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# SURVEY ON BEHAVIOR OF BANKING SYSTEM USING SIMULATION

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***ABSTRACT***

*In this paper be study the future behavior of banking system using monte Carlo simulation, we identify the number of persons waiting in the bank for service in due course.*

***Key words:*** *Arrival distribution – service distribution – Tag number – Number of arrival – Queue length.*

## INTRODUCTION

In a day to day life queue is inevitable. It is impossible to avoid queuing as long as the number of people arrived is greater than the capacity of the service facility. Queuing theory has enjoyed a prominent place among the modern analytical techniques of operation research.

**Queue:** Queue is a waiting line, the customer wait in the line for their required service. [2]. A queuing system can be completely described by,

1. The input or arrival pattern (customers)
2. The service mechanism (output pattern)
3. The number of server in the system.
4. The queue discipline.
5. The number of customer allowed in the system.
6. Calling source (or) populations.

Queuing theory was introduced by Ange Krarup Erlang in 1909[2]. His pioneering work stimulated may authors to develop a variety of queuing models incorporating various arrival patterns various service time distributions. There are many valuable applications of the theory, including traffic flow (Vehicles, aircraft, people, communication) scheduling (Patients in hospitals, jobs on machines program on a computer) and facility design (banks, post office, amusement parks, fast food restaurants) [4]. In the fast food restaurants one of the papers is published by Matthias Dharmawirya, Erwin Adi. Similarly research work done in super market and toll gets using queuing simulation model [9] [6].

A flow of customers from infinite/finite population towards the service facility forms a queue on account of lack of capability to serve them all at a time. The customer is arriving unit that require some service to be performed [8] (Ex: persons, machines, vehicles, parts, etc,…)

Simulation is the imitation of the operation of a real world process over time [1], simulation is the process of designing a model of real system and conducting experiments with this model for the purpose of either understanding the behavior of the system and evaluating various strategies for the operation of the system. Simulation is one of the most widely used techniques in management science.

Simulation is a numerical technique for conducting experiments that involve certain types of mathematical behavior and structure of a complex real world system over extended period of time.

Simulation was introduced Mr. John von Neuman and S.M.Ulam, were given the first important application in the behavior of neutrons in a nuclear. A nuclear shedding problem with this remarkable success, it because very popular and it's a base for many applications of this technique varies from simple queuing models to models of large integrated system of production.



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In probability theory, simulations mean numerical construction of samples of a random process. Monte Carlo simulation is a computerized mathematical technique. In this we need to generate random numbers to obtain random observation from probability distributions and it's a sequence of numbers whose probability of occurrence is the same as that of any other number in the sequence. We used random phenomena in waiting line model, the arrival rate and the service rate are usually probability rather than deterministic [7].

One of the important applications of simulation in the analysis of waiting line problem and it's classified into deterministic, model, probabilistic model, static model, dynamic model [3]. Simulation can be used as a pre service test to try out new polices and decision rules for operating a system before running the risk of experimentation in the real system and it's the only 'remaining tool' when all other techniques became fail. It is the trial and error approach that produces different solutions in repeated trails. This means is gives only the optimum solution to the Industrial problems. The simulation model does not produce answers by itself. The user has to provide all the constraints for the solutions which he wants to examine.

Now a day, if it's taking any public service department like bank, queue should be unavoidable one. This paper is mainly proposed study of simulation technique in banking system, so that we have collected the one month data from Uthangarai Indian bank. Based on the data, As initial step for predicting the customers arrival rates, reducing customer wait times, forecasting the future system loads to produce the scheduling the service facilities in efficient manner[8].

This paper contains the analysis of the behavior of banking system. It will review the efficiency of the M/M/1 queue model used terms of arrival time, waiting time, and service time in the system. We have developed user friendly window, net application to simulate the model M/M/1 queue model called service time of the system simulator.

