COMPUTER SIMULATION

(The Evening & Urgent Care of Gonzaba Medical Group Project)

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I. INTRODUCTION

The Evening and Urgent Care of Gonzaba Medical Group which is located at Crown Meadows area were very welcoming receiving us as students from St. Mary's University who wanted some information regarding a simulation project using Arena software. This project is about the effects of number of this clinic staff like recepients, nurses, and doctors on the waiting time and patients' convenience. Some information and data have been collected during day time. Then, it got analyzed and studied to have a wide view of their work so that some recommendations can be provided.

II. ASSUMPTIONS

The assumptions of this project are as following:

1- The Clinic is open 9 hours a day.

2- Data collection includes time between arrival and the processing time until getting seen by the doctors.

3- There are two Recipients with one queue.

4- 17% of the patients are visiting the clinic for the first time.

5- There are two doctors and three nurses.

6- All patients are more than two years old.

7- All patients have known symptoms.

III. DATA COLLECTION

Forty six data points were collected which include arrival time, start service time, end service time, and processing time. Then, processing times were calculated and found their average (3.11 minutes) for the old patients' registration, (7.25 minutes) for the first patients' registration, and (6.98 minutes) for seeing the doctor. Also, the average of arrival time is 8.54 minutes.

IV. DATA ANALYSIS

By sing input analyzer, the interval time distribution is NORM(8.54, 3.69). Similarly, 1.5+WEIB(1.78, 1.42) and 6.35+LOGN(0.947, 0.775) for the old patients' registration process and new patients' registration process respectively. Also, the process time for seeing the doctor is UNIF (5, 9).

V. SIMULATION MODEL

- Create block with a name of Patients Arrive as a Create with NORM(8.54, 3.69) minutes and one entity per arrival and NORM(8.54, 3.69) maximum arrivals.

- Decide block with a name of OldORnewPatient with 2-way by chance type to select the path used by the patients (entities) regarding to the patient if he/she an old or new one.

- Record block named balking with count type has counter named balking to collect the number of balking people who leave the café prior to ordering.
- Record block to count the old patients which is named Record Old Patients and another one for the new patients with a name of Record New Patients.
- Process 1 for old patients registration using expression 1.5+WEIB(1.78, 1.42) minutes, the resource's name is Registrar1, and value added allocation.
- Process 2 for new patients registration using expression 6.35+LOGN(0.97, 0.775) minutes, the resource's name is Registrar2, and value added allocation.
- Process 3 for seeing the doctors using Uniform(5, 9) minutes, the resources' names are Dr. One and Dr. Two with value added allocation.
- Record block to count the patients who have been seen by the doctors which is named Record Seen Patients.
- Finally, the dispose which its name is Hope You Get Better Soon.
- Record block named serviced customers with count type has counter named serviced customer to collect the number of customers served.
- The model setup is one replication, with a length 365 days.

VI.   RESULTS AND DISCUSSION

Based the on the model report, the number out of the system is 23,029 patients, average waiting is 3.559 minutes and the maximum is 42.318, average waiting time for the new patients registration is 0.1795 minute and the maximum is 11.233.
, and the average waiting time for the old patients registration is 0.126 minute and the maximum is 10.04. Also, the average waiting time for seeing the doctors is 3.423 minutes and the maximum is 39.966. On the other Hand, the utilization of the new patients' registrar is 14.82% and 29.99% for the old patients. Both doctors have the same utilization which is 81.90%. From these result, the new patients' registrar needs to be faster, reduce the required information from the patients, or serve the old patients when possible. The maximum waiting time to see the doctors is very high; therefore, they might specify a room for patients who need more time like waiting for a specific result.

VII.   RECOMMENDATIONS

- Collecting more data.
- Collect data in different times throughout the year.
- Considering seasons while taking data.
- Noticeable sign refers to some policies like age 2 and above only.
- Make a sign for the new patients so that they can go directly the proper reception rather than waiting in the general queue.
- Serve the old patients at the new patient's reception when there is no new patients are waiting.
- Reduce the required information from the new patients.
- Using an ID reader to save time while registering the old patients.
- Specify some rooms for patients who are waiting for some result to give an opportunity to serve other patients during this time.

