ODBC-enabled databases (Open Database Connectivity) without agent intervention.

Unified IP IVR applications support ODBC. Integrated IP IVR applications can access Microsoft Structured Query Language (SQL) servers and Oracle, Sybase, and IBM DB2 databases.

A single IP IVR can be hosted on your IP network on any Cisco-approved virtual server.

Usually, the process of servicing call center applications consists of three stages. The first stage is processed by an IVR device, the second by an operator, and a specialized operator. Upon completing the first stage, the customer can complete the service in the call center or continue it with the operator. The operator's responsibility is to enter into a dialogue with the client and fill in the missing information in the response received during the IVR. After that, the operator sends the client's call to the consultant for technical details. If this is not necessary, the client stops the service with an operator and leaves the analyzed communication system.

Training and retaining a large staff of competent specialists in all aspects of the company's activities (products, services, etc.) is impractical from the trust. For this reason, if necessary, operators are divided into regular and specialized, usually on several issues. Such employees are called consultants, technical support specialists, and second-line operators.

IP IVR software system-multimedia (voice, data, Internet) is an interactive voice response solution that automates call processing by interacting with subscribers independently. The IVR interactive voice menu system is used to clarify the subscriber's wishes automatically. IVR task to prepare the operator for a conversation and reduce the time spent on this conversation. This is needed to get as much information from the caller as possible.

2. Literature review and problem statement

Many researchers and practitioners worldwide have spent countless efforts developing call center processing models and methodologies over the past few decades. There are many options for call handling. The three most common: 1 – call service only by operators; 2 – call service only by automatic IVR system; 3 – combined. Each has its minuses and pros. However, it is considered that the combined mode of incoming call service (joint work of operators and IVR) is the best option for call service.

In the study [2], the authors analyze the degree of variability in the quality of the call center. An index of work quality is created, and empirical analysis of the characteristics of workplaces in call centers is carried out to achieve the goal. The advantages of this study are that the authors had determined the level and variability of the job quality in this sector and established whether the reality of these jobs is the same as the forecasts. The disadvantages of this study are that it does not investigate the joint work of the operator and the IVR system.

In the study [2] research has been carried out and comparative characteristics of signal transmission modes using virtual networks have been obtained to identify the effectiveness of the network in various modes of organizing a virtual network, and to optimize a virtual network in order to

identify an effective method for organizing a VPN. Also, the work analyzes the specifics of the work of corporate information systems and networks intended for their maintenance, showed that for building a corporate network it is advisable to use virtual private network (VPN), the authors analyze the actual number of new calls compared to the expected number of new calls for the router. A router operation model has been developed for shared calls, new calls, redial, and reconnection. The model is based on the data set of call records from the call center of Mobile Telecom Service LLP. The method of creating this model formed the basis of this study.

Kazakhstan ranks number nine globally by area, but its population density is one of the lowest [3]. The small population is dispersed over a large area. Because of this, there was an opinion that the quality of the call center's service is influenced by the territorial location and the specifics of the language dialect.

In the study [4], the authors concluded that operators' professionalism and motivation play an important role. A survey of customer satisfaction with the quality of service of contact centers was conducted. It is proved that customer satisfaction is affected only by the intended customer orientation of the operator and is not affected by the emphasis, location of the contact center, and the competitiveness of the company's product.

The advantages of this study are the authors' conclusions that the companies with a higher priority on ensuring call center agents have a strong customer orientation [4] and with the best forms of service organization for existing and potential customers are often winning than companies with competitive products and services. This conclusion is confirmed by the study results [5], where the authors concluded that companies need highly motivated and dedicated employees to achieve a high-quality standard of operator performance.

However, the authors of the study [6] had identified a weak relationship between customer satisfaction and the financial performance of the call center.

In the study [7], the authors analyze the optimization of the communication system by determining the optimal number of operators using a key performance indicator.

The conducted research shows that this optimization can be performed using the queuing theory approach. This review examines the practical application of call center optimization using a stochastic approach to queuing. The advantages of this study are the authors' results that the optimal number of call center operators was determined for various peak periods, taking into account four performance indicators. The collected information showed the importance of using the queuing theory model as a deterministic tool for optimizing the communication system. The disadvantages of this study are that it did not consider the possible combined operation of operators with an IVR system.

