

Enrolment Queuing System for a Local College in Angeles City, Pampanga

Airamhay Angelica R. David¹, Diana Joy M. Guinto¹, Abigail M. Lopez¹, Jamaica A. Pagulayan¹, Sharlyn C. Quiazon¹, Hyacith D. Santos¹, Lovell M. Abello²

¹*Bachelor of Science in Accountancy, Institute of Business and Management, City College of Angeles*

²*Program Coordinator, Bachelor of Science in Accountancy and Faculty Member, Institute of Business and Management, City College of Angeles*

This study was conducted to validate the waiting time of the students during enrolment in the Registrar's Office and Dean's/Coordinator's Office of City College of Angeles (CCA). The researchers utilized an interview and a survey among the faculty staff and students of CCA and conducted an actual observation during enrolment. After analyzing and interpreting the results the researchers were able to validate that the longest waiting time for the Registrar's Office is in the Institute of Education, Arts and Sciences (IEAS) who arrived at 7:30AM and served after 2 hours and 47 minutes for the 127th person in line. While for the Dean's Office, the longest waiting time are also in the Institute of Education, Arts and Sciences (IEAS) who arrived at 9:53AM and served after 1 hour and 52 minutes for the 79th person in line. It also validates that the longest completion time in the Registrar's Office is seven minutes per student while the longest completion time in the Dean's Office is 17 minutes per student.

Keywords: Queuing System, arrival time, service time, waiting time, completion time, and Standard Deviation

Introduction

To control queues, a queue management system is used. People's queues are formed in a queue area in different situations and locations. The queue forming and propagation process are known as the theory of queuing. The first published account of people in line can be found in a book by Thomas Carlyle in 1837, *The French Revolution: A History*. Carlyle described what he thought was an odd sight, "people in an orderly line to buy bread from Parisian bakers." The queuing theory originated in Agner Krarup Erlang's research in 1904 when he developed models to describe the telephone exchange in Copenhagen. Because technologies such as telecommunications, traffic engineering, computing, and factory design, stores, offices and hospitals, concepts have been seen.

Noticeable problem during enrolment is the length of time students consume, probably because of high volume of enrollees due to free tuition program or the Republic Act 10931 or the Universal Access to Quality Tertiary Education Act, a law in the Philippines that institutionalizes free tuition and exemption from other fees in state universities and colleges (SUCs) and local universities and colleges (LUCs) in the Philippines implemented by the Commission on Higher Education (CHED). Based on the researchers' observation, the arrival of students, waiting time and service time are the major problems that affect the flow of the enrolment, probably because of lack of manpower and modern technology. The queuing system is one of the most effective ways to solve this kind of problem. It eliminates line cutters and queue jumpers and is a way to avoid crowd and waiting time. Automated/computerized queuing models need minimal data and provide fast result in a relatively simple formula to avoid delay

and possible wasting of time before being served. It is not difficult to use, and it is inexpensive to develop.

City College of Angeles (CCA) offers sixteen courses under three institutes: Institute of Business and Management (IBM) with courses Bachelor of Science in Accountancy (BSA), Bachelor of Science in Accounting Information System (BSAIS), Bachelor of Science in Entrepreneurship (BSEntrep) and Bachelor of Science in Tourism Management (BSTM); Institute of Computing Studies and Library Information Science (ICSLIS) with courses Bachelor of Science in Computer Science (BSCS), Bachelor of Science in Information Systems (BSIS), Bachelor of Library and Information Science (BLIS) and Associate Degree in Computer Technology (ASSOCIATE); and Institute of Education, Art and Sciences (IEAS) with courses Bachelor of Physical Education (BPE) Major in School P.E., Bachelor of Technical Teacher Education (BTTE), Bachelor of Technical-Vocational Teacher Education (BTVTED) Major in Food and Service Management, Bachelor of Arts in English Language Studies (BAELS), Bachelor of Performing Arts (BPA), Bachelor of Science in Psychology (BSPsych), Bachelor of Science in Mathematics (BS MATH) with Professional Education, Bachelor of Special Needs Education (BSNE) with specialization in Elementary School Teaching.

