

## ENHANCING INMATE MEETING PROCESSES: A SIMULATION-DRIVEN BUSINESS PROCESS ENGINEERING APPROACH

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### ABSTRACT

In this era everyone prefers smart work than the hard work that takes too many resources and the time in contradiction they like efficient ways to run their work. Business Process Engineering (BPE) is a way which provide the efficiency and authentication for your business process and help to make changes, improve productivity and make you able to calculate the operational cost. We apply the business process engineering in inmate meeting system of the Central Jail of a City. We did the survey and found that there are many people who come to meet their beloved ones in the Central Jail. It will create a crowd of people outside the Jail Gate and then people must wait in the multiple queues which is very time consuming and inconvenience for the people. We consider this process as our current business and make improvement in it by introducing the online system that will eliminate queue system in token area and reduce the waiting time in waiting room. We looked up at the problem by making its simulation model. The Solution simulation model is prepared for it and check it properly. This will solve the problem, provide the clear way of implementation and require less number of resources.

**Keywords:** Inmate meeting, business process engineering, simulation and modeling

### INTRODUCTION

The Business Process Re-engineering (BPR) is the redesign of business processes in order to produce significant improvements in crucial areas of a business (Thong et al., 2000). BPR allows us with modeling and simulation to make changes in the current business process to make it efficient and get benefited from it using new and easiest ways.

Currently, one of the most concerned issues in Central Jail of any City is the crowd of people that is gathered outside the central jail of a city. Managing the flow of visitors at a central jail can be a complex and time-consuming process. With many people visiting their loved ones in jail, it is not uncommon to see long lines of people waiting outside the jail gates. This creates an inconvenience

for visitors, who must spend a significant amount of time waiting in multiple queues.

For visitors, the process of visiting a loved one in jail can be a stressful and emotional experience, and long wait times outside the jail gates. People who come to meet their beloved ones in the jail must undergo many queues before meeting to their person such as.

- **Queue Outside the Jail:** In manual system, there are a lot of visitors standing outside the jail gates before starting the meeting time which causes a huge mass of people. This can cause inconvenience and increase the wait times for visitors, as well as raise safety concerns.

- **Checking Queue:** After entering the gate of the jail, the next step is to wait in the queue for checking. In this queue, people must remove unnecessary items such as mobile phones and other restricted things. A lot of time is wasted during this process.

- **Queue for Token Taking:** After that, the visitors have to wait in a token queue. In this queue, visitors are assigned a token that is called for meeting with the person in the jail.

- **Waiting Room:** In the waiting room, visitors sit and wait for the call to meet with their person in the jail.

The jail administration faces several challenges in managing visitor flow, including maintaining security, managing many visitors, and ensuring a smooth flow of visitors. The impact of the problem extends beyond the jail gates and affects the community. Long wait times and crowds outside the jail gates can disrupt the local community and create a negative image of the jail and the city.

Therefore, it is necessary to find a solution that addresses the root of the problem and improves the visitor experience, jail administration, and the community at large. To address this problem, an Automated Mobile App has been proposed as a practical solution to manage visitor flow at a central jail of a city. The app would assign available visit times to visitors and allow them to plan their visit in advance. Here's how it could work in detail:

- **Appointment Booking:** Visitors would be able to book their appointment through the mobile app. They would choose their preferred visit time and provide basic information, such as their name and the name of the person they are visiting.

- **Confirmation and Token Allocation:** After booking, the app would confirm the appointment and allocate a token to the visitor. The token would act as a virtual queue ticket and indicate the visitor's place in the physical queue.

- **Real-Time Updates:** The app would send real-time updates to visitors, including their estimated wait time, the current status of the queue, and any changes to their visit time.

- **Check-in Counter:** At the jail gates, visitors would use check-in counters to confirm their appointment, verified the automated token, and remove the unnecessary items such as mobile phones and other restricted things.

- **Meeting with the Person:** After arriving at allocated time, visitors meet with their loved ones.

In conclusion, an automated mobile app has the potential to significantly improve the visitor experience, reduce wait times, and address safety concerns at a central jail. By allowing visitors to plan their visit in advance and receive real-time updates, the app would make the process of visiting a loved one in jail more convenient and less stressful.

