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A Prototype for Project Selection: A Case of Uwezo Fund in Kenya

Karanja Anthony Ng'ang'a

Master of Science in Information Technology

2017

A Prototype for Project Selection: A Case of Uwezo Fund in Kenya

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Adm No: 083873

Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Information Technology at Strathmore University

Faculty of Information Technology

Strathmore University,

Nairobi, Kenya

June, 2017

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Karanja Anthony Ng'ang'a

.....

09 June 2017

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Dedication

I dedicate this to my friends and family especially my wife Mary Nduta, my daughter Amaryah Mary Gathoni and to all Kenyans who would love to see Kenya's public institutions run in a more efficient manner.

Acknowledgements

First of all I would like to thank God for enabling me to go through this course successfully despite the very busy life schedules. I also deeply appreciate my entire family for allowing me time to be away in the evening in order to undertake this Master's program.

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Thanks to all of you and May God bless you

Abstract

Selection of the right project is very crucial in any institution as it enables it to select high priority projects aligned with their strategies. Stakeholders evaluate each project idea and select projects of the highest priority. Despite overwhelming evidence of project selection techniques superiority in selecting projects that yield higher success results, many organizations do not apply them to select projects. Poor project selection reduces the benefits and outcomes derived from projects. The study aimed at developing a project selection prototype that would help select high priority projects at Uwezo fund for funding. The selection criterion used for selecting projects are based on the project requirements. The research is a form of applied research and utilized quantitative research design. The sample size was computed through convenience non-probability sampling. The prototype was developed using Rapid Application Development (RAD) Methodology as it is designed to take advantage of powerful development software's like CASE tools and prototyping and enable speedy prototype development. The prototype developed provided a more effective and efficient way of selecting projects for funding that had high priority and success probability.

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List of Abbreviations / Acronyms

- BCR** - Benefit Cost Ratio
- IRR** - Internal Rate of Return
- NPV** - Present Value (PV) & Net Present Value
- RIO** - Return on Investment

Chapter One: Introduction

1.1 Background of the Study

Project selection is one of the biggest decisions that any organization would have to undertake. It is a process to assess each project idea and select the one with the highest priority (Momanyi, 2013). Once proposals have been received, there are very many factors that are considered before a decision to take any up is made. The most viable option needs to be chosen keeping in mind the goals and requirements of the organization (Stoemmer, 2009). This is also true for funding institutions that fund small and mediums enterprises like hedge funds and even governments.

In Poland, the BGK-managed Urban Development Fund is a financial instrument for facilitating sustainable growth in region's urban and metropolitan areas. The instrument has a very effective selection process whereby the projects selected for facilitation are those that are financially viable, have a social element that is important to the local community and that form a part of an urban integrated development plan (European Investment Bank, 2013). The selection process is keen to only select those projects that meet those and as a result, the fund became very successful and gained recognition for stability among investors in the region.

The same is true in India where the joint initiative between the Un-Habitat and Narotam Sekhsaria Foundation which provided funds to the youth of India who were working on projects that would provide employment and provide solution facing the challenges of urban governance and shelter (Padmini, Oyebanji, & Oyeyinka, 2015). This initiative was only key

in funding those projects whose key focus Among others included urban planning and design, Urban basic services, access to health information and facilities and Housing and Slum Upgrading. The funds also only focused on the youth between the ages of 15 to 32 who lived in cities or towns. This again shows a very keen and precise selection process where only projects that met given creation were selected for funding.

The case is no different is Botswana where the Ministry of Youth, Sport and Culture organized the Youth Development Funds (YDF) which was meant to help the youth venture into economic enterprises(Mwobobia, 2012). The YDF was a 50% loan and 50% grant and is assessible to any Botswana youth in the age bracket of 15-35 year who's unemployed or underemployed. The prospective entrepreneur needed to provide a well written business plan and a clear profit and loss statement among several other requirements to qualify for the funds. A clear selection criterion is once again seen here as the YDF aimed to fund only those projects that were viable and had high chances of success.

In Kenya, the government has availed various platforms for the youth and women to acquire such funds, Uwezo fund being latest on their provisions as of September 2013. Uwezo fund was aimed at proving financial support to youth, women and persons with disabilities at the constituency levels in line with the vision 2030 as well as building their capacity. Among other objectives, the government aimed to achieve through provision of the Uwezo fund expansion of access to finances, generate gainful self-employment among the women and youth and grow the economy. Among the requirement for qualification of the funds include that the groups be registered with the department of social services and comprises of members of ages between 15 to 35 (Uwezo Oversight Board, 2016).