The enrolment process is as follows: in the Registrar's Office where students secure enrolment form (CCA-RO-1); in the Dean's Office where students secure advisement slip from the Dean/Coordinator; in the Finance office where students pay past dues fees before UniFAST; again, in the Dean's Office where students present official payment receipt, advisement slip and enrolment form (CCA-RO-1) for official encoding of registration form; in the guidance office where students fill up the Personal Data Sheet Form (PDS); in the computer laboratory where students create their school email account; in the library, where students present their student's registration forms for their library card and uniform orders and ID picture taking Cards is facilitated; and lastly in the Registrar's Office again where students submit their registration form copy, enrolment form (CCA-RO-1) and advisement slip, and the registrar gives their official student's registration form copy.

During enrolment, waiting in line is a problem of the students in City College of Angeles (CCA). Many students including the researchers have encountered this problem in enrolment. This prompted the researchers to conduct a study in queuing or waiting in line problem. The researchers read different books and found out that queuing theory can be applied in CCA during enrolment since it has an associated queue or waiting line area where students who cannot be served must wait or wait for service immediately.

In general, this study analyzed the enrolment queuing of City College of Angeles. Specifically, it aimed to:

1. Determine the service and waiting time of students in different services during enrolment in:
 - 1.1 Registrar's Office (Secure Enrolment Form CCA-RO-1)
 - 1.2 Dean's/Coordinator's Office (Secure advisement slip from Dean/Coordinator)
2. Determine the existing queuing system during enrolment in City College of Angeles (CCA).
3. Identify the fitted distribution in the queuing problem during enrolment in CCA in terms of:
 - 3.1 Waiting time
 - 3.2 Service time

Significance of the Study

This research is significant to the following:

This study is significant and helpful to the Registrar's and Dean's Office to be efficient and improve the enrolment in City College of Angeles. The queuing system will help each staff to control every queue of every transaction that may take place. It can speed up the service time and may result to many students that can enroll in a day.

For the students, this study will help them to have assurance and security in every transaction that they may encounter. Queuing system can help them to reduce line-cutters and queue jumpers that can delay every transaction. It can lessen their waiting time and can assure that they will be enrolled within the day. Considering their arrival time and that they want to go elsewhere, they can easily go back to their queue because they already secured their queue number.

Future researchers can use this study as a reference/basis in case they want to improve this system or add new functions to make it more systematic and functional.

Scope and Limitation

This study, conducted in City College of Angeles in Angeles City Pampanga, analyzed the queuing system during enrolment in the said institution. The researchers focused their study on the numbering/queuing system. Most of the students arrived earlier than the schedule of the enrolment but the service time needs to be adjusted earlier than the scheduled time. This study focused on the waiting time and service time in the Registrar's Office and Dean's/Coordinator's office in City College of Angeles.

The enrolment procedure was conducted within sixteen days from July 8, 2019, to July 30, 2019, excluding weekends. It started from 8:30 am to 11:30 am and resumed at 1:00 pm to 5:00 pm.

Conceptual Framework

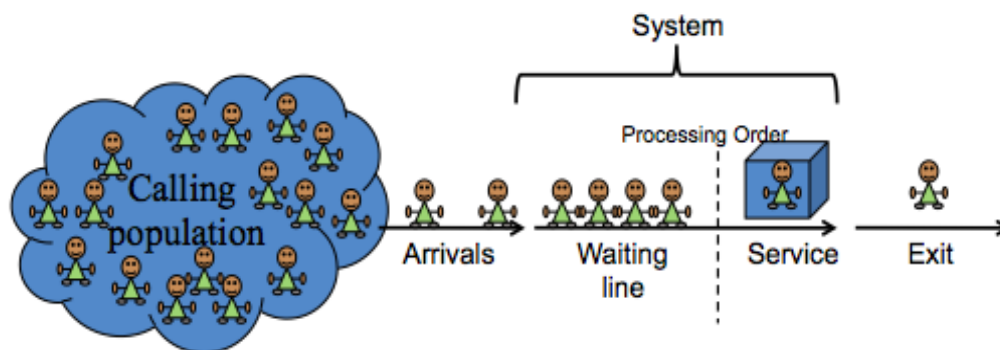


Figure 1. Structure of queuing process

Figure 1 shows the sequence adopted by the researcher to prepare a queuing system model for the different departments during enrolment in City College of Angeles.

To support the analysis, the authors read and collected data and interviewed the staff of CCA for some necessary data and information like numbers of windows in Registrar's Office, Dean's Office, and information about the schedule of enrolment of the 1st year up to 4th year. After this, the researcher conducted a survey and an actual observation to support the gathered information. Computing the waiting time and service time was also done.