## 1 BACKGROUND

Business Process Reengineering (BPR) is the one of the most up to date and the most effective innovation in the business, industrial and management sciences. BPR help the engineers to make rapid, improve is a process and designing strategies, that leads the organization to optimize the working of the system and the production of the products or the services of is a process.(Khan, 2000)

Now-a-days the success in the competition for any firm who provide the better response, have the advantage of the cost effective and supplies the better qualities than before that was supplied by is a process. If we done these things in most efficient way than this is categorized in process management. This process management is also known as the Business Process Reengineering. This was first introduced by the three scientists named as Hammer in 1990, Daven and Short are both who introduced also in 1990.(O'Neill & Sohal, 1999)

According to the Ramchandran an Indian physicist, BPR is challenging and efficient tool for all the process of the organization to make changes in their processing from all aspects and transform them for radical improvement (2010:2). Before 1994, there were management system for all the public that allow them to make changes and help in efficient delivery methods or services. Eventually, after (1994) many process brought into being to reengineer the public like the services and public sector renders also.(Lucas, 2016)

Modeling is a process in which we produce or create the model that is the representation of the construction of the system and the working of the system. Model is same as the system but it's much simpler than it. The main purpose of the modeling is to enable analysts to predict the effects of the changing in is a process. Model is much closer than the real system. Modeling can't be much more complex so we can't perform any experiment easily with it. Model validation can be done by the making the simulation of the model, giving input to the system and then comparing the results of the system.

Simulation is done by the simulation software for example Any Logic (Zarei, 2001).

Simulation is used for the experimentation of the model. Simulation provides the facility of the less cost because it is very costly to implement the operation in the real system. Whether it will work according to the conditions or not. The operations of the system are studied and analyzed according to the real system, whether our to be process will behave same as we want or not. Simulation can be defined as evaluation of is a process and the evaluation of to be process under the several circumstances over a long period of real time. Simulation is also used for existing and the purposed system to reduce the chances of the failure, to meet the desire outcome. Simulation comprises of the variables who measure the performance of the system and the system entities for example, the entities like Queue and server (Freitas & Pereira, 2015).

Simulation is suggested for all the business process because it perform the major role in the understanding the essence of the system. Process should be identified if want to make changes in it, new process is to be designed and prototyped to remove the defects of the system and to check the effects of the changings on the performance of the system. Simulation is introduced in the business process so that re-engineering effects can be identified in a quantitative way, visualization of the process and the animations are provided. Now-a-days simulation is most in use because it is cost effective and required less number of resources .There are many software are present for the simulation.(Jakli, n.d.)

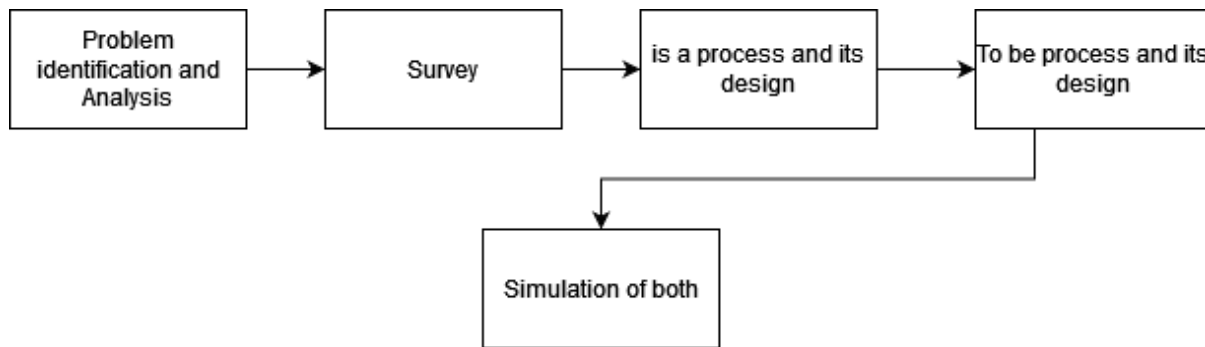
Queueing system are the most important and basic components for the performance and success of the system in most of the fields of life, we know that it is very easy to perform calculations of the queueing system, but on the other hand is the most difficult task to make the simulation of the queueing model to analyze it from various points. If we implement these things naturally, the cost of development will be much higher. All the pilots are provided with a simulation that behave really like the same in the

nature. Then the planes are handed over to the pilots. Simulation also applied in various area of the life, due to less complexity and low costs implementation.(Alhaag et al., 2015)