Sometimes customers have problems using IVR [8], like answering the same question repeatedly or having incorrect answers registered if IVRS did not recognize their voice [9]. The authors of [9] concluded that it is needed to pay careful attention to phone signal reliability, data cleaning, questionnaire design, and participant fatigue.

Based on the analytical review, the authors of the present study decided to consider all the pros and cons of previous studies. For example, the complex work of the operator and the IVR system reduces the number of erroneous responses of the call center, thus increasing customer satisfaction.

3. The aim and objectives of the study

The aim of the study is to analyze the efficiency of modern call centers. Namely, to analyze the efficiency of using IVR devices, operators, and consultants for differentiated customer service and the necessity to take feedback into account for calculating the financial flow of all applications.

To achieve this aim, the following objectives are accomplished (V is the number of operators):

- to determine the dependence of the probability of the second type lost calls on the incoming load (at $V=8$);
- to determine the dependence of the average waiting time of the first type of calls on the received load (at $V=8$);
- to determine the dependence of the probability of the second type lost calls on the incoming load (at $V=16$);
- to determine the dependence of the average waiting time of the first type of calls on the incoming load (at $V=16$);
- to determine the dependence of the probability $P(>t)$ on the incoming load (at $V=8$ and $V=16$).

4. Methods and materials

The paper uses analytical formulas and recursive algorithms to analyze the performed studies [3]. The mathematical model is created to estimate the number of operators, reflecting receiving and serving customer information calls. The input data of the mathematical model were the statistical data of the call center of Kazakhtelecom JSC (Almaty, Republic of Kazakhstan) for 11 days. The sequence of using call center resources and the user’s specific behavior was considered when the model was developed. The model calculates specific scenario steps of the interaction between the client and the call center.

The call center is open from Monday to Friday and from 8.00 am to 8.00 pm, for a total of 11 consecutive operating days. We also divide the working hours into 24 intervals; the duration of each interval is 30 minutes. This is a widespread practice in call centers, as it facilitates the management of call center activities and reporting. Based on this picture, we see some interesting patterns in the process of visiting. The first pattern is the time of activity during the day, when, for example, we know a lot of visitors from 9:30 in the morning. During the lunch break from 12:00 to 12:30, daytime activity decreases, and after lunch (around 13:00–13:30) until the evening, daytime exercise increases again. The second pattern is activity during the week. On Monday, the number of visitors is higher than on the rest of the week, and on Friday there is the lowest activity for the whole week.

To solve this problem, the authors use models and methods of teletraffic theory [10] or queuing theory [11], presented in the basic instructions on this topic. According to D. J. Kendall’s classification denoted as M/M/v [1], the classical Erlang model [12, 13] was used to calculate the number of operators in the early stages of the call center study. Also, some changes were made to the model to clarify the interaction between the customer and the help desk operator.

The features of this service system are:

- requests of the first type can wait for their turn;
- requests of the second type leave the system and disappear, seeing that all tools are occupied.

The system serves both streams with full access from V operators. Calls from the 1st thread are received according to Poisson’s law with an intensity of λ_1 . They model the process of receiving calls sent to the IVR system for primary service,

so they are served within the waiting model. In case of refusal to provide the service, the call will be queued.

To simplify the calculations, we assume that the number of waiting places is unlimited. Calls to the 2nd thread also come with an intensity of λ_2 according to Poisson’s law. They simulate the process of sending or receiving calls to contact center operators, so they are served within the framework of expense models. In case of refusal to provide the service, the call is rejected and not renewed. The service time of calling from the first and second threads has an exponential distribution with a parameter equal to μ . A two-dimensional Markov trend [8] characterizes the constructed model. The calculated formulas are obtained from the transformation of the system of equilibrium equations.

For calculations, we took the formulas of the teletraffic theory for a mixed service system.