Methodology

Research Design

Applied type of research was used to employ the sixteen-day process of enrolment and working time of the staff in the Registrar's Office and Dean's/Coordinator's Office in City College of Angeles. The information collected was analyzed and interpreted, using the queuing model method.

Standard deviation is a number used to tell how the average (mean) or expected value of measurements for a group is spread out. A low standard deviation means that most of the numbers are near to the average. A high standard deviation means more spreading of numbers.

Data Collection Procedure

The primary data used were gathered through actual observation and interview method while secondary data such as list of courses and number of populations of City College of Angeles (see Appendix C) were gathered from the Admission Office.

The researchers evaluated all the collected data based on the actual observation and interview. The number of respondents was calculated using online survey sample software retrieved from <http://www.raosoft.com/samplesize.html> (see Appendix D). From the gathered data queuing formula was used to adapt a queuing model.

Results and Discussion

Service Time and Arrival Time

The scheduled number of enrolment days in CCA for the first year level is three, (July 8, 9, and 10) for the second year level is four (July 11, 12, 15 and 16), for the third year level is three (July 17, 18, and 19), for the fourth year level is three (July 22, 23 and 24), and for irregular students is three (July 29, 30 and 31) which is usually on the last three days of enrolment. The enrolment process passes through different offices of the school. Queuing mostly occurs in the Registrar's Office for securing enrolment form CCA-RO-1 and in the Dean's/Coordinator's Office for advisement slip and printing. Meanwhile, the arrival time and service time of the students are very necessary to make formulas for a different queuing model. Waiting line models require a time of arrival and a time of service. The arrival time specifies the average number of students per period. For example, a system may have ten customers arriving per hour on average. The service level determines the total number of customers that can be serviced during their time. If the number of customers to be served per time is lower than the average number of arriving customers, the waiting line will increase infinitely.

The queuing model of the Registrar's and Dean/Coordinator's Office fulfills the condition of a single server queuing model. The students were served first-in, first-out (FIFO) and every student who was independent from the procedure waited to be served regardless of the queue length. The arrival and service time was described by standard deviation.

Table 1. Number of students arrived in the Registrar Office

Registrar	
Operating hours	
8:30am-9:30am	187
9:31am-10:30am	7
10:31am-11:30am	0
Total:	194

Table 1 shows that the largest number of arrivals happened within 8:30AM to 9:30AM because most of the students arrived earlier than the said operating hours. Furthermore, the lowest arrivals occurred during 9:30AM to 10:30AM. Also, it could be noticed that no arrivals at 10:31AM to 11:30 AM.

Table 2. Computed waiting time and service time during operation hours in the Registrar's Office

Registrar's Office					
RES	AT	WT	SST	ST	CT
1	7:00:00	1:46:00	8:46:00	0:04:00	8:50:00
2	7:00:00	1:46:00	8:46:00	0:04:00	8:50:00
3	7:30:00	1:16:00	8:46:00	0:05:00	8:51:00
4	7:00:00	1:47:00	8:47:00	0:02:00	8:49:00
5	7:00:00	1:50:00	8:50:00	0:01:00	8:51:00

190	10:00:00	0:57:00	10:57:00	0:02:00	10:59:00
191	10:30:00	0:27:00	10:57:00	0:01:00	10:58:00
192	10:00:00	0:59:00	10:59:00	0:01:00	11:00:00
193	10:30:00	0:29:00	10:59:00	0:01:00	11:00:00
194	10:00:00	1:00:00	11:00:00	0:03:00	11:03:00

Table 2 shows the results computed for the waiting and service time of the first and last five students served in the Registrar's Office during the enrolment (refer to Appendix E for the complete computation). It shows that the Registrar's Office accommodated 194 students during the first three hours of enrolment. Waiting time and service time were computed according to the arrival time and completion time of the students within the operating hours using the gathered data from the actual observation. The longest waiting time in the Registrar's Office was experienced by the 127th person in line who arrived at 7:30 AM and was served after two hours and 47 minutes. The shortest waiting time was experienced by the 191st person in line who arrived at 10:30 AM and was served after 27 minutes. The slowest service time is seven minutes per student and fastest service time is one minute per student.

