

DESIGN AND DEVELOPMENT OF MARKET TRADING SPACE SYSTEM

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Abstract

The increase in the production of information that needs to be well managed, maintained and referenced with high efficiency by organizations at any given time, have given rise to the development of computer applications that are specific thus reducing if not all the problems that arise without such applications in place. Situations that especially involve management of a scarce resource that a large number of people need to share soon become very critical and require a high level of integrity in its management. This is the situation that characterizes the trend in many Zambian Markets which are seeing traders increase by the day causing scrambling for trading space whenever the situation is left to take care of itself. With the preceding information just above, a scene for the birth to the project entitled Design and Development of Market Trading Space was set. The design and Development of Market Trading Space System is a project which was undertaken to reverse the undesirable effects of manual market trading space management system in use by the Chingola District Council which includes but not limited to these challenges inefficiency, one trading space allocated to many vendors and lack of proper records for reference. The final product is a web-based application that enables prospective marketers to apply online for market space stating their business space

requirements such as size wherever they may be. In many situations where sharing scarce resources is involved, in this case, trading space, fair allocation follows first come first serve and that's what the ultimate solution intended to provide. This requires tracking what space has been allocated and which is available. This will be part of the solution too.

Therefore, it was designed to take care of the flaws in the manual systems of Market Space Management. This is a final report that has explained this project from its inception to its completion covering the following main areas: Study of the current manual allocation, an activity which yielded the requirements for the new system, Study of other market managements in use elsewhere-a task that provided a perspective on this project, Analysis of the requirements from which use cases and other analysis tools were developed, Design and Implementation which is a phase that produced the final tested product. The report also shows how the system will be used by availing the prospective users who are herein identified as Traders or vendors, System Administrators and Market Staff will be guided utilizing a user guide which is included in the report.

Key Phases: *Trading space, Allocation, Application, Market levy, Design, Project, Marketers*

1.1 Introduction

The use of ICT has taken center stage in the day to day lives hence the need to design and develop market trading space that would bring about trading space management and allocation efficiency. This research will look at the undesirable effects of manual market trading space management system in use by the Chingola District Council of Chingola which include but not limited to these challenges inefficiency, one trading space allocated to many vendors and lack of proper records for reference. The final product is a web-based application which enables prospective marketers to apply online for market space stating their business space requirements such as size wherever they may be. This process will create an account which the applicant will be using to check if the application is successful or not. Once this is done an application number will be generated for the applicant and stored for comparison when he or she makes actual payment. Then depending on the number of available space, the allocation of space for all successful applicants will then be done on the first come first serve basis. To avoid allocating of one space to more than one trader, the system will be taking note of spaces allocated and those available. When all the space is exhausted and available notifications will be given to the applicants whenever they access their accounts. With this system, all traders will be registered their total number. It will also enable the council to account accurately for the revenue collections

by day, month and even a year. The project intends to reduce the cost of operation by reducing the number of personnel and much paperwork which is a bad combination as far as efficiency and accuracy of trading space management are concerned.

In many situations where sharing scarce resources is involved, in this case, trading space, fair allocation follows first come first serve and that's what the ultimate solution intended to provide. This requires tracking what space has been allocated and that which is available. This will be part of the solution too. Therefore, the Market Trading Space System will ultimately ease some of the problems faced by a good number of traders or marketers by offering them yet another state of the art and impeccable option to apply for the trading space with a refreshing and reassuring feeling of not being in a waiting list but being aware that they have successfully applied for the space when they receive a feedback online.

1.2 Motivation and Significance of the Study

Zambia like any other African country is facing a very difficult challenge of formal employment. Consequently, the large number of its citizens is finding solace at least through self-employment by becoming vendors. This situation has seen an influx of traders grow in residential areas, streets, and most especially main markets. This exactly describes what has become most of the markets in Chingola District. These markets are growing fast and becoming busy every single day in the

district. The Markets also serve as bus stations that serve many of the major and minor routes in the district. It has several Wholesale and retail shops that serve the insatiable consumers. Management of these markets is the responsibility of the Chingola District Council which is under the ministry of a local government ministry. The traders pay market levy regardless of whether the trader is a shop owner or not. This levy is used in the maintenance of the market and general market management.