The probability that all operators will be free of service:

$$P_0 = \frac{V - \alpha_1}{[V - \alpha_1 + \alpha_1 \cdot E_V(\alpha_1 + \alpha_2)] \cdot N_V(\alpha_1 + \alpha_2)}, \tag{1}$$

where $\alpha_1 = \lambda_1 / \mu$ and $\alpha_2 = \lambda_2 / \mu$ – load intensity of the first and second types; and V is the number of operators.

$$N_V(\alpha_1 + \alpha_2) = \sum_{k=0}^V \frac{(\alpha_1 + \alpha_2)^k}{k!},$$

$$E_V(\alpha_1 + \alpha_2) = \frac{(\alpha_1 + \alpha_2)^V}{N_V(\alpha_1 + \alpha_2)} - \text{Erlang’s Formula I.}$$

The probability of lost call is defined as:

$$P_{loss} = \sum_{k=0}^{\infty} P_k = \frac{V \cdot E_V(\alpha_1 + \alpha_2)}{V - \alpha_1 + \alpha_2 \cdot E_V(\alpha_1 + \alpha_2)}, \tag{2}$$

where k is the probability that operators will be engaged in servicing of requests. k is determined by the condition $0 < k < V$

$$P_k = \frac{V - \alpha_1}{V - \alpha_1 + \alpha_2 \cdot E_V(\alpha_1 + \alpha_2)} \cdot \frac{(\alpha_1 + \alpha_2)^k}{k!} \cdot \sum_{k=0}^V \frac{(\alpha_1 + \alpha_2)^k}{k!}. \tag{3}$$

If $k > V$, then P_k is determined by (4):

$$P_k = \frac{(V - \alpha_1) \cdot E_V(\alpha_1 + \alpha_2)}{(V - \alpha_1 + \alpha_2) \cdot E_V(\alpha_1 + \alpha_2)} \cdot \frac{\alpha_1^{(k-V)}}{V}. \tag{4}$$

The probability that the waiting time for the first type of request is more than the t time is determined by (5):

$$P(>t) = P_{wait} \cdot e^{-(V - \alpha_1)\mu t}. \tag{5}$$

The average waiting time of the first type of requests:

$$T_{wait} = \frac{P_{wait}}{\mu \cdot (V - \alpha_1)}.$$

It is recommended to use formulas to calculate the values P and $P(>t)$ to evaluate the quality of service indicators for pre-oriented telephone calls in the interactive IVR grid system. It is of practical interest to study the degree of influence of mixed order on the quality of telephone call service. Here, the following notation is introduced:

- $A = (\alpha_1 + \alpha_2)$ – total load intensity;

– $\omega=(\alpha_1/A)$ – coefficient describing the part of calls served with waiting, ω is the variable that changes from 0.5 to 0.9. The average waiting time for the first type of call increases dramatically when the coefficient ω changes.

For the first and second types of requests with $\mu=40$ calls/hour, it is assumed that the service will be provided with the same intensity ($t_0=20$ s). This is needed to calculate the probability that the waiting time of customers will be more than t_0 .

The IVR system can be used to adjust λ_1 and λ_2 flow intensity of the call.

The model was created by using the C++ language.

5. Results. The probability of lost calls on the incoming load dependence

5.1. Dependence of the probability of the second type lost calls on the incoming load determination (at $V=8$)

The calculations for $V=16$ and $\omega=0.5$ are shown in Table 1.

Fig. 1 shows the second type of lost calls' probability on the incoming load dependency (for the number of operators $V=8$).

As shown from Fig. 1, a graph of the dependence of the probability of loss of calls of the second type on the incoming load is given (at $V=8$). As the incoming load increases, the probability of their loss increases exponentially.

