# OPTIMIZATION OF SERVICE AND THE INTRODUCTION OF SELF-SERVICE CASH REGISTERS IN A GROCERY STORE

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**Abstract:** A grocery store chain is exploring the possibility of increasing customer service and, more specifically, introducing self-service checkouts to optimize its staff. However, increasing service productivity should not come at the expense of compromising service quality. Due to the specifics of the technological activity surrounding the improvement of service and the introduction of self-service checkouts, the staff needs to be trained by the manufacturer. By introducing self-service checkouts to the store network, an opportunity is identified to achieve an increase in service speed through organizational and technical changes in service processes, along with an investment in adding new equipment. Providing fast and quality customer service takes time, and this is where customer service checkouts come to the rescue. This report is related to many of the advantages associated with using customer service checkouts and we will give some valuable tips that you can use to increase your customer satisfaction. By using self-service checkouts in stores, the customer service team could be significantly optimized. At the same time, it is emphasized that not all problems can be solved with the use of self-service checkouts, but nevertheless they will significantly help save time. Self-service checkouts for customer service in stores in customer service are a great way to achieve the goal, which is to consider the possibility of optimizing the operational staff in a company - a food chain of stores, as well as optimizing the workflow in terms of customer service activities at the checkout, by introducing self-service checkouts (SCO-self-Checkout), which will improve the effective use of human resources and the efficiency of the work of the operational staff. Self-service checkouts are becoming increasingly widespread in Bulgaria. Introduced by a number of international companies operating in the country, this type of service has not yet taken over retail in our country and the cashier with real cash is often the preferred method of payment in the store. It provides customers with the opportunity to manually mark and pay for the products in their basket, saving time. A suitable choice for supermarkets, hypermarkets and smaller format stores, but with a high load during peak shopping hours. The benefits of automation are many, especially for the retail outlet: improving the working conditions of employees related to customer service activities, by forming uniformity in the daily distribution of service personnel and optimizing the workflow of the cashiers, which saves labor costs, insurance premiums, etc.; reducing labor costs - one cashier can assist 4 to 10 self-service cashiers simultaneously; speeding up the customer service process and shortening queues; free employees can focus on better customer service; cashiers do not have access to the customer's money. In addition, the quality of the service offered improves and customer satisfaction increases. Self-service checkouts that are open and operating constantly are presented as a Multi-server mass service system. One employee from each shift takes care of servicing these checkouts to help the customer. The technology or discipline of service implies that customers enter a common queue, and the service takes place in a multi-server device with a number of server equal to the number of checkouts. Changes in the system's throughput are possible, the goal being to reduce the waiting time of service requests in the system.
**Keywords:** management, mass service system, self-service cash

## 1. INTRODUCTION

The relevance of this development is to find the main directions for improving the quality of work and achieving efficiency from this activity, by optimizing the work process in terms of customer service activities at the cash desk, through the introduction of self-service cash desks. Thus, the following gaps in the research of mass service systems have been revealed: the principles of system analysis (unity of elements, connectivity, hierarchy, etc.) are often ignored when modeling functional subsystems interconnected within the contour of an economic system (for example, an industrial enterprise); calculations of the optimal level of resource consumption should be based on the analysis of the maximum number of solutions (search iterations) within the modeled mass service system and should not be limited to alternative ones; causal relationships between the eco-economic effect of the practical implementation of the provisions of the theory of mass service (in the context of processes) and the level of competitiveness of organizations are insufficiently presented and substantiated; and studies devoted to the construction of an effective organizational structure on the basis of the mass service system are poorly presented, (Farida and Naira, 2024).

**Tasks:**

With the implementation of the main goal of this project, the following tasks are expected to be realized:

- new modern technology to be introduced;
- improving the working conditions of the employees related to the customer service activity by forming uniformity in the daily distribution of the service personnel and optimizing the work process of the service desks;
  improving the quality of the service offered and increasing customer satisfaction;
- It provides customers with the opportunity to mark and pay for the products from their basket with their own hands, saving time. A suitable choice for supermarkets, hypermarkets and shops with a smaller format, but with a heavy load during peak shopping hours. A long queue in the store can dissuade the customer from shopping at the store. Self-service checkouts solve this problem by reducing waiting times, retrieved from (https://www.eltrade.com/bg/product/183-kasa-na-samoobslujvane-eltrade-smart-pay).