The success of the objectives Uwezo Fund sets to achieve is directly linked to the success of the projects selected for funding. A great majority of the projects funded ,90%, have not revolved any cent back, which goes to show that the projects are not doing well (Musau, 2016). To ensure a high success rate of the projects selected for funding, there is need to have a good selection model that can be employed to see to it. The current application method does not include any specific metric that can be used to measure the probabilities of the projects success and to which magnitudes. They only include some general questions about the applicants.

Moreover, a study that sought to examine the project selection process among local authorities by Asaka, Aila, Odera and Abongo (2011) revealed that no structured models for prioritizing projects existed. The study further found out that no structured models for prioritizing projects existed and that managers tasked with the duty of selecting projects had limited skills in project selection and implementation. The same was discovered for constituency development fund (CDF) by Tshangana (2010) whereby resources were not flowing to the intended beneficiaries due to improper influence by Members of Parliaments on the project selection process. This shows that proper project selection process has direct impact on the success and quality of projects selected.

1.2 Problem Statement

In many cases, the prioritization of projects selection is not usually clearly defined and often projects are selected based on a subjective approach (Nee, 2009). In Nigeria, Diugwu, Mohammed and Baba (2015) found that poor project selection reduced the benefits and outcome derived from projects. The study revealed that deficient project selection practices resulted in development of poor projects. There is therefore need to have a standard and clearly defined criterion for prioritization and selection of projects (Nee, 2009). This will rid the selection process off subjectivity and ensure that all projects are selected in a disciplined, consistent manner and relative to each other and ensure selection of high priority projects (Nee, 2009).

1.3 Research Objectives

- i. To analyze factors considered during projects selection.
- ii. To analyze models and algorithms used for projects selection.
- iii. To develop a prototype for projects selection.
- iv. To test the prototype

1.4 Research Questions

- i. What are the factors considered in projects selection?
- ii. What are the models and algorithms used for projects selection?
- iii. How will a prototype for projects selection be developed?
- v. How will the prototype be tested?

1.5 Justification

Poor projects selection techniques lead to funding of poor projects that end up failing. This causes loss of money as the projects funded are not able to repay the funds. It also deprives the community of good and beneficial projects that could better solve existing problems and improve their lives in general.

1.6 Scope & Limitations

The research was focused on developing a prototype that would aid in projects selection. The prototype focused on selection of projects to fund for Uwezo Fund. The researcher wished to develop a fully functional system. However, due to limitations of time and other resources, the final product was a prototype covering only the basic functionalities.

Chapter Two: Literature Review

2.1 Introduction

A Project typically has a distinct mission that it is designed to achieve and a clear termination point which is when it has achieved its goals or objectives (Ridenour, Newman, & DeMarco, 2003). Projects involve a wide range of complex activities that use varied resources. All projects differ in their nature, size, objectives, complexity and time duration. However, all projects possess some similar attributes which include a specific course of action, specific objectives and a definite time perspective (Bakouros & Kelessidis, 2000).

Project selection is the process of carefully assessing proposed projects to select those of high priority, that align better with the overall goals and objectives of an organization among competing proposals(Authority, 2007). For there to be a free and fair selection process on all projects, there is a need to have a consistent model of making decision free of human bias. Clear metrics and criterions for their selection need be discussed and agreed upon by all relevant personnel. Before any project can be selected for funding, an application need first be done, and it is during the application process that key specific metric for selection is captured (Bakouros & Kelessidis, 2000).

2.2 Factors Considered During Projects Selection

During projects selection, various factors came into play before the final decision is made. The more complex a project is the challenging the selection process. It is essential to ensure that the project selected is in line with the organisation's goals (Infrastructure Development, 2014). Some of the factors considered during project selection include:

i. Requirements of the Project

Before the project can be selected, the selecting committee seeks first to understand what the projects at hand requires for its implementation. This is mainly in regards to the resources required. If a project seeks to utilize resources that are far out of reach for the organization then it is not considered. Whereas if a project seeks to utilize resources that are within the organizations means makes a good candidate. It is here that factors like cost of the project, time and manpower are taken into account (Jeffrey & Dennis , 1998).

ii. Feasibility of the projects

Feasibility is basically an analysis and evaluation of the proposed project to determine if is technically feasible and within the estimated cost. It basically checks how a project can be successfully completed within budget to determine if it can work and whether it should be taken up (Wolfe, 2017).

iii. Alignment with organisation's Strategy

For any project to be viable for selection, it must be in line with the organization's' strategy. This means that the project need to be able to push the organization forward in its mandate to achieve its strategic plans. For this to happen it is very important that the stakeholders in the room are well vast with the overall strategy. With the strategy in mind, projects that meet multiple organizational goals are identified as candidates for selection (Jeffrey & Dennis , 1998).