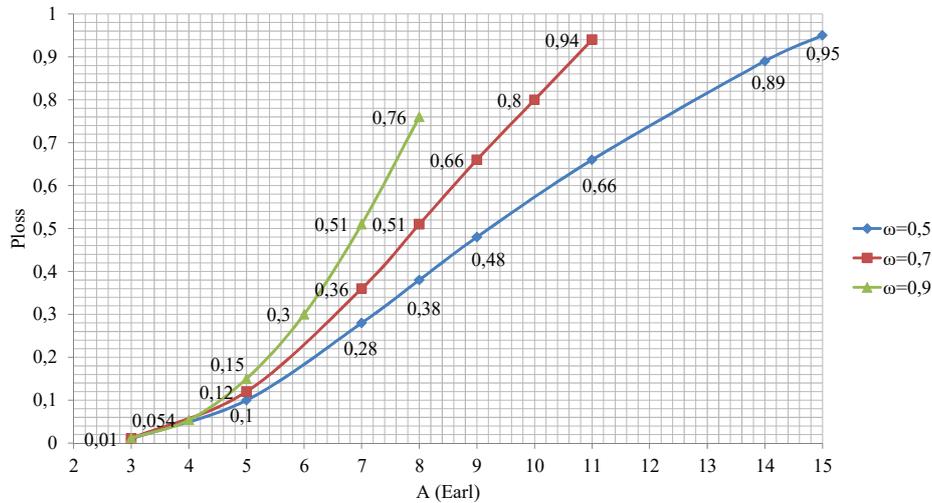


Fig. 1. Probability of the second type lost calls on the incoming load dependency (at $V=8$)

Table 1

Calculations for $V=16$ and $\omega=0.5$

A (Earl)	α_1 (Earl)	α_2 (Earl)	$E_V(\alpha_1+\alpha_2)$	P_{loss}	$T_{wait}(s)$	$P(>t)$
8	4	4	0.00453	0.0060	0.05	0.0004
9	4.5	4.5	0.011052	0.0153	0.12	0.0012
10	5	5	0.022302	0.0321	0.26	0.0028
11	5.5	5.5	0.038852	0.0580	0.50	0.0056
12	6	6	0.06	0.0927	0.83	0.0100
13	6.5	6.5	0.086	0.1368	1.30	0.0166
14	7	7	0.11	0.1801	1.80	0.0244
15	7.5	7.5	0.1446	0.2414	2.56	0.0365
16	8	8	0.175308	0.2983	3.36	0.0504
17	8.5	8.5	0.205852	0.3561	4.27	0.0673
18	9	9	0.235695	0.4131	5.32	0.0873
19	9.5	9.5	0.26449	0.4695	6.50	0.1108
20	10	10	0.292033	0.5238	7.86	0.1381
21	10.5	10.5	0.318224	0.5759	9.42	0.1696
22	11	11	0.34303	0.6256	11.26	0.2059
23	11.5	11.5	0.366466	0.6728	13.46	0.2475
24	12	12	0.388576	0.7177	16.15	0.2950
25	12.5	12.5	0.40942	0.7601	19.55	0.3492
26	13	13	0.429066	0.8003	24.01	0.4109
27	13.5	13.5	0.447589	0.8383	30.18	0.4810
28	14	14	0.46506	0.8743	39.34	0.5606
29	14.5	14.5	0.481551	0.9083	54.50	0.6508
30	15	15	0.497129	0.9405	84.65	0.7531
31	15.5	15.5	0.511859	0.9711	174.79	0.8689

5. 2. Dependence of the average waiting time of the first type of calls on the received load determination (at V=8)

Fig. 2 shows the graph of the average waiting time of the first type of calls as a function of the incoming load (for the number of operators V=8).

Fig. 2 shows a graph of the dependence of the average waiting time for calls of the first type on the incoming load (at V=8).

Looking at the chart, we can say that as the load increases, the waiting time for calls in the queue increases proportionally.

5. 3. Dependence of the probability of the second type lost calls on the incoming load determination with V=16

Fig. 3 shows the second type of lost calls' probability on the incoming load dependency (for the number of operators V=16).

As shown from Fig. 3, a graph of the dependence of the probability of loss of calls of the second type on the incoming load is given (at V=16). As the incoming load increases, the probability of their loss increases exponentially.

5. 4. Dependence of the average waiting time of the first type of calls on the incoming load determination with V=16

Fig. 4 shows the graph of the average waiting time of the first type of calls as a function of the incoming load (for the number of operators V=16).

Fig. 4 shows that the average waiting time for calls of the first type changes depending on the incoming load.

5. 5. Dependence of the probability P(>t) on the incoming load determination (at V=8 and V=16)

Fig. 5 shows the graph of the dependence of the probability P(>t) on the incoming load (for the number of operators V=8).

In Fig. 5, a graph of the dependence of the probability P(>t) on the incoming load is constructed (at V=8). We can see that as the load increases, the probability P(>t) also increases.