This study aims to provide a lasting solution to such issues by way of designing and implementation of Market Trading Space System that would bring about trading space management and allocation efficiency.

Therefore, the significance of this study is as follows:

- Providing a faster and easier option of applying for trading space and processing. If your computer at your desk or mobile form is internet-enabled, you are as good as being at the Chingola District council applying for space. It is as easy as filling in the form and submitting it.
- Reducing administration and service consultant's time to attend to every walk-in trader. This will give these workers enough time to attend to other equally important business activities.
- Speeding up application processing and improving accuracy. The system will be

web-based with a database therefore report generation and data retrieval will not only be improved but accurate.

- Providing a user-friendly system and a good interface for users of the system. The Market Trading Space System capacity will be online and readily accessible.
- Promoting multi-user application of space although it will reduce face to face communication. This will ensure that users any time will be able to lodge in applications from different places almost at the same time
- By no way substituting the other options rather supplementing the efforts at the convenience of the prospective traders.
- Offering a more centralized method for monitoring of trading space areas and identification of spaces which have high demands

The study should also contribute to the pool of knowledge that can be utilized by interested individual's quest for improving service delivery by Chingola District Council through embracing ICT.

In this fast-growing information age, Chingola District Council cannot afford to continue using a manual system that does not only fail to embrace its mission but also which has a lot of problems in the capture, storage, and processing of applications.

1.3 Scope

The research was conducted on the Copperbelt Province in particular Chingola District one of the towns in Zambia. A baseline study was done on one of the largest markets in the district namely Chiwempala Market. The result of this study is to find a solution to the problems that will be identified to build the new system, the Market Trading Space System, that will ultimately ease some of the problems faced by a good number of traders or marketers by offering them yet another state of the art and impeccable option to apply for the trading space with a refreshing and reassuring feeling of not being in a waiting list but being aware that they have successfully applied for the space when they receive a feedback online. In this fast-growing information age, Chingola District Council cannot afford to continue using a manual system that does not only fail to embrace its mission but also which has a lot of problems in the capture, storage, and processing of applications.

1.4 Problem Statement

Management of these markets is manually done at times with the involvement of political cadres who make it difficult for the Local Council to manage the trading space efficiently and with integrity. Currently, a prospective trader applies to trade space in writing. Then if that application is successful the trader pays a lease fee. Under normal circumstances, the allocation of stands and space should be done on a first come first serve basis. But oftentimes this is not the case as

fight and contentions are seen because the administration of the city often has failed to follow this expected and fair rule. Other problems include inefficient allocation process of trading space due to the bureaucracy of handling the applications. Sometimes the administration may allocate one space to more than one person thereby creating contentions. Vendors can often be seen to encroach on each other's trading space. Also, there is a failure to know the number of vendors at any given time which creates problems in maintaining Hygiene.

1.5 Aim

To design an intelligent market trading space that would bring about trading space management and allocation efficiency. It is a web-based application that enables prospective marketers to apply online for market space stating their business space requirements such as size wherever they may be. The process will create an account which the applicant will be used to check if the application is successful or not.

1.6 Objectives

The specific objectives that will enable the achievement this objective are as follows:

- ✓ To design and develop the market trading space system for Chingola District Council.
- ✓ Speeding up application processing and improving accuracy. The system will be web-based with a database, therefore, report generation and

data retrieval will not only be improved but accurate

✓ Providing a faster and easier option of applying for trading space and processing. If your computer at your desk or mobile form is internet-enabled, you are as good as being at the Chingola District council applying for space. It is as easy as filling in the form and submitting it.

✓ Reducing administration and service consultant's time to attend to every walk-in trader. This will give these workers enough time to attend to other equally important business activities.

✓ Providing a user-friendly system and a good interface for users of the system. The Market Trading Space System capacity will be online and readily accessible.

✓ Promoting multi-user application of space although it will reduce face to face communication. This will ensure that users any time will be able to lodge in applications from different places almost at the same time

✓ By no way substituting the other options rather supplementing the efforts at the convenience of the prospective traders.

✓ Offering a more centralized method for monitoring of trading space areas and identification of spaces which have high demands.