2.3 Approaches for Projects Selection

There is no one simple solution to every complex problem (Mencken, 2017). This therefore goes to show that it would be very challenging to construct one project selection model that would solve all the selection problems. Most selection decision processes involve complex technicalities and each project has its own dynamics to be considered (Infrastructure Development, 2014). The projects selection criteria play a big role in determining which project selection model should be employed.

There are three major projects selection methods which include scoring model, benefit measurement model (Economic model) and mathematical models also known as Constrained Optimization (Mencken, 2017).

2.3.1 Scoring Model

The scoring model as the name suggest evaluates projects and assigns them scores against a certain criterion that need be achieved and then prioritized per their score (Matino, 2009). The criterions with which the projects are checked against could be among many other options like cost analysis, duration analysis and or financial benefits analysis. Inappropriate criterion selection could lead to the failure of the scoring model. It is therefore very curial that the stakeholders build a consensus on the best and most appropriate list of criteria to use for scoring projects against. It is also very important to maintain a short and precise scoring list to avoid developing a long and cumbersome list of criteria that could end up being unmanageable (Matino, 2009).

To construct a scoring model, one must take the following issues into consideration and resolve them. The first one must decide on the form of the model, with certain categories of criteria or factors. Secondly, one must decide and assign each criterion a value of importance and lastly, measurement of each criterion.

A generic scoring model would have the following form:

$$Score = \frac{A(bB + cC + dD)(1 + eE)}{fF(1 + gG)}$$

Equation 2.1 Generic Scoring Model (Matino, 2009)

Where A, B, C, D, E, F, and G symbols in this model represent the criteria to be included in the score for the project. The value of each criterion for a given project is substituted in the formula. The symbols b, c, d, and g represent the weights assigned to each criterion. In the model, the criteria in the numerator are benefits, while the criteria in the denominator are costs or other benefits. The criteria are selected by management, as are the weights. The values of the criteria are project-specific and are normally provided by the project team (Matino, 2009).

2.3.2 Benefit Measurement Method (Economic Models)

Benefits are the measure of the positive outcome from a project. They are most commonly referred to as “the reasons why a project is being done”. If a project yields more positive outcome then it can be said, that project is beneficial. The benefit measurement method is also referred to as the economic model. This is where projects are selected with the aim to realize benefits against the investment made. Here, data is collected consolidated and analysed to measure if the expected benefits will be yielded. Using this method projects are selected based on their present value of investment and revenue generated by the projects. In short, the more benefits a yield, the better its chances of being selected (Deshpande, 2015).

Some of the methods used to predict the viability of the completed projects include:

i. **Benefit Cost Ratio(BCR)**

This is the measure of the running cost of a project vis a viz the expect monetary outcome. The higher the expected outcome in relation to the cost of implementation the better the project.

$$\text{BCR} = \frac{\text{PV}_{\text{benefits}}}{\text{PV}_{\text{costs}}}$$

where:

$\text{PV}_{\text{benefits}}$ = present value of benefits

PV_{costs} = present value of costs

Equation 2.2 Benefit Cost Ratio (Babou, 2010)

Return on Investment (RIO)

The return on investment is basically the percentage of the profit.

$$\text{ROI} = \frac{\text{Total Revenue} - \text{Total Cost}}{\text{Total Cost}} \times 100$$

Equation 2.3 Return on Investment (Babou, 2010)

ii. Present Value (PV) & Net Present Value (NPV)

The net present value is the difference between the market value of a project and its cost. Its aimed to determine how much value is created from undertaking the project.

Net Present Value (NPV)

$$\text{NPV} = \sum_{t=1}^T \frac{\text{Cash Flow}_t}{(1+i)^t} - \text{Initial Cash Investment}$$

t = Cash Flow Period
i = Interest Rate Assumption

Equation 2.4 Net Present Value (Babou, 2010)

iii. Internal Rate of Return (IRR)

Internal rate of return is basically the rate at which the sum discounted cash inflow equals the sum of discounted cash outflow. Otherwise put as the rate at which the discounts the cash flow to zero. Using this, projects are select based on their IRR rate (Babou, 2010).

$$IRR = r_a + \frac{NPV_a (r_b - r_a)}{(NPV_a - NPV_b)}$$

r_a = lower discount rate

r_b = higher discount rate

NPV_a = NPV using the lower discount rate

NPV_b = NPV using the higher discount rate

Equation 2.4 Internal Rate of Return (IRR) (Babou, 2010)

iv. Opportunity Cost

Opportunity cost is basically a comparison of different projects bottom lines and selecting the one that offers better opportunities. That is if at the end of a given time frame project A will yield more that project B, then project A is selected over B (Babou, 2010).

2.3.3 Constrained Optimization Model (Mathematical Models)

The constrained optimization model, also referred to as Mathematical Model is whereby complex mathematical calculations are done before selecting a project. This model is mostly used in complicated and large-scale projects. With this model, best and worst-case scenarios and outcome probabilities are calculated for the various projects and the one with the best outcome is selected (Deshpande, 2015).