## 2. OPPORTUNITIES TO INCREASE EFFICIENCY

With the introduction of the technology - self-service cash desks, space is saved that can be used for new shelves, showcases, stands, advertising panels and more in (https://icash.bg/bg/functionalities/samoobslujvane/).
The benefits of automation are many, especially for the retail outlet: improving the working conditions of employees related to customer service activities, by forming uniformity in the daily distribution of service personnel and optimizing the workflow of service desks, which saves labor costs, insurance, etc.; reduction of labor costs – one cashier can help 4 to 10 self-service cash desks at the same time; speeding up the customer service process and shortening queues; freelancers can focus on better customer service; Cashiers do not have access to the client's money. Along with this, the quality of the service offered is improved and customer satisfaction increases;
The negatives that can be caused by self-service cash desks are both for the stores and for the customers themselves: the retail outlet: the machines are installed for installation; Often, they will be dismissed; the client does everything on his own, which makes the service slower and allows customers to get a little bit of advice; Shops also suffer greater losses and more damage to homeowners, than traditional ones; When marking some items, such as cigarettes and alcohol, it is mandatory for an employee to authorize their purchase.

## 3. ORGANIZATION OF THE WORK OF THE CASH DESKS AT THE GROCERY STORE

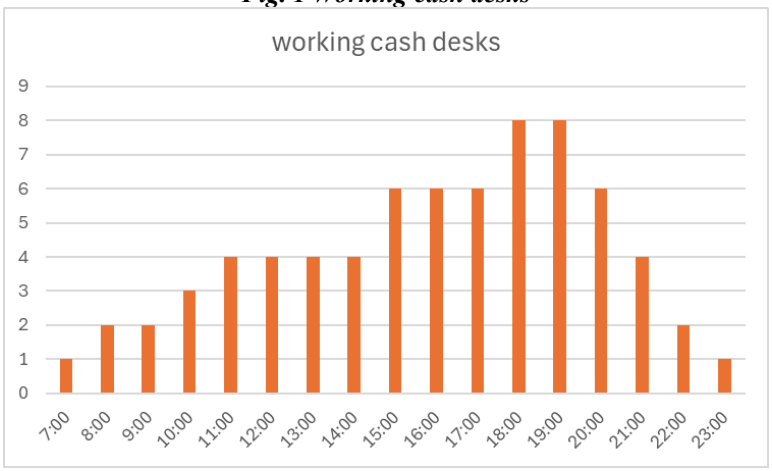
Initially, the data from Table 1 will be examined for customers arriving at the checkout by hour, which represents the necessary personnel costs, valued over time. The first column of Table 1 presents the number of working checkouts for customer service, second and third belts operating in the hours from-to. The following columns present the number of customers by day of the week and by hour, according to the load. The data presented is for a sample week with an average load of the store.

***Table 1 Data on working cash desks by hours for one week***

| | | | number of customers | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **working cash desks** | **hour** | | **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** | **Saturday** | **Sunday** |
| 1 | 7:00 | 8:00 | 52 | 43 | 36 | 55 | 70 | 88 | 68 |
| 2 | 8:00 | 9:00 | 124 | 111 | 115 | 131 | 155 | 162 | 101 |
| 2 | 9:00 | 10:00 | 148 | 134 | 151 | 160 | 172 | 182 | 112 |
| 3 | 10:00 | 11:00 | 186 | 165 | 174 | 190 | 202 | 212 | 117 |
| 4 | 11:00 | 12:00 | 212 | 202 | 248 | 252 | 262 | 279 | 292 |
| 4 | 12:00 | 13:00 | 184 | 165 | 146 | 192 | 278 | 299 | 245 |
| 4 | 13:00 | 14:00 | 176 | 165 | 187 | 199 | 248 | 275 | 231 |
| 4 | 14:00 | 15:00 | 211 | 207 | 209 | 220 | 212 | 242 | 199 |
| 6 | 15:00 | 16:00 | 242 | 213 | 222 | 253 | 232 | 262 | 178 |
| 6 | 16:00 | 17:00 | 263 | 242 | 252 | 272 | 309 | 312 | 165 |
| 6 | 17:00 | 18:00 | 301 | 289 | 299 | 309 | 323 | 389 | 145 |
| 8 | 18:00 | 19:00 | 326 | 309 | 304 | 333 | 357 | 385 | 242 |
| 8 | 19:00 | 20:00 | 246 | 242 | 232 | 252 | 262 | 320 | 312 |
| 6 | 20:00 | 21:00 | 189 | 168 | 145 | 190 | 202 | 222 | 147 |
| 4 | 21:00 | 22:00 | 78 | 71 | 68 | 82 | 92 | 142 | 87 |
| 2 | 22:00 | 23:00 | 46 | 42 | 39 | 55 | 66 | 92 | 42 |
| 1 | 23:00 | 0:00 | 7 | 3 | 12 | 9 | 8 | 22 | 7 |
| total: | | | 2991 | 2771 | 2839 | 3154 | 3450 | 3885 | 2690 |

