# CHAPTER 3: ANALYSIS

## 3.1 Introduction

This chapter, the analysis phase is where the student studies or evaluates the system currently in use for GTSOA vehicle operations. The student will employ different data gathering techniques and these will aid in understanding the current system in use. Understanding the current system will help realise its weakness and brainstorm on possible solutions. One best solution and implementation method will be selected thereafter.

## 3.2 Information Gathering Methodologies

As stated earlier the student will need data and information to understand the current system in use and that is where information gathering techniques come in. Information gathering techniques are the methods or processes used to create and organise data from different sources into meaningful information that can be used for decision making. These methods and processes include interviews, brainstorming, on site observations, surveys and record inspections. To be able to obtain as much information as possible the student shall make use of all the techniques.

### 3.2.1 Interviews

Interviews are an information gathering technique in which the researcher, referred to as the interviewer in this case asks the respondents a set of questions to acquire the desired information. The interviewer asks questions and the respondents answer. Interviews can be either be structured or unstructured. Structured interviews are interviews where the interviewer follows only the set questions and cannot diverge from them whereas an unstructured interview is where the interview questions are subject to change depending on the interviewee or the response made by the interviewee. Eight interviews were carried out with the various stakeholders of this project and the breakdown of the interviews are as follows

One structured interview with a transport operator

One unstructured interview with a transport operator

One structured interview with a passenger

One unstructured interview with a passenger

One structured interview with a driver

One unstructured interview with a driver

One structured interview with a conductor

One unstructured interview with a conductor

#### Advantages

Interviews make the stakeholder feel involved in a project and thus increasing the chances of the stakeholder liking the project

Interviews yield more meaningful information especially in cases where the researcher does not fully understand the business operations

Ability to capture non-verbal cues

#### Disadvantages

Interviews are time consuming as the developer has to arrange sessions for different individuals

Relatively high costs

The data collection and analysis process is difficult

### 3.2.2 Brainstorming

Brainstorming is not only a fact gathering technique but it also seeks to find solutions for the problems identified during a talk session of a group of people. (Osborn, 2013).

#### Advantages

It is a great way to generate new ideas and innovations

More insights from the participants

It is an approach which avoids conflict

#### Disadvantages

It may be time consuming

Participants may be unwilling to contribute

Requires a facilitator for it to be successful

The researcher carried out three brainstorming sessions. For the first one the student was alone with internet and research was carried out from other countries like the United Kingdom and South Africa that have already implemented the service. The student also read articles, journals and research papers discussing the automated fare collection topic. The second brainstorming session was carried out with fellow students in the same level as the researcher. In this session the researcher introduced the research topic to the other students and they exchanged ideas on the topic which the student was taking note of. The last brainstorming session was carried with two transport operators, a software engineer and the student.

### 3.2.3 Surveys

Surveys are a data collection method to get the opinions and views of a group of people by providing them a set of questions they have to respond to. The researcher put the survey on a web link and sent the link to many WhatsApp groups asking passengers to help with responses. Another link was also sent to Transport Operators who had failed to get the interview opportunity.

#### Advantages

Surveys are a quick method to get responses in a short time

Surveys are time saving

Questions can be tailored for differing stakeholders in a project

#### Disadvantages

Some people expected to respond may not respond

There is possibility of bias due to low response rate

There may be need for translation and explanation to the respondents

### 3.2.4 Onsite Observations

These are findings made from the operation site. For this to be successful a data collector has to be physically on the site where the operations take place and observe how the operations are carried out. The researcher noted these findings at Shurugwi-Chachacha Rank which is situated on Corner Seventh Street and Leopold Takawira Street and boarded one random minibus to Shurugwi and made more observations on the road.

#### Advantages

It gives the researcher undistorted information

#### Disadvantages

People being observed can fake how they operate because they will be knowing they are being monitored

## 3.3 Analysis of the Existing System

Through all the information gathering techniques an analysis of the current system was being made by the researcher and the researcher managed to understand the system. This section will give a detailed account of the current system.

**3.3.1 Description of the current system**

The system begins with a passenger boarding a minibus from a pickup point to a desired destination. The passenger pays the amount set by the conductor and on receiving the money, the conductor writes and issues a bus ticket. On dropping off the passenger shows the conductor the ticket and the conductor has to verify if truly the destination on the ticket is correct. The conductor then logs the operations report of the day that includes the revenue collections made for different trips. These log sheets are submitted to the transport operator on cashing in and the transport operator has to verify if the ticket book amounts tally with the cashed in revenue and amounts recorded on log sheets.

The current system has many loopholes and prone to losing revenue in that, the conductor is the one who determines the bus fare for a pick up point and intended destination. Staff can also easily manipulate the log sheets to match the cashed in revenue which may not be the true revenue collected. Transport operators and fleet managers manually inspect fraud from the ticket books and this is very difficult to carry out and as a result they do not do it at most times.

## 3.4 Process Analysis

Process analysis is the evaluation of business processes in an organisation in a bid to identify their occurrence, faults, deficiencies and weaknesses. There are different methods to carry out process analysis and these include activity diagrams and flowchart diagrams.

### 3.4.1 Activity Diagram

An activity diagram is a visual representation of flow of actions in a system. It can also be referred to as an operation of a system.