Blockages and the crowds have been seen in many public areas. Try to decrease the time is the important priority and it also leads to less headache of the government in managing them. Many people say crowd is inversely proportional to the inside space. But, according to Silvester, Lendon, Bevan, Steyn, and Walley (2004), there is no correlation between organizational capacity and waiting times. Ups and downs in average demands can be pop out in the development of the queues as overrated demands is carried over. If proper management is done of the processes there will be less gathering and waiting time will be face by the public .(Völlm et al., 2009).

## **2      METHODOLOGY**

Methodology starts from the identification of the problem. The identification of this problem starts by looking at the crowd of the people outside the central jail of city Gujrat. One day by chance we were sitting with one of our group mates whose brother was the inmate in the jail. He described the whole procedure also talk about the problems of is a process. He described that we go there around 8:00 PM when our meeting day arrives. We must wait for two to three hours if we reached there late. Then the process is started to meet the corresponding person in the jail. The process starts by first standing in the queue for checking and id verification. When 50-100 persons verification is done, those people are asked to go to the waiting area. Then all those people must inline in a token queue for taking the token and making in the receipt of things we want to give to our person. Then all those persons go back to the waiting room. A policeman come with a list of 10-20 persons those persons are allowed to enter in the prison other persons must wait in the waiting area and the late comers wait outside the jail building that cause the crowd outside the jail.



**Figure 1: System Execution Chain**

The next stage is the analysis of is a process which was done by visiting the central jail of city Gujrat as when the person come to meet inmate have necessary items like ID card. This process contain various steps like the first step is that when person enter the gate is the verification step. Person should verify his/herself through the CNIC. He must wait in the waiting hall to get the token to enter in a prison. When token is received person must go back to the waiting area and wait for name calling. After name calling, person will go to the prison to meet the inmate. So, the problem analysis clearly identifies the wastage of too much time in these activities. The time is as follows.

Steps	Name	Time
1	Verification	1.5 minutes
2	Waiting Area	5 minutes
3	Token Queue	2 minutes
4	Waiting for call	5 minutes
5	Meeting	30 minutes

**Table 1: Time Consume at each Stage**

Only 50-100 persons are allowed at a time to go inside the prison to meet the inmate. On the other hand, all the remaining persons must wait for a period until they get free, and their turn come. Otherwise, they must wait outside the central jail. Almost 250-300 persons came daily to meet. A process is carried until 5 days of the week. 50-100 persons are allowed to enter in a jail and 10-20 persons are allowed at a time to meet the inmates. Data collection is one of the most crucial tasks for simulation modelling, thus it is important to get the necessary data to analysis a queuing situation, the distribution of arrivals, and the required service times. The best data must be collected when queuing system is in use to determine these distributions.(Alhaag et al., 2015)

The main aim of our system is to minimize the time of the persons and provide them efficient service. The data was all the primary data that we collected from the persons directly. We gather data by two techniques i.e., survey and questionnaire. Questionnaires are the group of written questions in which answers are taken by the persons in written form. Our questionnaire contains 10-15 questions which of both types are qualitative and quantitative. Survey is the process in which we target a sample of the whole population and asked the questions to get data (Morgan & Harmon, 2001)

Quantitative research involves the collecting of the data in the numerical figures. After the collection of the numerical data, the mathematical operations are perform on them, to get the result and leads to successful phase in the future, There are many tools and techniques are applied to get data in the form of quantitative, like questionnaire, survey, interviews etc.

Questionnaire technique was used in data collection activity. Questionnaires contain the answers in numeric numbers and some in the attribute forms. In this way we get most of the data quantitative and the qualitative data help us in building of model.