Source: (https://www.kaufland.bg/moyat-kaufland/uslugi/filiali/sofia-center-6400.html)

***Fig. 1 Working cash desks***




Source: (https://www.kaufland.bg/moyat-kaufland/uslugi/filiali/sofia-center-6400.html)

**Statement of the task:**

After the introduction of four self-service cash desks of a mixed type (it is possible to pay by bank card or cash), four of the customer service cash desks will not work in this chain store. One of the four employees (for each shift) will be auxiliary service personnel for the self-service cash desks, and another three (for each shift) will perform other tasks in the store, such as: checking items on the shelves for expiration dates, which will reduce losses; arranging items on shelves; offering new items, if they are produced by the chain itself; loading items on shelves, and others.

The same table 1 is used, where the number of customers by hours during working hours is presented by day of the week, but in the first column - the maximum number of cash desks: four. Four more self-service cash desks are constantly open. To simplify the task, only Monday is considered, which has a "relatively" average value of the incoming flow into the system. The incoming flow into the system is presented in two separate subtasks.

***Table 2 With maximum of 4 cash desks with service cashiers***

| | | | number of customers | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| working cash desks | hour | | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
| 1 | 7:00 | 8:00 | 52 | 43 | 36 | 55 | 70 | 88 | 68 |
| 1 | 8:00 | 9:00 | 124 | 111 | 115 | 131 | 155 | 162 | 101 |
| 1 | 9:00 | 10:00 | 148 | 134 | 151 | 160 | 172 | 182 | 112 |
| 1 | 10:00 | 11:00 | 186 | 165 | 174 | 190 | 202 | 212 | 117 |
| 2 | 11:00 | 12:00 | 212 | 202 | 248 | 252 | 262 | 279 | 292 |
| 2 | 12:00 | 13:00 | 184 | 165 | 146 | 192 | 278 | 299 | 245 |
| 2 | 13:00 | 14:00 | 176 | 165 | 187 | 199 | 248 | 275 | 231 |
| 2 | 14:00 | 15:00 | 211 | 207 | 209 | 220 | 212 | 242 | 199 |
| 3 | 15:00 | 16:00 | 242 | 213 | 222 | 253 | 232 | 262 | 178 |
| 3 | 16:00 | 17:00 | 263 | 242 | 252 | 272 | 309 | 312 | 165 |
| 3 | 17:00 | 18:00 | 301 | 289 | 299 | 309 | 323 | 389 | 145 |
| 4 | 18:00 | 19:00 | 326 | 309 | 304 | 333 | 357 | 385 | 242 |
| 4 | 19:00 | 20:00 | 246 | 242 | 232 | 252 | 262 | 320 | 312 |
| 3 | 20:00 | 21:00 | 189 | 168 | 145 | 190 | 202 | 222 | 147 |
| 2 | 21:00 | 22:00 | 78 | 71 | 68 | 82 | 92 | 142 | 87 |
| 1 | 22:00 | 23:00 | 46 | 42 | 39 | 55 | 66 | 92 | 42 |
| 1 | 23:00 | 0:00 | 7 | 3 | 12 | 9 | 8 | 22 | 7 |
| total: | | | 2991 | 2771 | 2839 | 3154 | 3450 | 3885 | 2690 |

Source: (https://www.kaufland.bg/moyat-kaufland/uslugi/filiali/sofia-center-6400.html)

The technology assumes parallel single-server devices, and customers first check if there is a free serving device, and if there is, they take it.