Fig. 6 shows the dependence of the probability P(>t) on the incoming load determination (at V=16).

Fig. 6 shows the dependence of the probability of exceeding the normalized waiting time t=40 s P(>t) on the incoming load (at V=16).

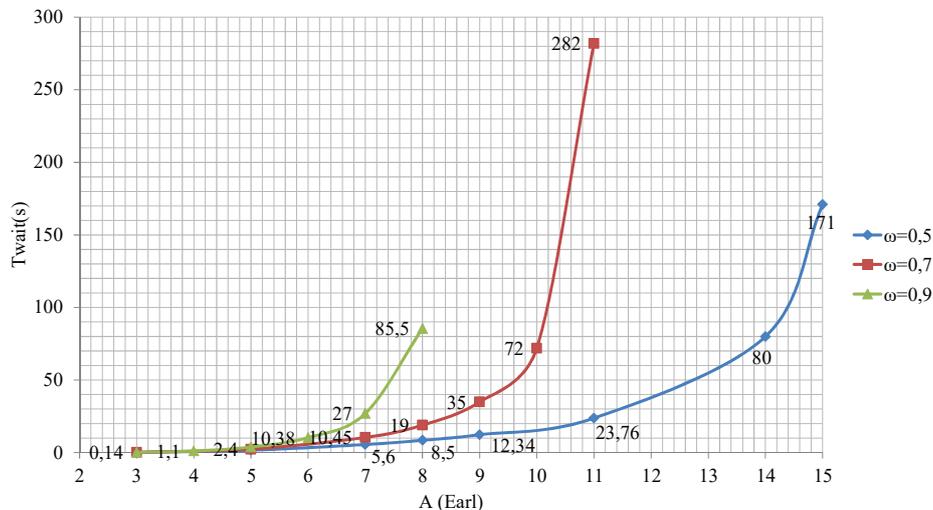


Fig. 2. Dependence of the average waiting time of the first type of calls on the received load (at V=8)

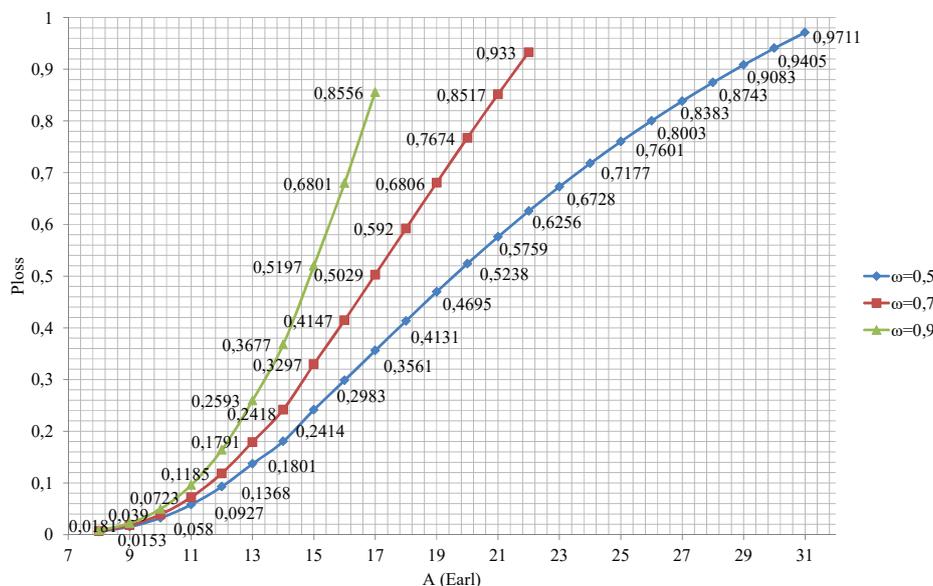


Fig. 3. Probability of the second type lost calls on the incoming load dependency with V=16