VIII.   CONCLUSION

Pertaining to the project results, this urgent room can manipulate and address the waiting time issue by move some of their staff from branch to another regarding to the fluctuated number of patients throughout the year since they have a couple of properties around the city. In this case, they save money and provide their patients better service.

APPENDIX I: PROCESSING TIME DISTRIBUTION-1

Patient Number	Arrival Time	Time between Arrivals	Start	End	Process Time
1	9.00	0.00	9.00	9.03	3
2	9.00	0.00	9.03	9.05	2
3	9.07	7.00	9.05	9.09	4
4	9.12	5.00	9.09	9.16	7
5	9.21	9.00	9.16	9.18	2
6	9.32	11.00	9.18	9.22	4
7	9.42	10.00	9.22	9.24	2
8	9.55	13.00	9.24	9.32	8
9	9.63	8.00	9.32	9.34	2
10	9.68	5.00	9.36	9.39	3
11	9.75	7.00	9.41	9.44	3
12	9.80	5.00	9.49	9.56	7
13	9.85	5.00	9.56	10.00	4
14	9.91	6.00	10.00	10.02	2
15	10.03	12.00	10.02	10.10	8
16	10.16	13.00	10.10	10.13	3
17	10.23	9.00	10.13	10.15	2
18	10.35	12.00	10.15	10.22	6.5
19	10.43	8.00	10.22	10.26	4
20	10.48	5.00	10.26	10.28	2
21	10.54	6.00	10.28	10.30	2
22	11.03	9.00	10.30	10.33	3
23	11.17	14.00	10.33	10.35	2
24	11.28	11.00	10.37	10.40	3
25	11.34	6.00	10.40	10.48	7.5
26	11.42	8.00	10.48	10.52	4

APPENDIX I: PROCESSING TIME DISTRIBUTION-1

27	11.54	12.00	10.52	10.54	2
28	12.05	11.00	10.54	10.58	4
29	12.25	20.00	10.58	11.01	3
30	12.38	13.00	11.01	11.05	4
31	12.47	9.00	11.05	11.07	2
32	12.54	7.00	11.07	11.15	8
33	1.05	11.00	11.15	11.18	3
34	1.13	8.00	11.18	11.21	3
35	1.18	5.00	11.21	11.24	3
36	1.29	11.00	11.24	11.28	4
37	1.36	7.00	11.28	11.35	7
38	1.42	6.00	11.35	11.37	2
39	1.47	5.00	11.37	11.39	2
40	1.58	11.00	11.39	11.42	3
41	2.03	5.00	11.42	11.48	6
42	2.16	13.00	11.48	11.51	3
43	2.23	7.00	11.51	11.53	2
44	2.32	9.00	11.53	12.00	7
45	2.45	13.00	12.00	12.04	4
46	2.51	6.00	12.04	12.08	4
	AVERAGE	8.54			3.83

APPENDIX II: PROCESSING TIME DISTRIBUTION-2

REGISTRATION				
Patient Number	Start	End	Process Time-Old Patients	Process Time New Patients
1	9.00	9.03	3	
2	9.03	9.05	2	
3	9.05	9.09	4	
4	9.09	9.16		7
5	9.16	9.18	2	
6	9.18	9.22	4	
7	9.22	9.24	2	
8	9.24	9.32		8

9	9.32	9.34	2	
10	9.36	9.39	3	
11	9.41	9.44	3	
12	9.49	9.56		7
13	9.56	10.00	4	
14	10.00	10.02	2	
15	10.02	10.10		8
16	10.10	10.13	3	
17	10.13	10.15	2	
18	10.15	10.22		6.5
19	10.22	10.26	4	
20	10.26	10.28	2	
21	10.28	10.30	2	
22	10.30	10.33	3	
23	10.33	10.35	2	
24	10.37	10.40	3	
25	10.40	10.48		7.5
26	10.48	10.52	4	
27	10.52	10.54	2	
28	10.54	10.58	4	
29	10.58	11.01	3	
30	11.01	11.05	4	
31	11.05	11.07	2	
32	11.07	11.15	8	
33	11.15	11.18	3	
34	11.18	11.21	3	
35	11.21	11.24	3	
36	11.24	11.28	4	
37	11.28	11.35		7
38	11.35	11.37	2	
39	11.37	11.39	2	
40	11.39	11.42	3	
41	11.42	11.48	6	
42	11.48	11.51	3	
43	11.51	11.53	2	
44	11.53	12.00		7
45	12.00	12.04	4	
46	12.04	12.08	4	
AVERAGE	10.39	AVERAGE	3.11	7.25