Collect Birth Record

Registrar Department

Check Paperwork

In Order?

No

Yes

Fill out forms

Collect Birth Certificate

Fig 3.1 Activity Diagram

## 3.5 Data Analysis

Data analysis is an intense look and study on how data flows through the business processes of an organisation. Data analysis for the current system will be represented through a context diagram and a data flow diagram (DFD).

### 3.5.1 Context Diagram

Simson and Witt (2005) define a context diagram as a diagram that depicts how a system or a part of a system interact with the different entities of a system. Context diagrams are necessary to identify the boundaries of the system and scope under investigation.

Post Natal Ward

Delivery Reports

register

Details Delivery register

Registrar department

Health Information dept

Registration Birth Confirmation

Details Birth certificate

Clients

Fig 3.2 Context Diagram

### 3.5.2 Data Flow Diagram

A DFD is a diagram illustrating how data is processed by the different system processes. It focuses on the flow of data in and out of a process. Data flows into a process as an input and out of a process as output. A DFD also shows the storage of data.

provides

Client

Information

Delivery register

Nurse

Update delivery reg

Update

Compile delivery information

Compiles

HIO

Birth rec register

Write Birth Record

Collect Birth Record Stores in

Submit application

Completes

Application register

Registrar

Application process

Print Birth Certificate

Birth Certificate

Fig 3.4 Dataflow Diagram

## 3.6 Weakness of the Current System

A deep analysis of the current system revealed the following weaknesses to the researcher:

**Unfair charging of customers**

Conductors are the ones who are on the ground dealing with ticketing passengers and hence determine the fares and this results in conductors unfairly charging customers so as to steal money.

**Loss of Revenue**

Revenue is being lost to the transport operators as they have an inefficient method to inspect the log sheets and ticket books to determine the revenue to be cashed in.

**Poor service delivery**

The transport industry is one of the industries in Zimbabwe where acceptance of plastic money is still an issue, but plastic money has become the easily accessible money for use as citizens are struggling with withdrawing cash from banks.

## 3.7 Evaluation of Alternatives

Different alternative solutions are available for the researcher to solve the problems being faced because of the current system. The alternatives are outsourcing, improving the current system and in-house development. Each alternative has its own advantages and disadvantages and this section aims to evaluate the most suitable alternative solution to implement.

### 3.7.1 Outsourcing

Outsourcing refers to finding and external service provider to purchase a system from for use in an organisation’s service delivery. The company providing the service is known as the vendor or third party or service provider. In ICT, organisations usually outsource from vendors well versed in software engineering and with readymade software for use.

#### Advantages

The third party usually specialize in the area thus more efficient services provided

Organisations has chance to expend its energy on their core competencies

Organisations outsource if the in-house team is not efficient to produce a required product

Outsourcing is fats to obtain the desired result

#### Disadvantages

It is at most times expensive

There may be difficulty in communication and collaboration between the vendor and the organisation

Intellectual property and concept may be owned by the vendor

### 3.7.2 Improvement of the Existing System

This alternative focuses on the weaknesses of the current system only and seeks to only find solutions that eliminate those weaknesses. The whole system is not changed or heavily altered.

#### Advantages

It is at most times the cheap option

It is faster to implement

#### Disadvantages

It is usually a short-term solution

It may be more expensive in the long run

### 3.7.3 In-house Development

This is when the IT department of an organisation is tasked to develop a system for use in business operations; a system which eliminates the weaknesses of the current system. This method is applicable for organisations with the required IT skill.

#### Advantages

The intellectual property and concept is safe with the employees of the organisation than outsiders

Better collaboration and communication between developers and users to achieve system goals as they are all members of the same organisation

Costs are generally low

#### Disadvantages

The IT department personnel can lack the required skills

Organisation can lack all the desired resources for developing the system

The chosen alternative is in-house development and the reasons for choosing the alternative are that the expenses are generally lower and the resources for the project are affordable. It is a more permanent solution compared to just improving the current system.

## 3.8 Requirements Analysis

Requirements analysis is the field of software engineering that deals with identifying the needs, wants or conditions to meet for a new product or project. Requirements can be classified as either functional or non-functional.

### 3.8.1 Functional Requirements

Functional requirements are the processes that that the system must do in order to carry out the business operations. The functional requirements in this project are a device that can

track a vehicle’s locations and movements and

when a passenger boards a vehicle take note of the pickup point so as to determine the amount the passenger should pay on dropping off.

The device will be monitored by a web application that can

set the fares,

track vehicle locations

report vehicle operations and

make analysis of vehicle operations and help in decision making

### 3.8.2 Non-Functional Requirements

These are system requirements that do not necessarily do a business operation but specify criteria for judging the operation and efficiency of a system. They are behaviours that a system has to possess. These include

Performance

Availability

Reliability

Recoverability

Durability

Scalability

Usability

Security

Interoperability

## 3.9 Conclusion

This chapter focused on an intense study and analysis of the current system through the different information gathering techniques. The gathered information was summarised through different process and data analysis techniques. Weaknesses of the system were identified and the different alternative solutions were evaluated to pick the most suitable solution. Different functional and non-functional requirements were identified. The next chapter the design phase focuses on designing a conceptual design of the solution.