**ARRIVAL DISTRIBUTION**

| **Inter Arrival** | 0-3 | 3-6 | 6-9 | 9-12 | 12-15 | 15-18 | 18-21 |
|---|---|---|---|---|---|---|---|
| **Probability** | 0.152 | 0.146 | 0.137 | 0.145 | 0.141 | 0.127 | 0.152 |

**SERVICE DISTRIBUTION**

| **Inter Arrival** | 0-2.15 | 2.15-4.3 | 4.3-6.45 | 6.45-8.6 | 8.6-10.75 | 10.75-12.9 | 12.9-15 |
|---|---|---|---|---|---|---|---|
| **Probability** | 0.151 | 0.140 | 0.144 | 0.139 | 0.143 | 0.137 | 0.146 |

**TAG NUMBERS:**

**ARRIVAL DISTRIBUTION**

| **Inter arrival** | **Probability** | **Cum. probability** | **Tag. No.** |
|---|---|---|---|
| 0-3 | 0.152 | 0.152 | 000-151 |
| 3-6 | 0.146 | 0.298 | 152-297 |
| 6-9 | 0.137 | 0.435 | 298-434 |
| 9-12 | 0.145 | 0.580 | 435-579 |
| 12-15 | 0.141 | 0.721 | 580-720 |
| 15-18 | 0.127 | 0.848 | 721-847 |
| 18-21 | 0.152 | 1.000 | 848-999 |

**SERVICE DISTRIBUTION**

| **Inter arrival** | **Probability** | **Cum. probability** | **Tag. No.** |
|---|---|---|---|
| o-2.15 | 0.151 | 0.151 | 000-150 |
| 2.15-4.3 | 0.140 | 0.291 | 151-290 |
| 4.3-6.45 | 0.144 | 0.435 | 291-434 |
| 6.45-8.6 | 0.139 | 0.574 | 435-573 |
| 8.6-10.75 | 0.143 | 0.717 | 574-716 |
| 10.75-12.9 | 0.137 | 0.854 | 717-853 |
| 12.9-15 | 0.146 | 1.000 | 854-999 |

 