Table 3. Computed waiting time and service time during operation hours in the Dean's office

Dean's Office					
RES	AT	WT	SST	ST	CT
1	8:50:00	0:00:00	8:50:00	0:05:00	8:55:00
2	8:51:00	0:04:00	8:55:00	0:12:00	9:07:00
3	8:51:00	0:16:00	9:07:00	0:05:00	9:12:00
4	8:52:00	0:20:00	9:12:00	0:04:00	9:16:00
5	8:53:00	0:23:00	9:16:00	0:02:00	9:18:00

76	9:51:00	0:00:00	9:51:00	0:02:00	9:53:00
77	9:52:00	0:01:00	9:53:00	0:02:00	9:55:00
78	9:53:00	0:00:00	9:53:00	0:02:00	9:55:00
79	9:53:00	0:02:00	9:55:00	0:02:00	9:57:00
80	9:54:00	0:01:00	9:55:00	0:02:00	9:57:00

Table 3 shows the results computed for the waiting and service time of the first and last five students served in the Dean's Office during the enrolment (refer to Appendix F for the complete computation). It shows that in the Dean's Office only 80 students were accommodated during the first three hours of enrolment. Waiting and service time was also computed according to the arrival time and completion time of the students within the operating hours using the gathered data from the actual observation. The longest waiting time in the Dean's Office was experienced by the 79th person in line who arrived at 9:53 AM and was served after one hour and 52 minutes. The slowest service time is 17 minutes per student while the fastest service time is one minute per student.

Table 4. Computed average waiting time and service time during operation hours in the Registrar's and Dean's Office

	Registrar (194 students)	Dean (80 students)
Waiting Time	0:25:47	0:27:32
Service Time	0:01:14	0:02:53

Table 4 shows the results computed for the standard deviation of waiting time and service time per student in the Registrar's and Dean's Office during enrolment. It shows that in the Registrar's Office, each student spends 25 minutes and 47 seconds while waiting for his or her time to be served and one minute and 14 seconds for the service time. In the Dean's Office, each student spends 27 minutes and 32 seconds while waiting for his or her time to be served and two minutes and 53 seconds for the service time.

Conclusion

Based on the findings, the following conclusions and recommendations are drawn:

1. The researchers were able to validate that the longest waiting time in the Registrar's Office is in the Institute of Education, Arts and Sciences (IEAS) by the 127th person in line who arrived at 7:30 am and was served after two hours and 47 minutes, while the longest waiting time in the Dean's Office is also in IEAS by the 79th person in line who arrived at 9:53 AM and was served after one hour and 52 minutes. The researchers

were able to see that the service time is slow on certain students, and were also able to find out that the service time is inconsistent and not fast enough; it created a slower line and longer waiting time.

Recommendations

1. The administration of CCA may implement the queuing system developed by the researchers.
2. Methods of analysis, operational analysis, and system analysis could also be done to reduce the service time and increase the overall productivity and efficiency of the offices.
3. Minimum number of servers for the different offices during enrolment in the CCA will improve the waiting time of every student.

References

1. Agner, E. (1904) *Queuing Theory*. Retrieved from <https://www.coursehero.com/file/p72k9e5/Queueing-theory-has-its-origins-in-research-by-Agner-Krarup-Erlang-wh-en-he/>.
2. Claudine, V. (2015). *Proposed Queueing Systems to Minimize the Waiting Time during Enrolment in Southern Luzon State University, Lucban, Quezon*.
3. Cronbach Alpha – Free Statistics and Forecasting Software. Retrieved from http://www.wessa.net/rwasp_cronbach.wasp.
4. Flowchart Tutorial. Retrieved from <http://www.visual-paradigm.com/tutorials/flow-chart-tutorial/>.
5. Perry, K. (2017). *Five Crucial Questions to Evaluate the Health of Your Queue Management System*. Retrieved from <https://www.lavi.com/en/resources-detail/evaluate-queue-management-system>.
6. Raosoft, Inc. (2004). *Sample Size Calculator*. Retrieved from http://www.raosoft.com/sample_size.html.
Standard Deviation. Retrieved from http://www.simple.m.wikipedia.org/wiki/Standard_deviation.
7. Thomas, C. (1837) *Queuing Theory*. Retrieved from https://www.wikiwand.com/en/Queue_area.
8. WordPress & The WP, *Time Perception*. Retrieved from <http://www.exactlywhatistime.com/psychology-of-time/time-perception>.