Bachelor's Degree Report (BSc)

A SYSTEM DYNAMICS STUDY OF MTN CUSTOMER SERVICE QUEUING SYSTEM

A Project Report

By

Ma'aruf M. Ka'oje
(A00018035)

Supervisor: Prof. Jean-Paul Cleron

School of Information, Technology & Computing

American University of Nigeria

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Ma'aruf M. Ka'oje

BSc Report

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Partial fulfillment of the requirements for the
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DECLARATION

I hereby declare that the whole of this work, research, result findings as well as the conclusions, with the help of journal articles, reports and the internet. The project and the report were carried out under the guidance and supervision of Dr Jean-Paul Cleron.

Student's Name: Ma'aruf M. Ka'oje Signature.....

Supervisor's Name: Jean-Paul Cleron Signature.....

Program Chair's Name: Ago Quaye Signature.....

Dean's Name: Mathias Fonkam Signature.....

SDP Coordinator's Name: Abubakar Sadiq Hussaini Signature.....

ABSTRACT

Customer service is the most important aspect of every business that builds its processes on the basis of customers going through the queue before receiving any service from the organization. These businesses become ineffective and inefficient if the queues are not moving well or the queues are not fluid. This research was inspired by the customer service of MTN Sokoto branch. System Dynamics was used in order to solve the overcrowd problem of the organization. System Dynamics is a methodology used for studying, understanding and managing dynamic models of different kinds of businesses. In short, System Dynamics could be used as an approach where models are created and used in order to simplify reality. The problem MTN customer service is facing with its queuing system is one of those realities System Dynamics can help understand. The System Dynamics model that has been produced from this research can be used in order to understand how queuing systems work. The model could be used to solve a number of problems MTN Sokoto branch can encounter and then policies would be developed in order to have a better Customer Service. There are a number of variables that have been generated in other to understand the causality and feedback of the system.

ACKNOWLEDGEMENT

In the name of God, the most Gracious and the most Merciful, I want to thank the almighty for sparing me up till this moment of my life and making me come across wonderful and great people. I want to acknowledge my Father and Mother for loving and supporting me in every possible way that they can throughout my life.

Great thanks to the SDP Coordinator Dr Abubakar Sadiq Hussaini ASH, my supervisor Dr Jean-Paul Cleron for guiding me through this research. I also want to thank the SITC faculty and the AUN community for their support through the course of my study.

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ACRONYMS

SD System Dynamics

QS Queuing System

CS Customer Service

CHAPTER ONE

1 INTRODUCTION

1.1 BACKGROUND OF STUDY

Customer Service is very important in every organization. Customers are actually quick to make complaints, especially when it involves customer service and waiting. Mostly, the customers or clients talk about what they could be doing while waiting or how their valuable time has been wasted. Today, it is odd for the customers to wait in line and not be addressed by the staff. Basically if the customers will have to wait for 15 minutes to see a staff face, then surely they will feel their time has been wasted. Definitely if you cannot talk to the customers right away, how will your customers ever feel valued? The valuable personal time of the customers is wasted if attention is not giving to them right away. If that attention is not granted, how will the customer ever feel valued?

Strategies like having newspapers, TV around need to be implemented to in order to help customers wait patiently in the queue. Taking advantage of that, we can actually improve customer experience in waiting lines. The interest of the customer can be caught during that period in time. There is the need to make your customer feel they are already receiving service while waiting. Queuing system improves the experience of the customer by analyzing wait times and also generating reports. By doing so, you will know exactly what the customers are experiencing, and based on that you can draw out decisions based on your findings.

The MTN Customer Service is facing a problem of overcrowd in its queuing system. Trying to solve the problem will help us find the possible right decisions to make in order to clear as many clients as possible. (Lee)

1.2 PURPOSE OF STUDY

This research will explore the dynamics of the MTN Customer Service Queuing system and find possible ways of clearing customers as fast as possible in order to prevent overcrowd. The model to be created will serve as a tool that will give the understanding of queuing system. The model will help find approaches to efficient and effective queuing system.

1.3 TARGET OBJECTIVES

This research paper has the following objectives:

- To develop the model of a system to explain its behavior over time.
- To determine the factors leading to a fluid movement of people through different processes.