**SIMULATION TABLE**

| Trial No. | Random number | Inter Arrival Time min) | Arrival Time | Service Begins | Random No | Service Time min) | Service Ends At (min) | Waiting Customer (min) | Waiting Server (min) | Line Length (queue) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 264 | 5 | 10.05 | 10.05 | 574 | 9 | 10.14 | - | 5 | - |
| 2. | 777 | 16 | 10.21 | 10.21 | 451 | 7 | 10.28 | - | 7 | - |
| 3. | 924 | 20 | 10.41 | 10.41 | 337 | 5 | 10.46 | - | 13 | - |
| 4. | 296 | 4 | 10.45 | 10.46 | 539 | 8 | 10.53 | 1 | - | 1 |
| 5. | 459 | 11 | 10.56 | 10.56 | 593 | 9 | 11.05 | - | 1 | - |
| 6. | 425 | 8 | 11.04 | 11.05 | 826 | 10 | 11.15 | 1 | - | 1 |
| 7. | 052 | 2 | 11.06 | 11.15 | 795 | 12 | 11.27 | 7 | - | 1 |
| 8. | 270 | 5 | 11.11 | 11.27 | 799 | 11 | 11.38 | 16 | - | 1 |
| 9. | 535 | 10 | 11.21 | 11.38 | 936 | 14 | 11.52 | 17 | - | 1 |
| 10. | 783 | 17 | 11.38 | 11.52 | 848 | 12 | 12.04 | 14 | - | 1 |
| 11. | 823 | 16 | 11.54 | 12.04 | 961 | 15 | 12.16 | 26 | - | 1 |
| 12. | 011 | 2 | 11.56 | 12.16 | 833 | 11 | 12.31 | 22 | - | 1 |
| 13. | 211 | 4 | 12.00 | 12.31 | 594 | 8 | 12.39 | 31 | - | 1 |
| 14. | 666 | 13 | 12.13 | 12.39 | 789 | 13 | 12.51 | 26 | - | 1 |
| 15. | 754 | 17 | 12.30 | 12.51 | 387 | 4 | 12.55 | 21 | - | 1 |
| 16. | 546 | 14 | 12.44 | 12.55 | 224 | 3 | 12.58 | 10 | - | 1 |
| 17. | 443 | 11 | 12.55 | 12.58 | 191 | 2 | 01.00 | 3 | - | 1 |
| 18. | 190 | 5 | 01.00 | 01.00 | 425 | 5 | 01.05 | - | - | - |
| 19. | 929 | 19 | 01.19 | 01.19 | 292 | 4 | 01.23 | - | 14 | - |
| 20. | 745 | 16 | 01.35 | 01.35 | 973 | 14 | 01.49 | - | 12 | - |
| 21. | 973 | 19 | 01.51 | 01.51 | 440 | 6 | 01.57 | - | 2 | - |
| 22. | 872 | 20 | 02.11 | 02.11 | 116 | 2 | 02.13 | - | 14 | - |
| 23. | 868 | 18 | 02.29 | 02.29 | 487 | 7 | 02.36 | - | 16 | - |
| 24. | 670 | 14 | 02.43 | 02.43 | 307 | 6 | 02.49 | - | 7 | - |
| 25. | 112 | 2 | 02.46 | 02.49 | 059 | 1 | 02.50 | 4 | - | 1 |
| 26. | 257 | 4 | 02.49 | 02.50 | 014 | 2 | 02.52 | 1 | - | 1 |
| 27. | 667 | 13 | 03.02 | 03.02 | 073 | 2 | 03.04 | - | 10 | - |
| 28. | 208 | 5 | 03.07 | 03.07 | 898 | 13 | 03.20 | - | 3 | - |
| 29. | 376 | 8 | 03.15 | 03.20 | 893 | 14 | 03.35 | 5 | - | - |
| 30. | 591 | 10 | 03.25 | 03.34 | 416 | 5 | 03.39 | 9 | - | 1 |
| 31. | 262 | 5 | 03.30 | 03.39 | 522 | 6 | 03.35 | 9 | - | 1 |
| 32. | 966 | 18 | 03.48 | 03.48 | 305 | 4 | 03.52 | - | 3 | - |
| 33. | 522 | 11 | 03.59 | 03.59 | 825 | 11 | 10.10 | - | 7 | - |
| 34. | 627 | 12 | 10.11 | 10.11 | 524 | 7 | 10.17 | - | 1 | - |
| 35. | 633 | 14 | 10.25 | 10.25 | 824 | 10 | 10.35 | - | 8 | - |
| 36. | 458 | 10 | 10.35 | 10.35 | 625 | 9 | 10.44 | - | - | - |
| 37. | 102 | 3 | 10.38 | 10.44 | 561 | 7 | 10.51 | 6 | - | 1 |
| 38. | 962 | 19 | 10.57 | 10.57 | 793 | 12 | 11.09 | - | 6 | - |
| 39. | 366 | 7 | 11.07 | 11.09 | 533 | 8 | 11.17 | 5 | - | 1 |
| 40. | 712 | 13 | 11.17 | 11.17 | 472 | 6 | 11.23 | - | - | - |
| 41. | 640 | 14 | 11.31 | 11.31 | 518 | 7 | 11.38 | - | 8 | - |
| 42. | 815 | 16 | 11.47 | 11.47 | 996 | 14 | 12.01 | - | 9 | - |
| 43. | 119 | 5 | 11.52 | 12.01 | 638 | 9 | 12.10 | 9 | - | 1 |
| 44. | 965 | 20 | 12.12 | 12.12 | 469 | 8 | 12.20 | - | 2 | - |
| 45. | 282 | 4 | 12.16 | 12.20 | 391 | 5 | 12.25 | 4 | - | 1 |
| 46. | 232 | 4 | 12.20 | 12.25 | 872 | 14 | 12.39 | 5 | - | 1 |
| 47. | 952 | 19 | 12.39 | 12.39 | 926 | 13 | 12.52 | - | - | - |
| 48. | 898 | 20 | 12.59 | 12.59 | 093 | 2 | 01.01 | - | 7 | - |
| 49. | 543 | 10 | 01.09 | 01.09 | 335 | 6 | 01.15 | - | 6 | - |
| 50. | 135 | 2 | 01.11 | 01.15 | 462 | 7 | 01.22 | 4 | - | 1 |
| Total | | 554 | | | | 429 | | 256 | 161 | 23 |

**SIMULATION TECHNIQUE**

1) Average arrival time =11.08days
   (Actual average arrival time=10.39days)
2) Average service time = 08.58min
   (Actual average service time = 08.54min)
3) Average queue length = 0.46
4) Average waiting time of a customer = 05.12min
5) Average waiting time of the server = 03.22min
6) Time a customer spends in the system = 0.46 + 08.58 = 09.04min

 

## CONCLUTION

In this paper we derive survey on behavior of banking system using simulation. The final results shows that simulation model coincide with original (Average arrival time, Average service time). Also we find the queue length of the bank; it shows supremacy of simulation model.

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