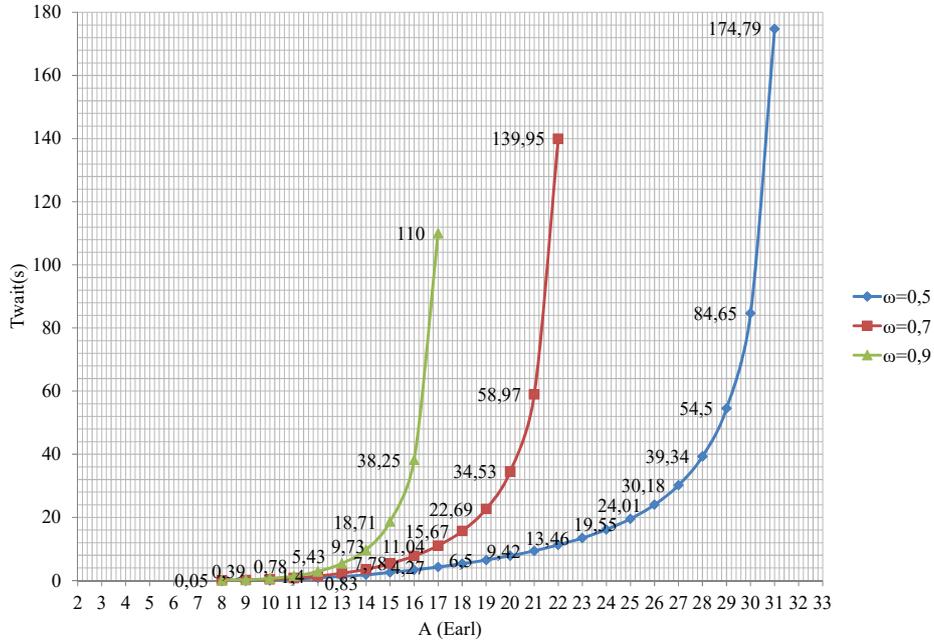


Fig. 4. Dependence of the average waiting time of the first type of calls on the incoming load with $V=16$

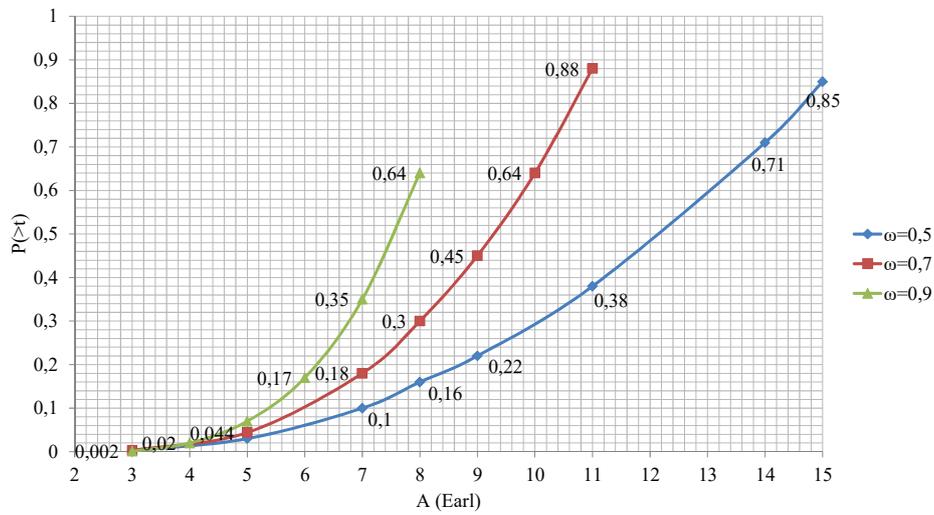


Fig. 5. Dependence of the probability $P(>t)$ on the incoming load (at $V=8$)