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1.4 RESEARCH QUESTIONS

The intended answers to the questions of this research;

- Does the system dynamics approach apply to Queuing Systems?

- Can the proposed model actually help overcome overcrowd in queues in order to have good customer services.

1.5 OUTLINE OF REPORTS

These are the topics to be discussed in the project report;

Chapter 1: Gives a general knowledge on the expectations of a queuing system and its impact on customers. This is where the problem statement, target objectives and the research questions have been identified.

Chapter 2: This is where the literature review is being carried out. Here we give the definition, history and origin of System Dynamics.

Chapter 3: This chapter talks about the methodology that has been used in order to carry out the project and the method of sampling that was used. Also the instruments that have been used to collect the data will be mentioned here.

Chapter 4: This chapter explains the model that was created. Here we explore the causal feedback loops in the model.

Chapter 5: This is where the simulations results are explained.

Chapter 6: This is where we have the conclusion of the report and recommendations.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 INTRODUCTION OF SYSTEM DYNAMIC

System Dynamics is the perspective and set of conceptual tools which actually enable us to get understanding of the structure and the dynamics of complex systems. System Dynamics is also a rigorous modeling tool which enables the building of formal computer simulations of systems that are complex and using those systems to design organizations with effective policies. (Sterman)

The human mind is brilliant because it can assimilate and understand the complexity of the world. However, the models we build mentally are limited, inconsistent and unreliable. The ability of the mind to understand someone's decision is actually poor. Here we know that people take actions which make sense from narrow minded perspectives which are short term which tends to have negative impact in the long run. Individuals understand the sources of policy resistance by the tendency of intentioned interventions to be understood well, by overcoming the response of the system to the intervention itself. Now one must understand the mental models of the systems which are used to make decisions and the complexity of those systems. (Joseph Hall)

Complexity is defined in terms of the dimensionality of a search space or the number elements that a system contains.

2.2 FEEDBACK

One’s ability to interpret experience as a series of events is one of the cause of policy resistance. For example the inventory gets filled due to number of goods produced. In the early stage, we were taught that things don’t just happen for any reason. We were taught that there has to be a cause for something to happen. Company A reduced its price for a certain commodity in order to boost sales and clear its inventory. So basically we would be left to blame others for our short comings or difficulties and will be powerless leaving us with no choice but to adapt.

2.3 TIME DELAYS

Time delays between decision and its effects are particularly troublesome. So basically delays in feedback loops tend to create instability and increase the tendency of systems to oscillate.

2.4 STOCK AND FLOWS

The stocks and flows are major components of System Dynamics. The stock is where the accumulation takes place while the rate drives the accumulation. The rates go in and out of the stocks.

CHAPTER THREE

3 METHODOLOGY

This part of the project shows the necessary procedures taken in order to achieve the aim of the overall project. It includes the area of study (the scope of data collected for the analysis report), the method of sampling (the steps used in collecting data) and the instruments used in getting the data and the sampling techniques used.

3.1 AREA OF STUDY

MTN has processes a customer will follow in order to get service. In those processes there are queues. System Dynamics has been used to model MTN Queuing System.

3.2 METHOD OF SAMPLING

The data that has been used in this research is mainly data gotten from an interview with the Manager of the company MTN Sokoto branch and some secondary data (data which was gotten from journals) as well as some assumptions.

3.3 INSTRUMENT USED IN COLLECTING DATA

The instrument used in the collection of data includes the interview with the Manager of MTN as well as some journals and internet research.

3.4 RESOURCES USED

This research used Vensim software for the modeling design and simulation. Microsoft excel was also used for calibration.

CHAPTER FOUR

4 THE MODEL

This part of the research shows the underlying system structure which was created to visually see the different processes involved in a queuing system. System Dynamics models contain elements such as stocks, flows, auxiliary variables, constants and data tables. The causal links and the feedback loops are identified by arrows in this system.