Normal Days	200-300
Special Days	500-650
In Meeting Hall	10-20
Waiting Hall	70-100
Outside the Gate	50-200

**Table 2: Stats Gathered through Survey**

The survey was comprising of 4 multiple choice questions and total number of questions are 15. The main aim was to get data from the 50 persons who visit the in purpose of meeting with the inmates and the 50 policemen who manage the outsider persons

and the inmates on all the 5 days of the Week from 8:00 AM to 5:00 PM daily.

We talk about how to advance the condition of research technology. We discuss many important research methodologies and consider how each has been or might be used in requirements-related research. Each approach aims to accomplish a slightly different research goal, they all try to advance the state of the art in some way, either by introducing new knowledge or by increasing the sophistication of earlier work.(Cheng & Atlee, 2007)

In requirements analysis the system specifications are checked and mapped whether the system will operate correctly or not. Requirements are the backbone of every system. The lack in the requirements means the failure of the system. The main requirement of our system isto minimize the time of the whole process. The token will contain the information of the time of the meeting and the authentication time to go inside the prison.

The next phase is system design from the gathered requirements. The Outside who came to meet the inmate will get token from the app. The token the QR code that will be scanned at the door allow to enter the person if the token is valid. The person will submit his credentials at the cabin a directly go inside the prison to meet the inmate. Then the person will go inside the prison and meet the corresponding person and get out in minimum time. Here is the flow chart that will describe the whole system.

Next phase is to implement the behavior of the all the persons and the subsystems involved in the whole system. such as the behavior of the app and the behavior of all the person who are at the jail gate and the inside the prison. The next step is to test the system. We run our simulation model and test our solution to the purposed problem. The system testing was also done in Any logic. This will minimize the time and describe the whole procedure of the system clearly.