If there is none, they check which one has the smallest queue and line up on it.

Let's assume that 30% of customers are not able to and will not use self-service checkouts, which implies that cashier-operated checkouts are represented as a Single-Server Mass Service System (MSS). The example presented in (vtubg.sharepoint.com/sites/documents/SharedDocuments/Forms/AllItems.aspx?ga=1&id=%2Fsites%2Fdocuments%2FShared Documents%2FДокументи ВТУ%2FПублични нормативни документи%2FГодишник ВТУ%2FБрой 5_2014%2FМонографияВТУ_КирилКарагьозов_Брой5_2014%2Epdf&viewid=abe4c4bc-8b82-421d-9a6e-ecf572d6bb62&parent=%2Fsites%2Fdocuments%2FSharedDocuments%2FДокументи ВТУ%2FПублични нормативни документи%2FГодишник ВТУ%2FБрой 5_2014) is shown the model for Single-server mass service models (model notation—M/M/1) are simple with a single service unit, a Poisson flow of incoming requests, and an exponential distribution of service times, considered in (Civelek, Biller and Scheller-Wolf, 2021), (Kondrashova, 2021), (Krishnamoorthy, Joshua and Kozyrev, 2021), (Singh et al 2021).
The results of the Single- Server MSS are presented in Table 3 and Table 4.

***Table 3 MSS - MM1***

**MSS M/M/1**

| Input parameters | | |
|---|---|---|
| *Arrival Rate* | lamda | 0,12 |
| *Service Rate Capacity of each server* | mu | 1,25 |
| *Number of Servers* | S | 1 |

| Results | | |
|---|---|---|
| *Load* | Ro | 0,093 |
| *corrective and preventive action* | Capa | 0,093 |
| *Average service time* | ts | 0,800 |
| *Probability of waiting* | Pw=Pd=P(n>S) | 0,093 |
| *Probability of no requests in the system* | P0 | 0,907 |

| Operational characteristics | | Mean | Variance | Standard deviation | Coefficient of Variation of Service time |
|---|---|---|---|---|---|
| | | (mean) | (variance) | (stdv) | (Cv) |
| *length of the queue* | Lq | 0,010 | 0,01 | 0,107 | 11,158 |
| *Leaving system* | Ls | 0,103 | 0,11 | 0,337 | 3,273 |
| *Waiting Time* | W | 0,082 | 0,14 | 0,372 | 4,520 |
| *Time in system* | Ts | 0,882 | 0,78 | 0,882 | 1,000 |

Source:
vtubg.sharepoint.com/sites/documents/SharedDocuments/Forms/AllItems.aspx?ga=1&id=%2Fsites%2Fdocuments%2FShared Documents%2FДокументи ВТУ%2FПублични нормативни документи%2FГодишник ВТУ%2FБрой 5_2014%2FМонографияВТУ_КирилКарагьозов_Брой5_2014%2Epdf&viewid=abe4c4bc-8b82-421d-9a6e-ecf572d6bb62&parent=%2Fsites%2Fdocuments%2FSharedDocuments%2FДокументи ВТУ%2FПублични нормативни документи%2FГодишник ВТУ%2FБрой 5_2014;

**Conclusion:** The results of the Single- Server MSS by working hours and by cash desks serviced by staff are presented in Table 4, in which it is noticeable that during peak hours the intensity of the inflow increases, as does the workload. The cashiers try their best with the service, but during these hours the intensity of the service decreases, which is also caused by the average time for serving the customer – a larger number of products.