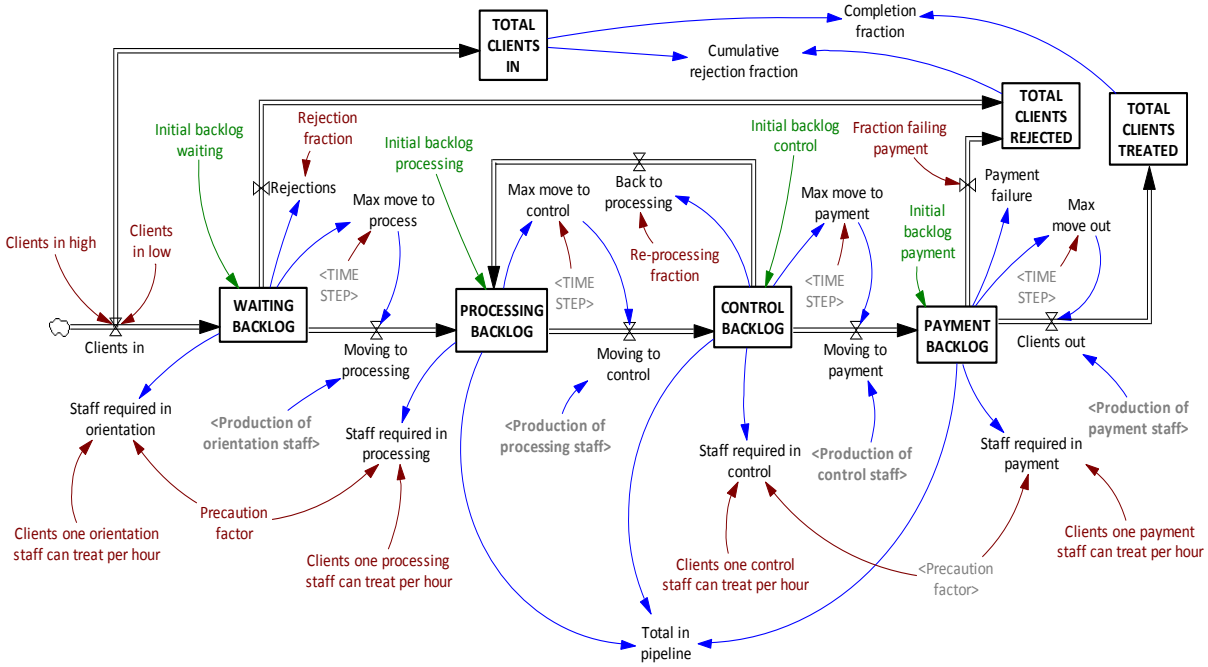

Figure 4.1 MTN queuing processes

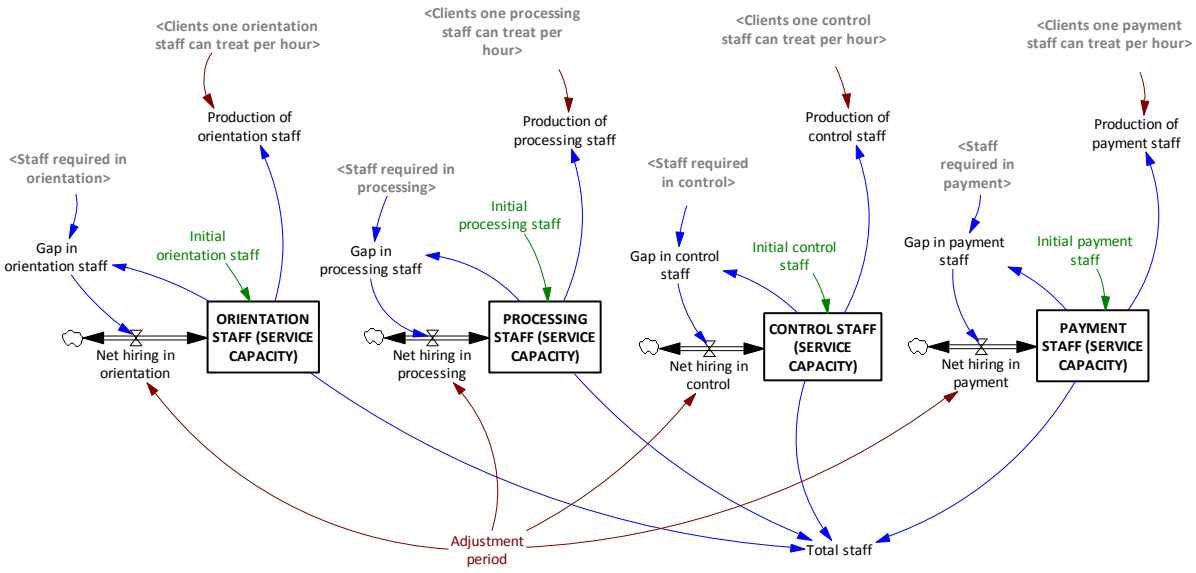

Figure 4.2 Staff in each process

4.1 STOCKS AND FLOWS

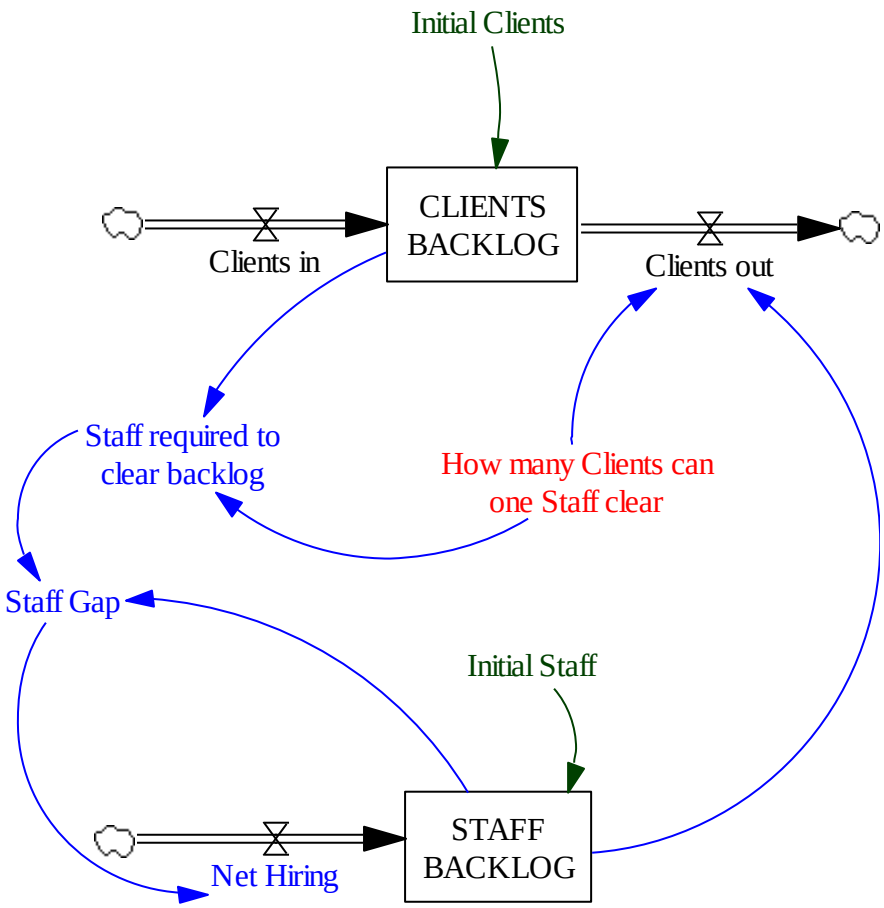

Figure 4.3 Basic Stocks and Flows

Stocks and flows could also be referred as levels and rates. The stocks are the variables that are in a box while the rates are the arrows that go in and out of the stocks.

4.2 WAITING BACKLOG

This is where customers wait to be oriented by the orientation staff. This stock is accumulated by the flow of customers coming in and the stock reduces by the flow of customers going out or moving to the next phase. Clients that don't have anything to do in the office are rejected. Customers move to the next process due to the production of the staff treating that backlog. We calculate how many clients can one staff clear, and we divide it by the number of clients

in the backlog. Then we will be able to know the staff we need or require. We will now compare the difference between the staff we have by the staff we need and we can generate the staff gap from which we can determine the net hiring of staff. As that process is going on, we will multiply the number of staff by the number of clients one staff clears per hour and we can determine the movement of the clients into the next backlog.