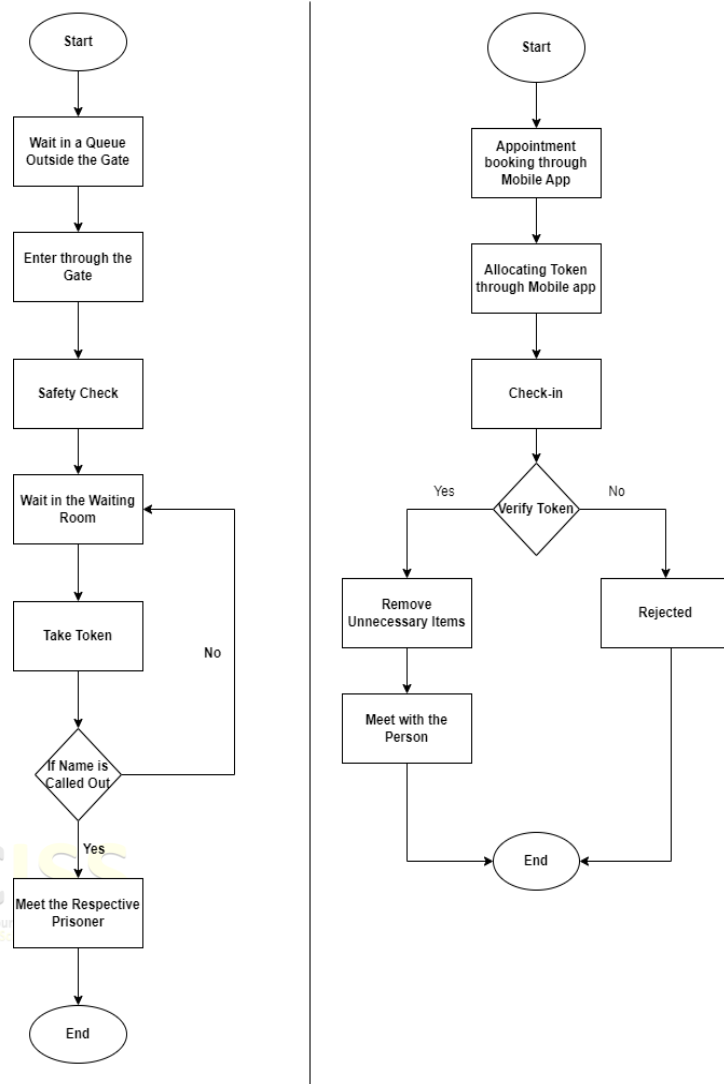


Figure 2: Flow Chart of Is-a Process & To-be Process

### 3 EXPERIMENTS

Our main aim was to makes changes in is a process and makes it effective and more productive. Is a process of inmate system in central jails are very long and time taking. Is a process where you do not have the specific time for a specific person to come and meet the corresponding person. It's a general term time from 7:00AM-9:00PM. If persons want to meet the inmate can come at any time of the day. Procedure for every person is same. When person enter the gate have the ID verification card or CNIC. Person will stay in the checking queue if there are