1.7 Research Questions

It is hypothesized that the new computerized web-based Market Trading Space System will greatly improve the quality of service provided by the Zambian government through the Chingola District Council towards the provision of trading spaces at the markets.

Research questions that the study sought to answer were:

- i) How does the current system affect the operations of the Chingola District Council Markets?
- ii) What improvement can a computerized web-based system make?

1.8 Research Contributions

The vision of the research and other related processes is to design and develop a system that will eliminate the problems that Chingola District Council is currently facing in the administration and management of markets. A qualitative data collection and analysis approach was used to understand the current system and to formulate a new system that will be able to solve the problems with the current system.

Methodology and Design

3.1 Introduction

The development of software using non structured approach in the past led to poorly constructed, difficult to manage and control systems. Applying development methodology to software development has several advantages which Dawson (2009:115) identified as:

- A large problem is divided into easy to understand tasks at each stage
- It leads to a more focused approach
- Facilitates planning and control which ultimately improve time estimates
- Progress is easily seen in the development
- Results in better coding and documentation.

Therefore, in this research, we shall use the exploratory technique. This is because the data will be collected through questionnaires, interviews and reviewing archive records.

Exploratory Research

Exploratory research is often conducted when the problem is not well known or it has not been clearly defined as yet, or its real scope is as yet unclear. It allows the researcher to gather the information as much as possible concerning a specific problem.

Exploratory research, as the name implies, intends merely to explore the research questions and does not intend to offer final and conclusive solutions to existing problems. This type of research is usually conducted to study a problem that has not been clearly defined yet.

Conducted to determine the nature of the problem, exploratory research is not intended to provide conclusive evidence, but helps us to have a better understanding of the problem. When conducting exploratory research, the researcher ought to be willing to change his/her direction as a result of the revelation of new data and new insights.

Exploratory research design does not aim to

provide the final and conclusive answers to the research questions but merely explores the research topic with varying levels of depth. It has been noted that "exploratory research is the initial research, which forms the basis of more conclusive research. It can even help in determining the research design, sampling methodology and data collection method". Exploratory research "tends to tackle new problems on which little or no previous research has been done". Unstructured interviews are the most popular primary data collection method with exploratory studies.

Examples of Exploratory Research Design

- A study into the role of social networking sites as an effective marketing communication channel
- An investigation into the ways of improvement of quality of trade space allocation within markets in Chingola District.

3.2 Baseline Study

Checklists were used to structure my observation and evaluation of performance. These were simple lists of criteria that were marked as present or absent of any Information technology aspects and also provided space for future comments. Most of the data about the current system were collected through observations. This was done by observing the officers perform their work and also, the documents. An in-depth description of a process, experience, and structure at Chingola District Council was carried

out to answer a combination of 'what' and 'why' questions.

3.2.1 Data Collection

As mentioned earlier, from primary sources data was collected by me as the researcher and also data was gathered through case studies, interviews, and observations. However, secondary sources (data collected, compiled and written by others), i.e. books, journals, and any other references have been acknowledged in this report.

3.2.2 Research Approach

A qualitative approach was undertaken and required gathering relevant data from the specified documents and compiling checklists to analyze the material and arrive at a more complete understanding and historical reconstruction of the experience of users and other stakeholders of the system. I had to shed more light on the research objectives and expanded the research question as follows:

- ✓ What problems (if any) do systems users face? (market staff and traders)
- ✓ What problems (if any) do other systems stakeholders face?
- ✓ What is it that can be done to get rid of these challenges?
- ✓ What are the inputs to the system?
- ✓ How possible is it to come up with a web-based computerized the Market Trading Space System?
- ✓

3.2.3 Development of the Application

This section describes the system development life cycle that was used to develop the application. A systems development life cycle (SDLC) is an outline that is used to describe the stages of developing an information system. These software development systems models include the waterfall model, rapid application development model, the spiral model, the incremental model, and the prototype model. These life cycle models are also known as predictive life cycles because the latitude of the projects can be clearly expressed and the schedule and the cost can precisely be predicted. A lot of time is used by the project team, to clarify the requirements of the entire system and then producing a design. For an extended period, users are often unable to see any real results in terms of the working software.