4.3 TOTAL CLIENTS REJECTED

In this backlog, clients are been rejected from either the waiting backlog or the payment backlog. Those are the only two rates that are going in to this backlog.

4.4 PROCESSING BACKLOG

This is where the accumulation of customers ready for processing is. The processing Staff processes the clients and moves them to the next backlog. And again the customers move to the next process due to the production of the staff in that backlog. We calculate how many clients one processing staff clear and we can divide it by the number of clients in the backlog. There we will be able to know the staff we need or require. We will now compare the difference between the staff we have by the staff we need and we can generate the staff gap from which we can determine the net hiring of staff. As that process is going on, we will multiply the number of staff by the number of clients one staff clears per hour and we can determine the movement of the clients into the next backlog.

4.5 CONTROL BACKLOG

In this backlog, the control Staff checks the record of the clients for mistakes or missing information. If there is any, then the client will be sent back to the processing and that is

where the loop exists. The clients only move to the next phase or process only if they have valid information cleared by the staff in processing backlog. And again customers move to the next process due to the production of the staff in that backlog. We tend to calculate how many clients can one staff clear, and we divide it by the number of clients in the backlog, there we will be able to know the staff we need or require. We will now compare the difference between the staff we have by the staff we need and we can generate the staff gap from which we can determine the net hiring of staff. As that process is going on, we will multiply the number of staff by the number of clients one staff clears per hour and we can determine the movement of the clients into the next backlog.

4.6 PAYMENT BACKLOG

In this backlog, the clients make payment for the services they got. If a clients has insufficient cash or their credit card is invalid and cannot make the payment, their service will be terminated and they would be rejected. But if they are able to settle the payment, then they can be considered as having received full services and can be moved as part of the stock total clients treated.

4.7 TOTAL CLIENTS TREATED

This is the virtual accumulation of clients that have been treated. There is only one flow coming in to virtual stock.

4.8 TOTAL CLIENTS IN

This is where we see the accumulation of the number of clients the company receives for every working hour.

4.9 AUXILIARY VARIABLES

This are used in order to represent cause and effect. They occur when the formulation of a stock's influence on a rate involves one or more intermediate calculations. They can be useful when formulating complex rate equations. They are used for clarity and ease of information. Some of the auxiliary variables in this model are as follows:

Auxiliary variables	**Meaning**
Rejections	The number of clients rejected
Staff required in orientation	Number of staff needed in the waiting backlog
Production of orientation staff	The ability of staff to attend to customer fast
Max move to process	This is to prevent the backlog to become negative
Staff required in processing	Number of staff needed in the processing backlog
Max move to control	This is to prevent the backlog to become negative

Production of processing staff	The ability of staff to attend to customer fast
Back to processing	Customers that are referred back to processing
Staff required to control	Number of staff needed in the control backlog
Max move to payment	This is to prevent the backlog to become negative
Production of control staff	The ability of staff to attend to customer fast
Staff required in payment	Number of staff needed in the payment backlog
Max move out	This is to prevent the backlog to become negative
Payment failure	Customers with insufficient funds to pay for service.
Completion fraction	The total number of clients attended to per hour
Cumulative rejection fraction	The total number of clients rejected per hour
Total in pipeline	The number of clients in processing, control and payment

Table 1 Auxiliary variables

4.10 CONSTANTS

The constants are System Dynamics variables that don't change. They contain data used to assist in simulating the model. The following are constants found in the model.

Clients in high	Large number of clients coming in
Clients in low	Small number of clients coming in
Clients one orientation staff can treat per hour	Number of clients a staff can clear per hour in the waiting back log
Precaution factor	This is a multiplier to increase the power of a decision.
Rejection fraction	The percentage of clients rejected
Clients one processing staff can treat per hour	Number of clients a staff can clear per hour in the processing backlog
Re-processing fraction	The percentage of clients referred back to processing
Clients one control staff can treat per hour	Number of clients a staff can clear per hour in the control backlog
Fraction failing payment	The percentage of clients that fail to make payment
Clients one payment staff can treat per hour	Number of clients a staff can clear per hour in the payment backlog