*Table 4 Results of the Single-server MSS*

| hour | Number of Servers | Arrival Rate | Service Rate Capacity of each server | Load | corrective and preventive action | Average service time | Probability of waiting | Probability of no requests in the system | length of the queue | Leaving system | Waiting Time | Time in system |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S | lamda | mu | Ro | Capa | ts | Pw=Pd=P(n>S) | P0 | Lq | Ls | W | Ts |
| 7:00 | 1 | 0,87 | 0,61 | 1,43 | 0,18 | 1,65 | 0,00 | 0,24 | 0,00 | 1,43 | 0,00 | 1,65 |
| 8:00 | 1 | 2,07 | 1,45 | 1,43 | 1,43 | 0,69 | 1,43 | -0,43 | -4,76 | -3,33 | -2,30 | -1,61 |
| 9:00 | 1 | 2,47 | 1,73 | 1,43 | 1,43 | 0,58 | 1,43 | -0,43 | -4,76 | -3,33 | -1,93 | -1,35 |
| 10:00 | 1 | 3,10 | 2,17 | 1,43 | 1,43 | 0,46 | 1,43 | -0,43 | -4,76 | -3,33 | -1,54 | -1,08 |
| 11:00 | 2 | 3,00 | 1,24 | 2,43 | 2,43 | 0,81 | 2,43 | -1,43 | -4,13 | -1,70 | -1,37 | -0,57 |
| 12:00 | 2 | 2,61 | 1,07 | 2,43 | 2,43 | 0,93 | 2,43 | -1,43 | -4,13 | -1,70 | -1,58 | -0,65 |
| 13:00 | 2 | 2,49 | 1,03 | 2,43 | 2,43 | 0,97 | 2,43 | -1,43 | -4,13 | -1,70 | -1,66 | -0,68 |
| 14:00 | 2 | 2,99 | 1,23 | 2,43 | 2,43 | 0,81 | 2,43 | -1,43 | -4,13 | -1,70 | -1,38 | -0,57 |
| 15:00 | 3 | 3,23 | 0,94 | 3,43 | 3,43 | 1,06 | 3,43 | -2,43 | -4,84 | -1,41 | -1,50 | -0,44 |
| 16:00 | 3 | 3,51 | 1,02 | 3,43 | 3,43 | 0,98 | 3,43 | -2,43 | -4,84 | -1,41 | -1,38 | -0,40 |
| 17:00 | 3 | 4,01 | 1,17 | 3,43 | 3,43 | 0,85 | 3,43 | -2,43 | -4,84 | -1,41 | -1,21 | -0,35 |
| 18:00 | 4 | 4,21 | 0,95 | 4,43 | 4,43 | 1,05 | 4,43 | -3,43 | -5,72 | -1,29 | -1,36 | -0,31 |
| 19:00 | 4 | 3,18 | 0,72 | 4,43 | 4,43 | 1,39 | 4,43 | -3,43 | -5,72 | -1,29 | -1,80 | -0,41 |
| 20:00 | 3 | 2,52 | 0,74 | 3,43 | 3,43 | 1,36 | 3,43 | -2,43 | -4,84 | -1,41 | -1,92 | -0,56 |
| 21:00 | 2 | 1,11 | 0,46 | 2,43 | 2,43 | 2,20 | 2,43 | -1,43 | -4,13 | -1,70 | -3,74 | -1,54 |
| 22:00 | 1 | 0,77 | 0,54 | 1,43 | 1,43 | 1,86 | 1,43 | -0,43 | -4,76 | -3,33 | -6,21 | -4,35 |
| 23:00 | 1 | 0,12 | 0,08 | 1,43 | 1,43 | 12,24 | 1,43 | -0,43 | -4,76 | -3,33 | -40,82 | -28,57 |

**The second subtask:**

Self-service checkouts that are open and operating constantly are presented as a Multi-Server mass service system. One employee from each shift takes care of servicing these checkouts in order to help the customer. The intensity of service is assumed to be four times less than that of normal checkouts. This is due to the fact that the customer must remove, mark and arrange their products themselves. Customers who use self-service checkouts do not have a large number of items. The model also assumes that during peak hours from 5:00 p.m. to 9:00 p.m., the intensity of service is slowed down by another 25%, due to the fact that most customers require service from staff.