people whose checking is going on. Then the person will go to the waiting area. After the waiting area he/she will stand in a token queue to take tokens to get into the prison and meet the inmate. After taking the token all the people who are in the queue will come back to the waiting area. After some time, a policeman will come and call names of 10-20 people. Those persons are allowed to go into the

prison and meet the inmate. While all the others must wait there in the waiting area. Meeting will continue for half an hour. During that time if someone arrives outside the jail for a meeting also will stay outside of the building and it causes a crowd of people outside the jail building if a huge number of people come at that time.

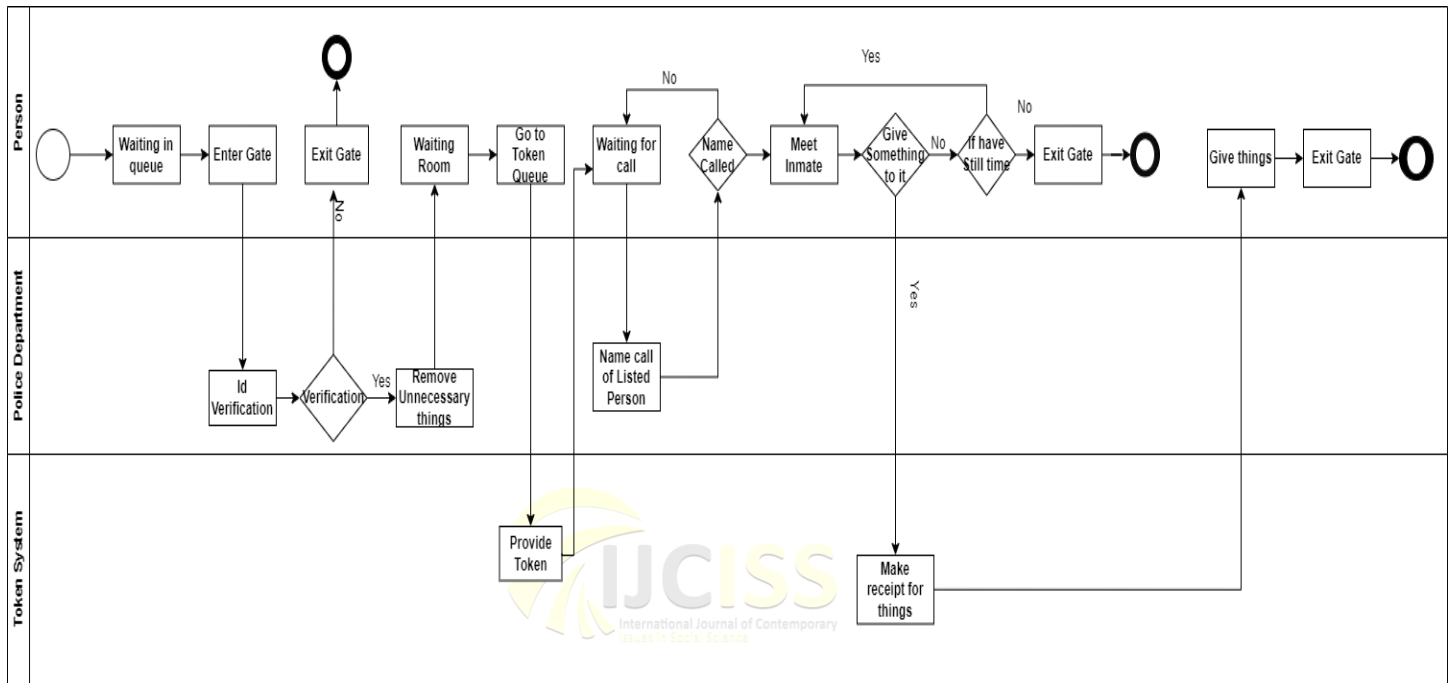
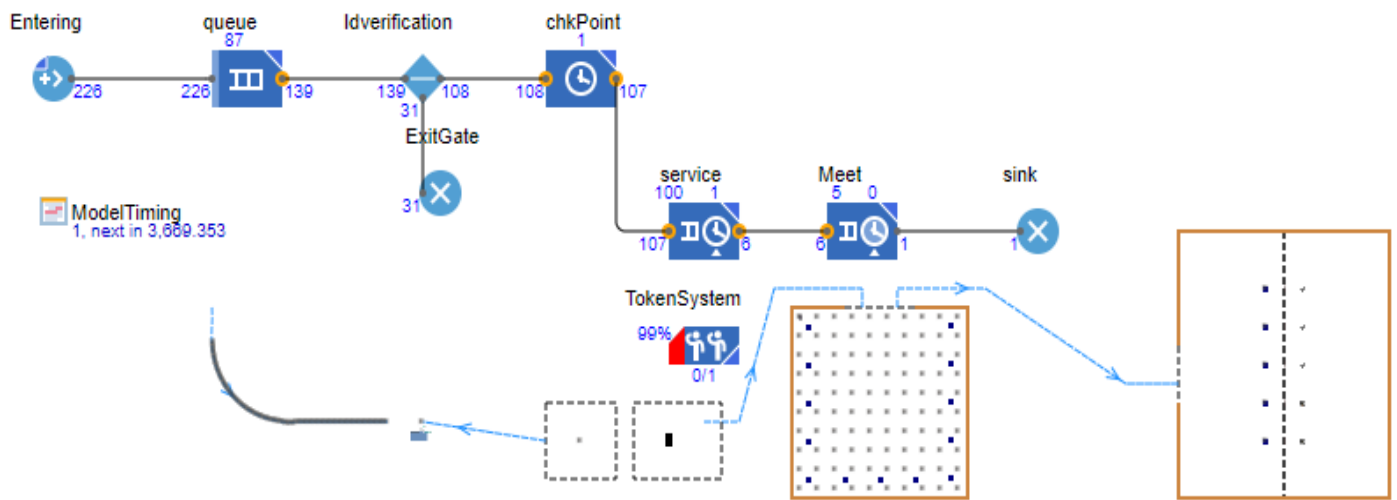