Table 2 Constants

4.11 CAUSALITY AND FEEDBACK LOOPS

Causality is the relationship between something that happened and the reason for it happening and thus, the principle of nothing happens without a cause. To build a System Dynamics model is to put in place the chains of relevant causality. The arrow begins at the cause while at the end stands the consequence which is the effect. The following is a causal link that could be found in the MTN Customer Service model. (Alain Jean-Marie)

Figure 4.4 causality and feedback loop

The causal link above shows how staffs are been recruited or fired based on the desire to hire staff. If the desire to hire is high, then we recruit based on the staff gap which determines the net hiring else if the desire to recruit is low, then we either keep the staff we have or fire some according to the situation. Therefore, the more staff we have, the faster we can clear the clients. (Tai Chai Xian)

CHAPTER FIVE

5 SIMULATIONS AND RESULTS

This part of the research shows the various simulations that were carried out. The behavior of the model under different conditions over time will be expressed on graphs.

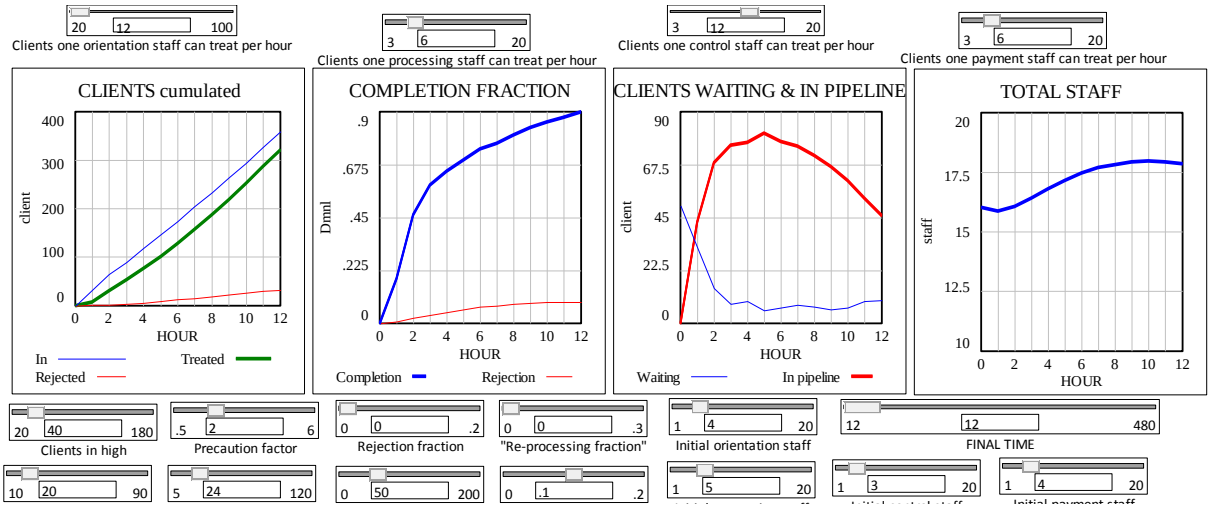

Figure 5.1 base case diagram

Base case: Taking a look at completion fraction the adjustment time is 24 hours which is in the middle. Not bad and not good.