On the other hand, the Adaptive Software development (ASD) life cycle models, which are the opposite of the Predictive life cycle models, assume that software development follows an adaptive approach because the requirements cannot be clearly expressed early in the life cycle. Unlike the predictive approaches, the adaptive approach offers more freedom to create components that provide functionality that is specified by the business group, using a freer form approach.

The development of software using non structured approach in the past led to poorly constructed, difficult to manage and control systems. Applying development methodology to

software development has several advantages which Dawson (2009:115) identified as:

- i) A large problem is divided into easy to understand tasks at each stage
- ii) It leads to a more focused approach
- iii) Facilitates planning and control which ultimately improve time estimates
- iv) Progress is easily seen in the development
- v) Results in better coding and documentation.

Therefore, the development methodology which was deemed fit was an incremental model because several components could easily be identified and then designed modularly. Time too was very limited and so it would be better to do it incrementally.

Incremental Model

With this approach, the system is delivered not as a fully functional product but as a series of intermediate working sub-systems over some time. Functionality is then incrementally added at every release of a sub-system and finally, the whole functioning system is ultimately developed.

Suitability

Appropriate where requirements are clearly defined and understood.

Advantages

According to Dawson (2009:124) this method has the following advantages:

- i) The user gets something early so that they can get an idea of the system capabilities and an idea of what the developer can produce.

- ii) There is great motivation when an early achievement is made on the part of the developer and the client is assured of the progress.
- iii) It facilitates planning and management of the project more effectively since it breaks down the development into several deliverables of which each can then be planned for in terms of time.
- iv) User training of the system takes place in stages of the functioning completed sub-systems and so they do not have to learn the whole completed system at once.

Disadvantages

- i) Components of the program may not be easily identified worth delivering in stages.
- ii) It may lead to users to identify so many improvements that might risk the project losing direction may take long to implement and consequently delay completion.

3.3.5 Modular design of the System functions

Introduction

This is a phase in which the requirement specified will be converted into a visible workable solution. The design will follow the functionality available for each user profile. Reference is specially made to the Universal Unified Modelling Language (UML) use case diagram in section Error! Reference source not found...