Figure 3: BPMN of Is-a Process

This is a huge process having too much time to perform these activities. This process is verified with the help of the Any Logic tool by making simulation of it and run the system by implementing it in the windows 3D view. Is a process is verified and have the issue that was observed in the problem identification and analysis of the problem. The simulation of the system is prepared same as the process is. The simulation is built in the Any Logic tool that is free for students. Any logic has all the

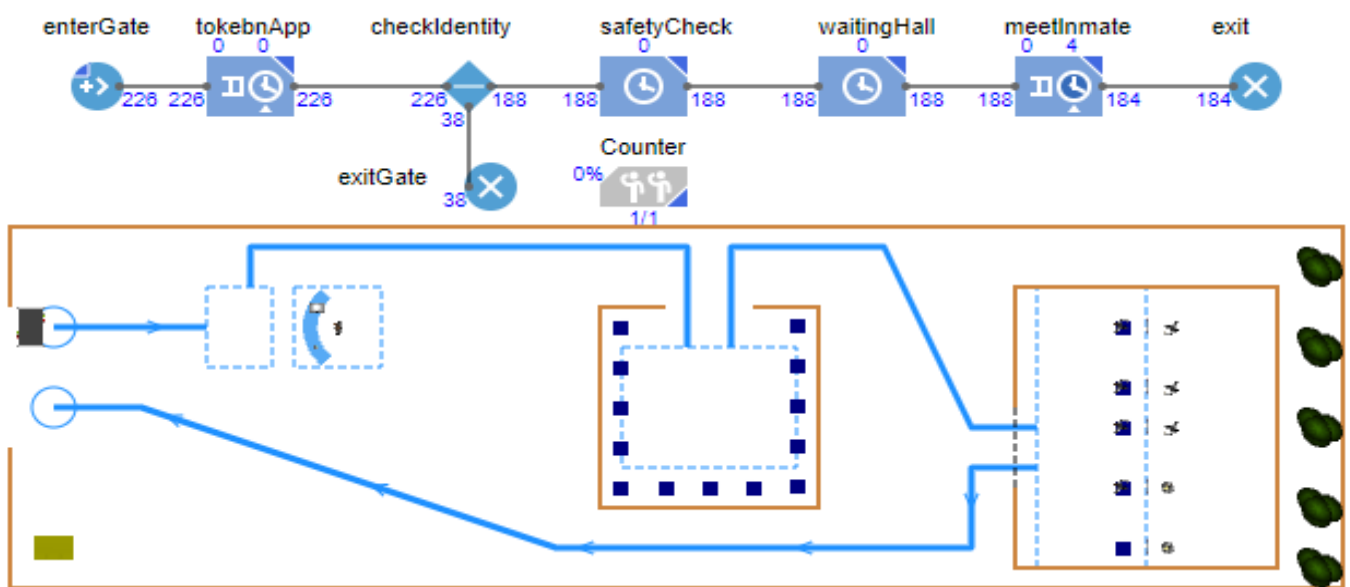
documentation in it. So, it is easy to understand and build the desire model in it. The Simulation of is a process is also built in this toll. The data we collected through the questionnaire is given to this model. Whether it behave like real or not. Our is a process behave same as the existing scenario. The agents are come from the source named as entry point. Then the person will stand in a queue for checking, will do id verification then go to the waiting are named as service and get the token and at the last he will meet the corresponding person.



**Figure 4: Simulation Model of Is-a Process**

This picture will clarify is a process how it behaves. How many people must wait inside the and outside the jail and how many persons are served and serving in a prison. This process involves a wastage of time. Data was inserted into the simulation model and checked at an event when person after the person

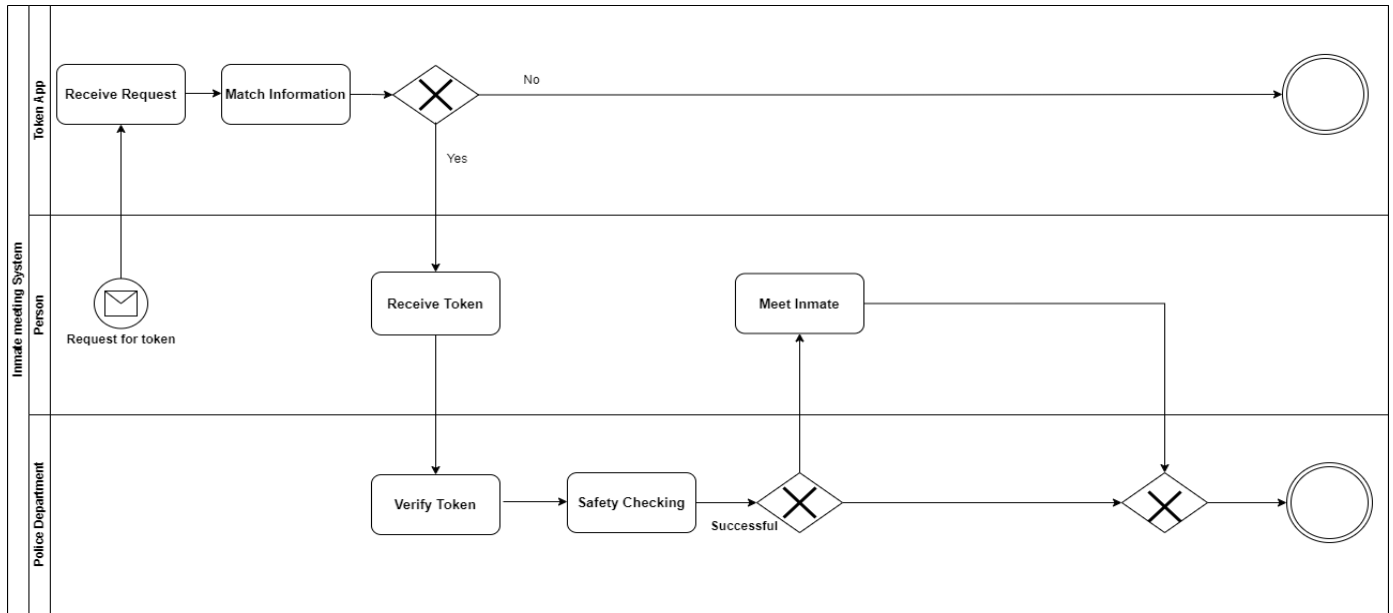
come to meet the inmate. The time consumed in the previous system like persons must wait on different things that are unnecessary things or just we can say those were the wastage of the time. The addition of the new technology inserts the great effect on the overall system.