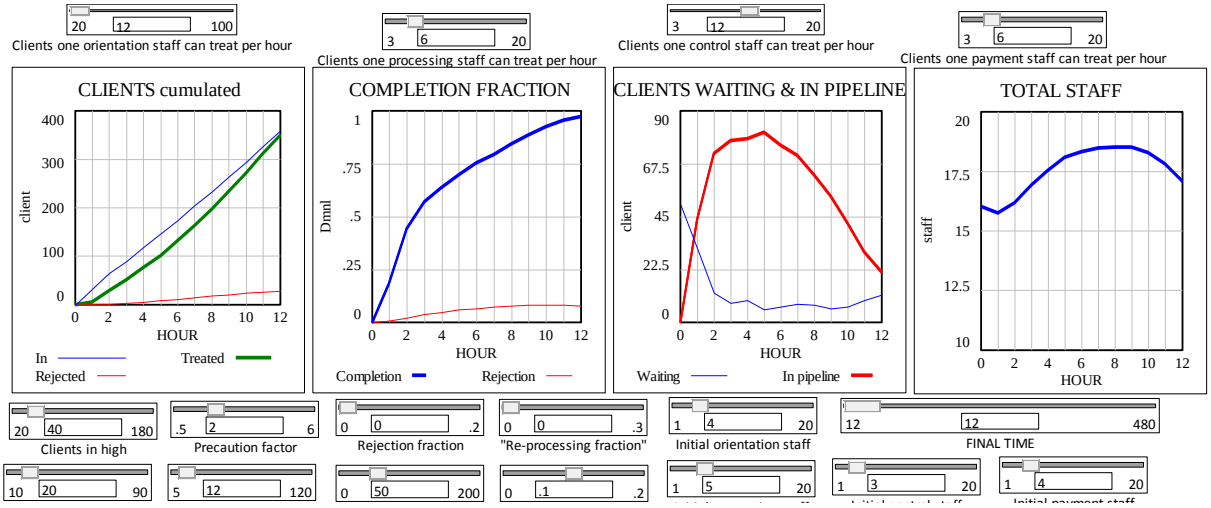

Figure 5.2 better case diagram

Better performance: we have taken a precaution factor of 2% making our completion fraction up a 100 % which shows that at this stage the model is ok.

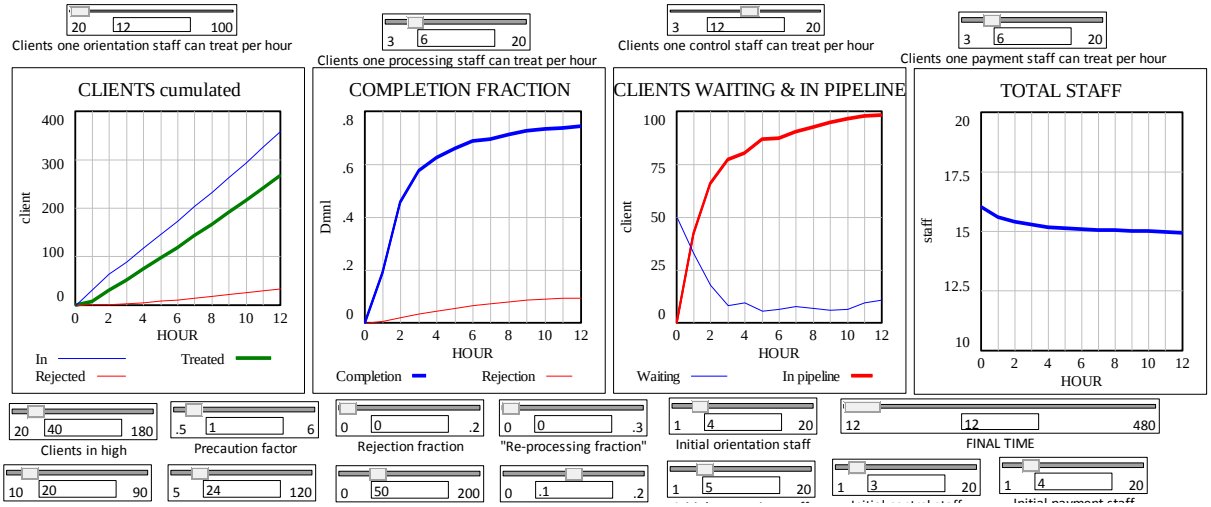

Figure 5.3 worse case diagram

Worse case: the precaution factor shows that the completion fraction is not even up to 80 % which is bad for business.

CHAPTER SIX

6 CONCLUSION

After a variety of simulations, the key parameters are as follows;

- The precaution factor.
- The productivity of staff.
- The initial staff that we have in each process.

Even though each and every variable affects the model in its own way, the above parameters affect the model the most. This model can be used by Managers to effectively monitor the Queuing System of their organization in order to ensure good customer service.

6.1 RECOMENDATION

A Telecommunication organization such as MTN needs to be able to manage its Customer Service process Queuing system if they really need efficiency in their business performance. Definitely customers first before anything and treating the customers in the right way with the aid of productive staff will make the organization clear as much customers or clients as fast as possible which will lead to less overcrowd of the queue. Therefore, there is the need to use often this model in order to explore more on the better decisions to take care of problems that MTN Sokoto branch is facing.

7 Refference

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