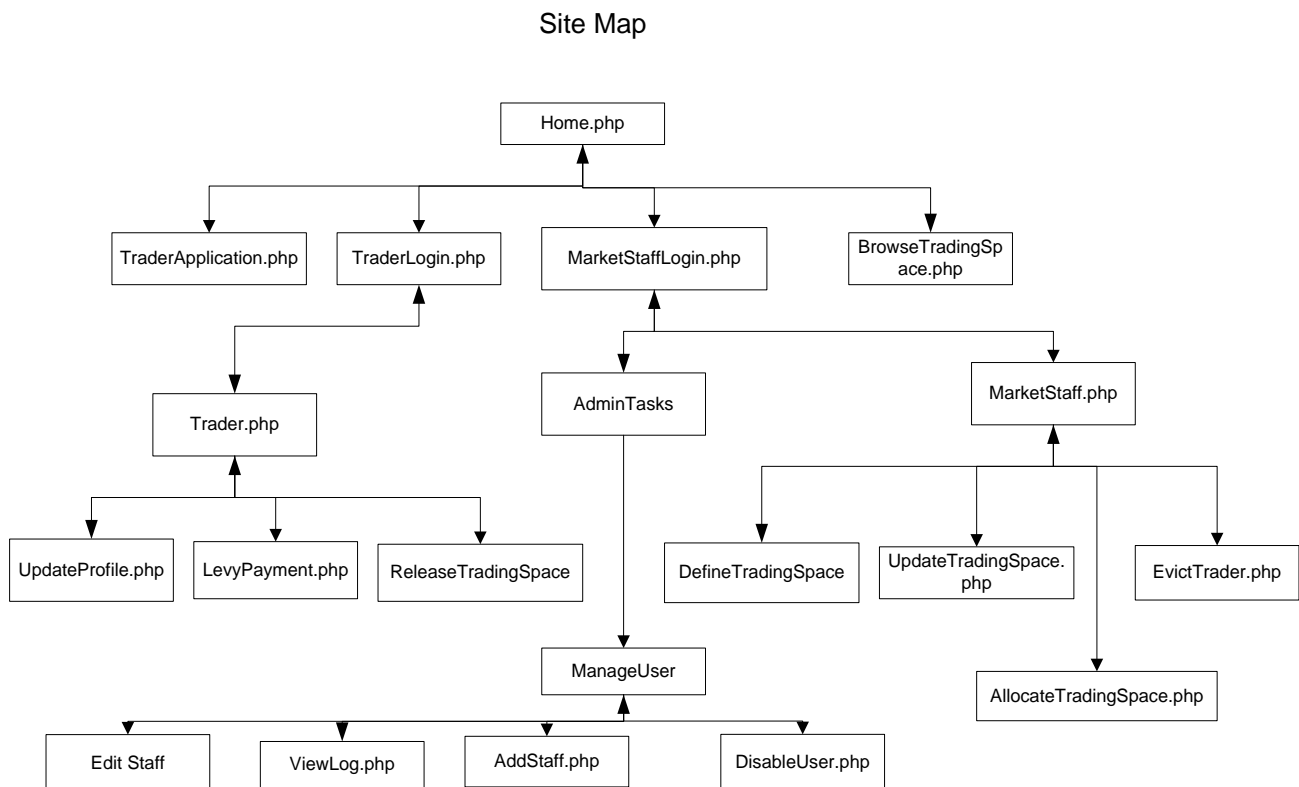
Front End Design Specification

Front end in this application refers to all the

visible part of the application with which the users interact. From the use case, the interactions of the actors with the system provide the as to what each user profile would appear.

As proposed Intelligent Market Trading Space Manager would be web-based and as such the way users interact with system use cases provides

a clue to the expected site map. A site map according to Rouse M (2005) is a visual or textually organized model of a Web site's content that allows the users to navigate through the site to find the information they are looking for. Below the site map design, the blueprint is illustrated.



The site map shown has been designed according to the user's point of view in terms of his or her navigation. It must be noted that other pages are not appearing in the site map that provides a response to the user and those that process requests.

Trader Profile

Trader will have access to the following screens:

i. Browse Trading Space

The screen will allow a trader to browse for the desired type of trading space. There will be no need for the user to be authenticated to do this.

ii. Trader login screen

A Trader will be expected to enter his username and password to access his

specialized screen master screen called Trader screen. The specialized screen will provide access to yet these other screens:

i) Update profile

Here users will be able to provide changes for instance residential address, business type password change.

ii) Levy Payment Screen

This page will allow users to pay market levy required of them by the authorities. It should be noted here that ePayment is at the moment not going to be implemented. They will just need to type in the amount to simulate online payment.

iii) Release Trading Space Screen

This will allow traders to release trading space voluntarily.

iv) Trader Application Screen

It is here where a prospective trader register and apply for the trading space of his or her choice including setting their login credentials.

Market Staff Profile

A market staff is a registered employee of the Chingola District Council and he will have access to the following screens besides Browse Trading Space and Trader Application screens which are accessed by everyone:

✓ **Market Staff Login Screen**

The staff will type username and password to have access to a market staff master screen called **Market Staff**. The screen will provide links to other more specialised screens as follows:

✓ **Define Trading Space Screen**

The screen will allow authenticated market staff to define trading space its size and type. This will be one of the initial activities to be performed.

✓ **Update Trading Space Screen**

This will allow a member of staff to search for and amend some details patterning to the trading space in question for example whether there is a stall or not.

✓ **Reposses Trading Space from Trader**

When the need arises for instance illegal trading of products not allowed by law the market staff will vacate trader, it is this screen which will allow a market staff to do so.

✓ **Allocate Trading Space**

It will be on this screen that the market staff will be approving applications made for trading space and assigning them to successful applicants.

Administrator Profile

The administrator who is still also a registered employee will have access to the following

screens beside Browse Trading Space, Market Staff login and Application for trading Space:

✓ **Add User Screen**

This will allow the administrator to register every new employee of the Market.

✓ **Remove User Screen**

This allow the administrator to remove the user from the system when the need arise.

✓ **Edit User Details**

This will allow the administrator to search and edit the particular user's details.