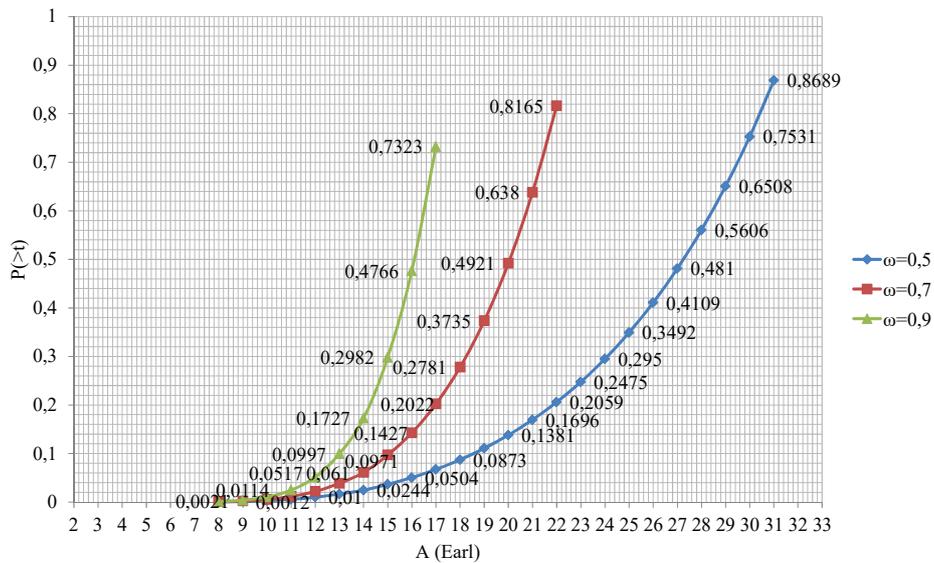


Fig. 6. Dependence of the probability $P(>t)$ on the incoming load (at $V=16$)

The graphs from Fig. 1 to Fig. 6 were obtained based on real statistical data of Kazakhtelecom JSC for 11 days.

6. Discussion of results of calculation of call service characteristics in combined mode

Two procedures have been developed for approximating the established call center model based on the use of asymptotic values of its characteristics [3] and using the implementation of the decomposition method when the call repetition rate tends to 0. In the studied model, the sequence of blocks is selected from the sequence of application maintenance stages (IVR, operators, consultants).

The peculiarity of the proposed method is the modeling and preliminary orientation of call processing in a combined model using IVR and an operator to assess the quality of service of past telephone calls using the teletraffic theory.

The combined service model of incoming calls affects the probability of denial of service. The calculation of call service characteristics in combined mode with $\omega=0.5; 0.7; 0.9$ is given in Fig. 1–6. Based on Fig. 1–6, the authors had concluded that the average waiting time for the first type of call increases dramatically when the coefficient ω changes.

The importance of this research is that the authors had concluded that the mixed order of incoming calls service affects the probability of denial of service. The result obtained gives an assessment of the degree of influence of the mixed order of service on the quality of call service of the contact center. The average waiting time of the first type of call increases dramatically when the coefficient ω changes. The average time, in this case, T_{wait} increases from 8.5 s ($\omega=0.5$) to 85.5 s ($\omega=0.9$), i.e. we see that T_{wait} increases up to 10 times at $A(\text{Earl})=8$ and $V=8$.

The obtained results are explained by the introduction of IP IVR systems for automatic request processing that can reduce the number of calls received by operators. Thus, customer service (calls) is increased by using automatic responses. Accordingly, the need for the number of simple operators decreases. On the other hand, the need for high-quality human resources – specialists increases.

The authors analyzed the efficiency of modern call centers. The authors noted the efficiency of using IVR devices, operators, and consultants for differentiated customer service and the necessity to take feedback into account for calculating the financial flow of all applications. The models allow determining the leading indicators of the service quality for applications received by the call center. Formal expressions for descriptions are derived from the values of the input parameters and the stationary probability of the model.

The relationships between the characteristics of the call center, regulating the intensity of incoming and outgoing calls, call processing via 3CXPhone, corporate mail, and social networks were obtained using Global Statistical. The dependencies found were used for indirect estimation of input parameters and model characteristics, which are difficult to measure with standard equipment due to difficulties with the distribution of primary and secondary calls and the development of approximate methods for evaluating the quality of applications. The developed methodology for organizing help desk systems allows us to consider the current trends in the development of call centers. IP IVR applications can

access Microsoft Structured Query Language (SQL) servers and Oracle, Sybase, and IBM DB2 databases. A single IP IVR can be hosted on an IP network on any Cisco-approved virtual server. Mainly, it allows configuring the operating system: change the order of call service; intelligent orientation to different groups of operators; including protection intervals for the time of receipt calls to operator workstations. The model was created by using the C++ language.