The technology or discipline of service assumes that customers enter a common queue, and the service takes place in a multi-server device with a number of servers equal to the number of checkouts, as described in the example in: (vtubg.sharepoint.com/sites/documents/SharedDocuments/Forms/AllItems.aspx?ga=1&id=%2Fsites%2Fdocuments%2FShared Documents%2FДокументи ВТУ%2FПублични нормативни документи%2FГодишник ВТУ%2FБрой 5_2014%2FМонографияВТУ_КирилКарагьозов_Брой5_2014%2Epdf&viewid=abe4c4bc-8b82-421d-9a6e-ecf572d6bb62&parent=%2Fsites%2Fdocuments%2FSharedDocuments%2FДокументи ВТУ%2FПублични нормативни документи%2FГодишник ВТУ%2FБрой 5_2014), (Todorova, 2020), and (Dimitrov and Ceder, 2018). The principles of mass service theory are also realized in the sphere of medical services, in (Stoyanova, 2022) and (Majlesinasab, Maleki and Nikbakhsh, 2022). The research and modeling of this category of systems are covered in the works of (Zychlinski, 2023).

Changes in system throughput are possible, with the goal of reducing the downtime of service requests in the system.

*Table 5 M/M/S MSS*

**M/M/S**

| Input parameters | | |
|---|---|---|
| *Arrival Rate* | lamda | 0,02 |
| *Service Rate Capacity of each server* | mu | 1,43 |
| *Servers* | S | 4 |
| **Results** | | |
| *Load* | Ro | 0,014 |
| *corrective and preventive action* | Capa | 0,004 |
| *Average service time* | ts | 0,700 |
| *Probability of waiting* | Pw=Pd=P(n>S) | 0,000 |
| *Probability of no requests in the system* | P0 | 0,986 |

| Operational characteristics | | Mean | Variance | Standard deviation | Coefficient of Variation of Service time |
|---|---|---|---|---|---|
| | | (mean) | (variance) | (stdv) | (Cv) |
| *length of the queue* | Lq | 0,000 | 0,00 | 0,000 | 404137,411 |
| *Leaving system* | Ls | 0,014 | 0,01 | 0,120 | 8,365 |
| *Waiting Time* | W | 0,000 | 0,00 | 0,000 | 34102,093 |
| *Time in system* | Ts | 0,700 | 0,49 | 0,700 | 1,000 |

Source:
vtubg.sharepoint.com/sites/documents/SharedDocuments/Forms/AllItems.aspx?ga=1&id=%2Fsites%2Fdocuments%2FShared Documents%2FДокументи ВТУ%2FПублични нормативни документи%2FГодишник ВТУ%2FБрой 5_2014%2FМонографияВТУ_КирилКарагьозов_Брой5_2014%2Epdf&viewid=abe4c4bc-8b82-421d-9a6e-ecf572d6bb62&parent=%2Fsites%2Fdocuments%2FSharedDocuments%2FДокументи ВТУ%2FПублични нормативни документи%2FГодишник ВТУ%2FБрой 5_2014;