✓ **View User Log**

This will enable the administrator to check for who did what and at what time.

Back End Design Specification

This section provides a back end data model of the entities involved in the system and their overall relationships which will not be visible to the users of the system. A data model is a database that will store all the attributes of the entities to be modeled. Connolly and Begg (2010:15) define a database as a shared collection

place, thing, concept, or event) in the organization that is to be represented in the database. The occurrence of an entity called instances share the same attributes or characteristics.

System Design

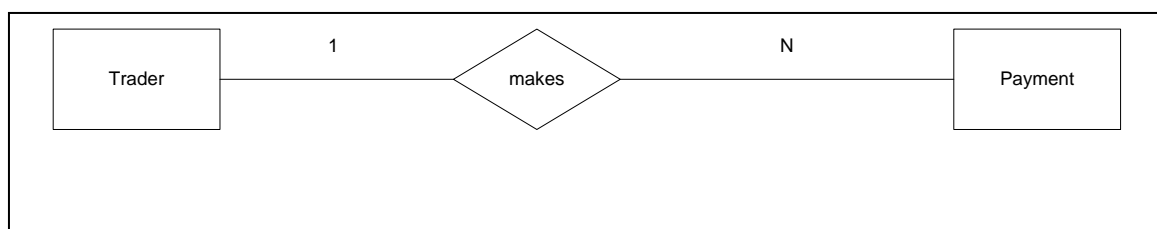
This part deals with the conversion of the specifications both functional and non-functional into design specifications and then shows how the implementation was done. A system analysis was done to determine the requirements of the system. Design techniques employed include ERD and Site maps.

3.8.2 Entity Relationship Diagram (ERD)

This is an abstract universal modelling language tool that shows the entity types and their relationships. Relationships can be Unary which involves a single entity type, Dual involving two entity types and Ternary which involves three entity types.

For example, the relationship between Trader entity and Payment entity or concept can be illustrated this way using Chen Notation:

1 and N implies that existence of Trader can be



of logically related data and its description designed to meet the information needs of an organization and an entity as a distinct (a person,

many payments.

RESULTS

4.1 Introduction

This chapter will present the outcome of the researcher's data collection and analysis, clearly projecting the view of affected individuals with the current system a qualitative data analysis approach was used to understand the current system and to formulate the new system that will be able to solve the problems with the current system. Finally, we look at the results of the survey that enabled us to determine the design and development of Market Trading Space.

4.2 Baseline Study

The vision of the research and other related processes was to design and develop a system that should eliminate the problems that the Chingola District Council is currently facing in the management of Markets. The researcher or developer collected data in three different ways:

i) Observations

First observed the manual reports from the system, the activities concerning the trading space application at Chiwempala Market as our baseline of study.

ii) Structured Interviews

50 people from both the market and traders or vendors were interviewed to get their views about the current system and access their feelings concerning the new system.

iii) Case studies

Case studies involving multiple cases within collected data from observations and interviews were used to build upon theory, to produce new theory, to dispute or challenge theory, to explain a situation, to provide a basis to apply solutions to situations, to explore, and to describe an object or experience.

4.3 Results of Structured Interviews

The following questions constituted the structured interview together with the results of the interview

Question1. What does it take to acquire a trading space?

Response	Number of Responses	Percentage
Formal Application	10	20%
Through Friends	5	10%
Can't tell	35	70%
Total	50	100%

Table 1 – how it takes to acquire a trading space (source: structured interview)

Explanation: The above (table1) indicates the percentages for current system users on how it takes to acquire a trading space on average they

could take to compile a statistical report. Only 10 % of the traders went through the normal channel of application and about 20% of the traders used their friends to acquire the trading space. 70% of the traders, however, could not tell how they acquired the space.

Question 2 Does reliable record exists for all the traders that use the market?

Responses	Number of Responses	Percentage
Yes	4	20%
No	16	80%
Total	20	100%

Table 2 Does reliable record exists for all the traders (source: structured interview)

Explanation: The above (table 2) indicates the percentages for current system users on how they felt if reliable records exist on the current system. 20 % of the market staff felt reliable records exist on the current system and while 80 % of the staff did not feel that the reliable records exist on the current system.