**Figure 5: Simulation Model of To-be Process**

The process to be designed for the same number of data including all the units of data covering both special and normal days. The Workflow or the business outline draw in the form of BPMN. The following diagram shows the BPMN.

Now having a look on the BPMN we consider our to be process will be short than is a process This simulation model prepared like the simulation of the problem. To verify the system will it perform well or not or fulfill our desire or not.



**Figure 6: BPMN of To-be Process**

This follows all the directions. In to be process the person must get token card that have the QR code on it that allow the person to enter in the jail. When the person gets token card, person will go directly to meet the inmate without any stop in the process except of security checking.

The above simulation shows the clear result. After a complete day there is no blockage of the persons, and no crowd is created outside the jail. This directly talks about the success of the system.

**4 DISCUSSION**

The data that was gathered during the survey through questionnaire was given to the simulation model of is a process and then run it to check the flaws. The outcome merges out which is as follows.

Total Numbers of persons	250-400
Waiting Area	30-100
Meeting	10-20
Served	6
Outside the jail	100-150

**Table 3: Stats Obtained through Simulation Model of Is-a Process**

The outcome of is a process is represented above in the form of the table. Table clearly mentioned the number of visitors who wait in several queues which cause inconvenience for both visitors and management team.

Hence the result outcome we get is that there is a smaller number of persons who are served or in the

service. This is because the wastage of the time more than the work time. So, we overcome this flaws in is a process by designing and implementing the to be process you can check in the experiment section figure 8. The same data was given to the simulation model of to be process which is also described clearly above section in the introduction and in other sections. The stats we come with this model is as follows.

In Meeting	10-15
Queue	0-5
Waiting Area	0
Outside the jail	1-5
Total in a day served	300

**Table 4: Stats Obtained through Simulation Model of To-be Process**

Now discussion end up with the result, when all the person was given the time to meet the inmate before if they will come at time then in each hour almost 30 persons are served and the next persons are ready for their service time.

**5 CONCLUSION**

We concluded that in is a process a smaller number of people are served. Most of the time is wasted in the queues and waiting areas. These things cause the crowd outside the jail and in the building. This increases the headache of the policemen and the wastage of the time. Is a process containing a huge



amount of the headache and the wastage of the time. Now a days everyone prefers the smart work and less costly than the hard. People prefer less effort and much output. Is a process is failed when the real figure of the data is given to the simulation model and analyzed it carefully.

We find the solution of this problem. The strategy we applied for the system solution are tested in the simulation. The strategy is that if all the persons are assigned with the token and the time of arrival first. That token will also perform the verification of the person. Only the person has to wait in the checking queue that is much important for all the safety measurement. Otherwise, there should be no queue and no waiting in the waiting area. The person will directly come and go to the prison to meet the inmate. This process gave the advantage to the police department in case of less headache to manage them in queues and in the waiting area. They just have to tackle them in the checking queue. On the other hand, advantage for the people, all of them don't have to wait for too much in futile, outside the jail or inside the jail in wait for their turn. So, the result come out that our purposed solution addresses this problem and leads to successful development of the inmate meeting system.

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