***Table 6 Results of Multi-server MSS***

| hour | Number of Servers | Arrival Rate | Service Rate Capacity of each server | Load | corrective and preventive action | Average service time | Probability of waiting | Probability of no requests in the system | length of the queue | Leaving system | Waiting Time | Time in system |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S | lamda | mu | Ro | Capa | ts | Pw=Pd=P(n>S) | P0 | Lq | Ls | W | Ts |
| 7:00 | 4 | 0,15 | 1,43 | 0,11 | 0,03 | 0,70 | 0,00 | 0,90 | 0,00 | 0,11 | 0,00 | 0,70 |
| 8:00 | 4 | 0,36 | 1,43 | 0,25 | 0,06 | 0,70 | 0,00 | 0,78 | 0,00 | 0,25 | 0,00 | 0,70 |
| 9:00 | 4 | 0,43 | 1,43 | 0,30 | 0,08 | 0,70 | 0,00 | 0,74 | 0,00 | 0,30 | 0,00 | 0,70 |
| 10:00 | 4 | 0,54 | 1,43 | 0,38 | 0,09 | 0,70 | 0,00 | 0,68 | 0,00 | 0,38 | 0,00 | 0,70 |
| 11:00 | 4 | 0,62 | 1,43 | 0,43 | 0,11 | 0,70 | 0,00 | 0,65 | 0,00 | 0,43 | 0,00 | 0,70 |
| 12:00 | 4 | 0,54 | 1,43 | 0,38 | 0,09 | 0,70 | 0,00 | 0,69 | 0,00 | 0,38 | 0,00 | 0,70 |
| 13:00 | 4 | 0,51 | 1,43 | 0,36 | 0,09 | 0,70 | 0,00 | 0,70 | 0,00 | 0,36 | 0,00 | 0,70 |
| 14:00 | 4 | 0,62 | 1,43 | 0,43 | 0,11 | 0,70 | 0,00 | 0,65 | 0,00 | 0,43 | 0,00 | 0,70 |
| 15:00 | 4 | 0,71 | 1,43 | 0,49 | 0,12 | 0,70 | 0,00 | 0,61 | 0,00 | 0,49 | 0,00 | 0,70 |
| 16:00 | 4 | 0,77 | 1,34 | 0,57 | 0,14 | 0,74 | 0,00 | 0,57 | 0,00 | 0,57 | 0,00 | 0,74 |
| 17:00 | 4 | 0,88 | 1,34 | 0,65 | 0,16 | 0,74 | 0,00 | 0,52 | 0,00 | 0,65 | 0,00 | 0,74 |
| 18:00 | 4 | 0,95 | 1,34 | 0,71 | 0,18 | 0,74 | 0,01 | 0,49 | 0,00 | 0,71 | 0,00 | 0,75 |
| 19:00 | 4 | 0,72 | 1,34 | 0,53 | 0,13 | 0,74 | 0,00 | 0,59 | 0,00 | 0,53 | 0,00 | 0,74 |
| 20:00 | 4 | 0,55 | 1,43 | 0,39 | 0,10 | 0,70 | 0,00 | 0,68 | 0,00 | 0,39 | 0,00 | 0,70 |
| 21:00 | 4 | 0,23 | 1,43 | 0,16 | 0,04 | 0,70 | 0,00 | 0,85 | 0,00 | 0,16 | 0,00 | 0,70 |
| 22:00 | 4 | 0,13 | 1,43 | 0,09 | 0,02 | 0,70 | 0,00 | 0,91 | 0,00 | 0,09 | 0,00 | 0,70 |
| 23:00 | 4 | 0,02 | 1,43 | 0,01 | 0,00 | 0,70 | 0,00 | 0,99 | 0,00 | 0,01 | 0,00 | 0,70 |

**Conclusion:** The results of the Multi-server MSS by working hours and by self-service checkouts, with one support staff, are presented in Table 5 and Table 6, in which it is noticeable that during peak hours the intensity of the incoming flow increases, as well as the load. The intensity of service – decreases, which is also caused by the average time for serving the customer – a larger number of products or more waiting time for support staff, as we have already said with 25% more customers.

## 4. CONCLUSIONS

Due to the increasing number of customers in the store, and the resulting increased personnel costs, as well as a decrease in service, which leads to losses, especially of customers. Due to the specifics of the technological activity surrounding the improvement of service and the introduction of self-service checkouts, the personnel need to be trained by the manufacturer. By introducing self-service checkouts in the store network, an opportunity is identified to achieve an increase in service, through organizational and technical changes in the service processes, along with an investment in adding new equipment. Based on the presented opportunity, the workflow is optimized in terms of customer service activities at the cash register. By introducing self-service cash registers (SCO-self-Checkout), it is expected to improve the effective use of human resources and the efficiency of the work of the operating staff.

The working conditions of the employees related to customer service activities have been approved, by forming uniformity in the daily distribution of the service staff and optimizing the workflow of the service cashiers.

The intensity of the incoming flow of service and the number of service devices - cash registers, through a mass service system (MSS) of the type - Single-channel and Multi-channel mass service system, with Poisson incoming flow and exponential service time, was studied.

The task is solved in two options:

**o First option:** before the implementation of the project: service should be provided only by Cashiers and the number of service devices - cash registers, through a mass service system (MSS) of the type - Single-channel and Multi-channel MSS;

**o Second option:** after the implementation of the self-service cash register project (SCO-self-Checkout), which provides a mixed system for servicing customers in the store - with cash registers with Cashiers and with self-service cash registers, which reduces the operating staff.

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