Question3. Are you satisfied with the procedures put in place?

Responses	Number of Responses	Percentage
Can't tell	1	5%
Yes	5	25%
No	14	70%
Total	20	100%

Table 3 satisfaction with the procedures put in place (source: structured interview)

Explanation: The above (table 3) indicates the percentages for current system users if they are satisfied with the procedures put in place. Only 5 % of the traders felt they cannot tell anything. While 25 % are satisfied with the procedure. 70% of the traders say they are not happy with the procedures.

Question4. What do you suggest can make market trading space allocation simple, efficient and of integrity?

Responses	Number of Responses	Percentage
Apply online	15	75%
Use manual Application	3	15%
Can't tell	2	10%
Total	20	100%

Table 4 suggest can make market trading space allocation simple, efficient and of integrity (source: structured interview)

Explanation: The above table indicates the percentages for current system users on how they suggest can make market trading space allocation simple, efficient and of integrity, .75% of the trader suggested that they can apply online and 15% suggested the use of manual application while 10% could not tell anything tangible.

Question 5: How much space on the filling cabinet is needed to store the manual applications?

Responses	Number of Responses	Percentage
Low	4	20%
High	13	65%
Not sure	3	15%
Total	20	100%

Table 5 - current system storage space requirements (source: structured interview)

Explanation: The table above indicates the percentages on how users of the system felt about the current system's manual file storage space requirements on filling cabinets. Only 15 % of the users said they were not sure as to indicate whether they categorize the requirement as high or low. 20% felt the storage requirements were low while 65% indicated that the space requirements were very high as each application done needed filing space

System Implementation Results

With respect to the interviews, observations and case studies conducted, the research and review of the current system revealed the following activities and facts:

- i) Concerning the interviews, observations and case studies conducted, the research and review of the current system revealed the following activities and facts:

- ii) A written application is required for formal traders to the council office, then pay an initial application fee. Thereafter an applicant has to keep on making follow-ups on the results of the application.
- iii) There are too many applications for limited spaces and so the success of one's application is left to probability.
- iv) The actual traders or vendors in the markets do not reflect the picture of our market records and the reason is that many just get there squeeze themselves and begin trading
- v) There is also no way of knowing which space has been left vacant but all you discover is another trader using the space paying the owner of the space which is a private arrangement
- vi) We also feel that there are fewer traders on record than what is actually on the ground which means the market levy does not reflect the expected total levy.
- vii) Also as Chingola District Council staff, we feel there is a mismatch between actual traders and records we have hence creating challenges for us to effect proper logistics for instance in the maintenance of the market premises.

5.4 Conclusion

The issues uncovered in this paper provide a relevant background for those partaking in the development and implementation of the Intelligent Market Space System for the betterment of Chingola District council. The

problem investigated in this research will hope to solve the problem which defines the objectives and scope of the project. The second chapter gives an overview of the researcher's known previous studies and comparative studies. The third chapter articulates on the methodology used by the researcher to collect relevant data and unfolds the population targeted by his research. Though it was a formidable undertaking that has ever been dared, Design and Implementation of the Intelligent Market Trading Space System has provided main lessons to its developer and author's knowledge of conducting an intensive project of this kind and scope.

5.5 Future Works

The developer recommends Chingola District Council as a custodian of market management to adopt technological systems like:

- i) Chingola District Council management should ensure that the Market staffs are trained on the use of technology management systems.
- ii) Chingola District Council management must adopt the Market Trading Space System proposed in this research (to help out the finance department on the easy generation of reports).
- iii) The Council should use the Market Trading Space System as way to reduce pressure and work load on the Market supervisor, which will improve the quality of Market supervisor's work delivery.

iv) The Chingola District Council management should set up a Research and Development department.

v) Chingola District Council management should develop and improve the security module on the administration of the software application

Summary

Although some functionalities could not be achieved which was mainly due to a very short (3 months) project duration time, the project was a success knowing the lessons learnt and some other specification functionalities achieved.

The project here is formally closed and the author points out the lessons learnt in carrying out the project. The strength and weaknesses of the project are discussed also here. The areas of a project where others can pick it up from and improve on are highlighted too.

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