But there are objective difficulties associated with the found dependencies that were used for indirect estimation of input parameters and model characteristics, which are difficult to measure with standard equipment due to difficulties with the distribution of primary and secondary calls and the development of approximate methods for evaluating the quality of applications. Based on that, it is possible to predict future demand. Of practical interest is the study of the degree of influence of the combined model on the quality of telephone service.

This means that the obtained scientific result in the form of identified efficiency of using combined call handling by using IVR devices, operators, and the feedback is interesting from a theoretical point of view. That method allows determining the indicators of the service quality for applications received by the call center.

Thus, the main disadvantage of this study is that the theoretical part is fully implemented, and the practical part is partially implemented. And the implementation into practice is complicated by the long legal process of concluding contracts between the university and the JSC Kazakhtelecom. Also, to implement this model in other enterprises, it is necessary to make individual adjustments.

Thus, the applied aspect of using the obtained scientific result is the possibility of improving the standard call handling. This constitutes the prerequisites for the transfer of the obtained technological solutions to business owners and state-owned companies for a successful implementation.

7. Conclusions

1. By the purpose of the study, it was necessary to determine the probability of the second type lost calls on the incoming load dependency (for the number of operators $V=8$). The graph shows that the maximum of lost calls (P_{loss}) at $A(\text{Earl})=8$ became with $\omega=0.9$ ($P_{\text{loss}}=0.76$), and the minimum with $\omega=0.5$ ($P_{\text{loss}}=0.38$), the difference is about two times. This means that as the incoming load (number of calls) grows, the probability of their losses increases exponentially.

2. By the purpose of the study, it was necessary to determine the average waiting time T_{wait} of the first type of calls as a function of the incoming load (for the number of operators $V=8$). The graph shows that as the incoming load (number of calls) is growing, the waiting time for calls increases proportionally. As a result of the analysis, we see that it is suitable for a call center with eight operators when $\omega=0.9$ (at $A(\text{Earl})=8$, $T_{\text{wait}}=85.5$) because even if the waiting time increases, the calls will not leave the queue; they will be more tolerant.

3. By the purpose of the study, it was necessary to determine the probability of the second type lost calls on the incoming load dependency (for the number of operators $V=16$). As the incoming load (number of calls) grows, the probability of their losses increases exponentially. The graph shows that the maximum of lost calls became

with $\omega=0.9$ ($P_{\text{loss}}=0.0082$), and the opposite value with $\omega=0.5$ ($P_{\text{loss}}=0.006$). With an increase in the number of operators from $V=8$ to $V=16$, the number of lost calls P_{loss} decreases 93 times.

4. For the study, it was necessary to determine the average waiting time for calls of the first type depending on the incoming load. The graph shows that the above curves grow exponentially, which means that as the load increases, the waiting time T_{wait} in the queue also increases. The maximum of lost calls became with $\omega=0.5$ (at $A(\text{Earl})=8$, $T_{\text{wait}}=0.05$). Moreover, the most influential work of the contact center corresponds to $\omega=0.9$ (at $A(\text{Earl})=8$, $T_{\text{wait}}=0.08$). With an increase in the number of operators from $V=8$ to $V=16$, the waiting time T_{wait} decreases 1000 times.

5. For the study, it was necessary to determine the dependence of the probability $P(>t)$ on the incoming load (for the number of operators $V=8$). As in the previous graphs, this graph shows that the probability $P(>t)$ increases with increasing load. The most probable $P(>t)$ with $\omega=0.9$ ($P=0.64$). When the probability of exceeding the normalized waiting time from the incoming load to 40 s and the number of operators $V=16$, it was found that

the probability $P(>t)$ increases with increasing load. The most effective curve is $P(>t)$ with $\omega=0.9$ ($P=0.87$).

Thus, the optimal number of required operators for JSC Kazakhtelecom is 16 ($V=16$). Additional studies were also conducted, in which it turned out that the efficiency of the call center does not increase by infinitely increasing the number of operators. As a result of accurate calculations, it was shown that at $V=48$ (48 operators), the call center's efficiency ceases growing, and the useful use of jobs decreases from 98.75 % (at $V=16$) to 49.4 %.

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