APPENDIX III: PROCESSING TIME DISTRIBUTION-3

SEEING THE DOCTORS			
Patient Number	Start	End	Processing Time
1	9.04	9.11	7.00
2	9.06	9.15	9.00
3	9.12	9.21	8.50
4	9.19	9.28	9.00
5	9.19	9.28	9.00
6	9.28	9.42	9.00
7	9.31	9.38	7.00

8	9.42	9.49	6.50
9	9.51	10.02	8.00
10	9.51	10.03	5.00
11	10.03	10.11	7.00
12	10.04	10.10	5.75
13	10.12	10.21	9.00
14	10.17	10.26	9.00
15	10.27	10.34	6.75
16	10.27	10.32	5.00
17	10.38	10.46	8.00
18	10.41	10.47	5.50
19	10.47	11.01	8.00
20	10.52	11.04	6.00
21	11.02	11.07	5.00
22	11.05	11.12	7.00
23	11.12	11.20	7.50
24	11.21	11.27	5.50
25	11.28	11.37	9.00
26	11.33	11.40	6.50
27	11.41	11.49	8.00
28	11.45	11.54	9.00
29	11.54	12.03	7.00
30	11.55	12.06	6.00
31	12.04	12.10	5.75
32	12.07	12.13	6.00
33	12.18	12.24	5.75
34	12.18	12.24	6.00
35	12.30	12.39	9.00
36	12.30	12.39	6.50
37	12.40	12.47	7.00
38	12.40	12.46	5.50
39	12.46	1.06	9.00
40	12.53	1.08	6.50
41	1.07	1.16	6.00
42	1.09	1.15	6.00
43	1.17	1.23	5.50
44	1.20	1.25	5.00
45	1.31	1.38	7.00
46	1.31	1.37	6.00
Average Process Time			6.98

APPENDIX IV: SIMULATON MODEL
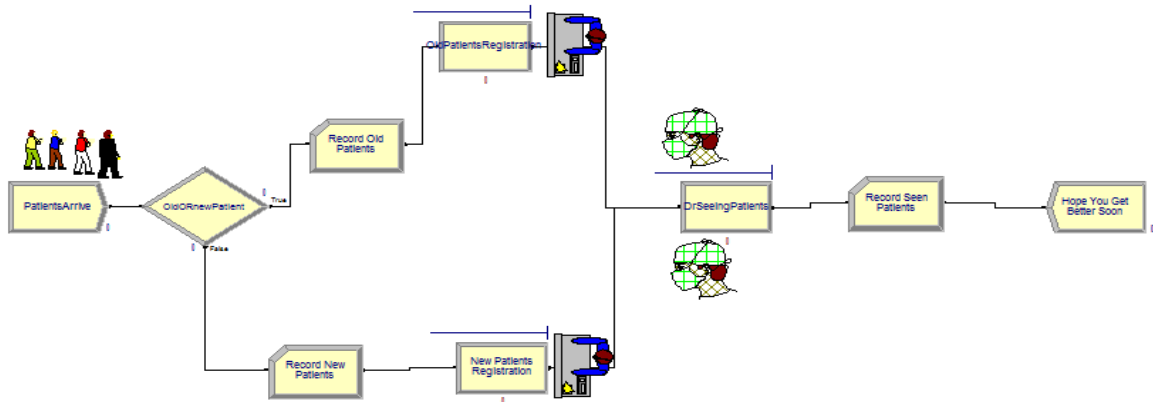
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