Mathematical programming for optimization methods are in many forms which include goal programming, integer programming, linear and non-linear programming and dynamic programming (Heidenberger & Stummer, 1999).

i. Linear Programming Method

Linear Programming Method is whereby the project duration is efficiently reduced with the main of reducing the project cost. This maximizes profits and reduces cost. Project activities are looked at running in their normal time and in their crash time and compared. Running the crash time scenarios enables reduction of the activity time of the entire project. If an activity does not lie in the critical path of the project, it is not considered for crashing. The activities considered for crashing are those that would reduce the entire project's time. Crashing an activity may require addition resource like man power and or machinery, thus careful calculation need to be made so as not to increase the project's cost (Heidenberger & Stummer, 1999).

A general representation of LP model is given as follows:
 Maximize or Minimize, $Z = p_1 x_1 + p_2 x_2 \dots p_n x_n$
 Subject to constraints,
 $w_{11} x_1 + w_{12} x_2 + \dots w_{1n} x_n \leq \text{or} = \text{or} \geq w_1 \dots \dots \dots \text{(i)}$
 $w_{21} x_1 + w_{22} x_2 \dots w_{2n} x_n \leq \text{or} = \text{or} \geq w_2 \dots \dots \dots \text{(ii)}$
 \dots
 \dots
 $w_{m1} x_1 + w_{m2} x_2 + \dots w_{mn} x_n \leq \text{or} = \geq w_m \dots \dots \dots \text{(iii)}$
 Non-negativity constraint,
 $x_i \geq 0$ (where $i = 1, 2, 3 \dots n$)

Equation 2.5 General Linear Programming Model (Deshpande, 2015)

ii. Integer Programming Method

This method looks into selection of projects whose outcome is integer values not fractions. An example in this would be like in the production of cars whereby there can never be a fractional. There are varied types of integer problems which include pure-integer, mixed-integer and binary integer. The pure-integer problems are those that require all decision variables be integer. The mixed-integer on the other hand requires that some are, but not all, in the final solution. The binary integer requires that the integer variable either to be 1 or 0. Such are used in **situations** where a yes or no decision is required (Heidenberger & Stummer, 1999).

$$\begin{aligned}
 & \text{Max } \sum_{m=1}^n c_m x_m \\
 & \text{Subject to:} \\
 & \sum_{m=1}^n a_{mp} x_m = b_p \quad (p = 1, 2, 3, \dots, j), \\
 & x_m \geq 0 \quad (m = 1, 2, 3, \dots, n),
 \end{aligned}$$

Equation 2.6 Integer Programming Method (Heidenberger & Stummer, 1999)

iii. Dynamic Programming Method

Using the Dynamic programming method, a complex problem is broken down into a sequence of simpler problems. It provides a general framework for analysis of many problem types. It uses mathematical technique to make a sequence of correlated decisions and uses systematic procedure to determine the best decisions combinations. There is no standard formula for this model and one must develop their equation per the problems' requirements. There are three main features in the dynamic programming method of project selection Stages, States and Recursive Optimization(Park, 2015).

The stages refer to the multiple 'stages' a problem is structured into. Each stage is solved sequentially and the solution on one stage defines the characteristics of the next. Once a stage has been defined, a States of the process is associated to it. The state of the process is the information one needs to assess the effect the decision has on the future action. This requires creativity and a deep understating of the problem as there are no specific set of rules to follow. However, the number of states should be kept to a minimal because of the computation cost involved and sufficient information should be provided to facilitate future decision making without considering process used to reach the state (Erickson, 2014).

Recursive optimization procedure is built after one has structured the stages and states. It is used to build a solution of up to n number of stages in their specified sequence one at a time. This recursive procedure solves all stages until an overall

optimum solution is available. The recursive procedure can either be based on Forward induction process where it begins with the first stage to the last, or Backward induction process where it begins with the last stage to the first in reverse order (Park, 2015).

iv. Goal Programming Method

Goal programming method is used to solve linear problems with multiple objectives. Each objective is established and assigned a specific numeric value. A hierarchy of importance is established and higher priority goals are done before the others sequentially. The goal programming methods are categorized into two, Non-preemptive goal programming and preemptive goal programming. In Non-preemptive method, all goals are roughly of the same importance and weights are assigned to the goals. A single objective function is constructed to minimize the weighted sum of deviations from goals. On the other hand, in preemptive goal programming, goals have different priorities and are solved sequentially (Heidenberger & Stummer, 1999).

2.4 Conceptual Framework

Based on this literature, the researcher has conceptualized the use of a scoring model for project selection to help the Uwezo funds projects selection process as show in the below.

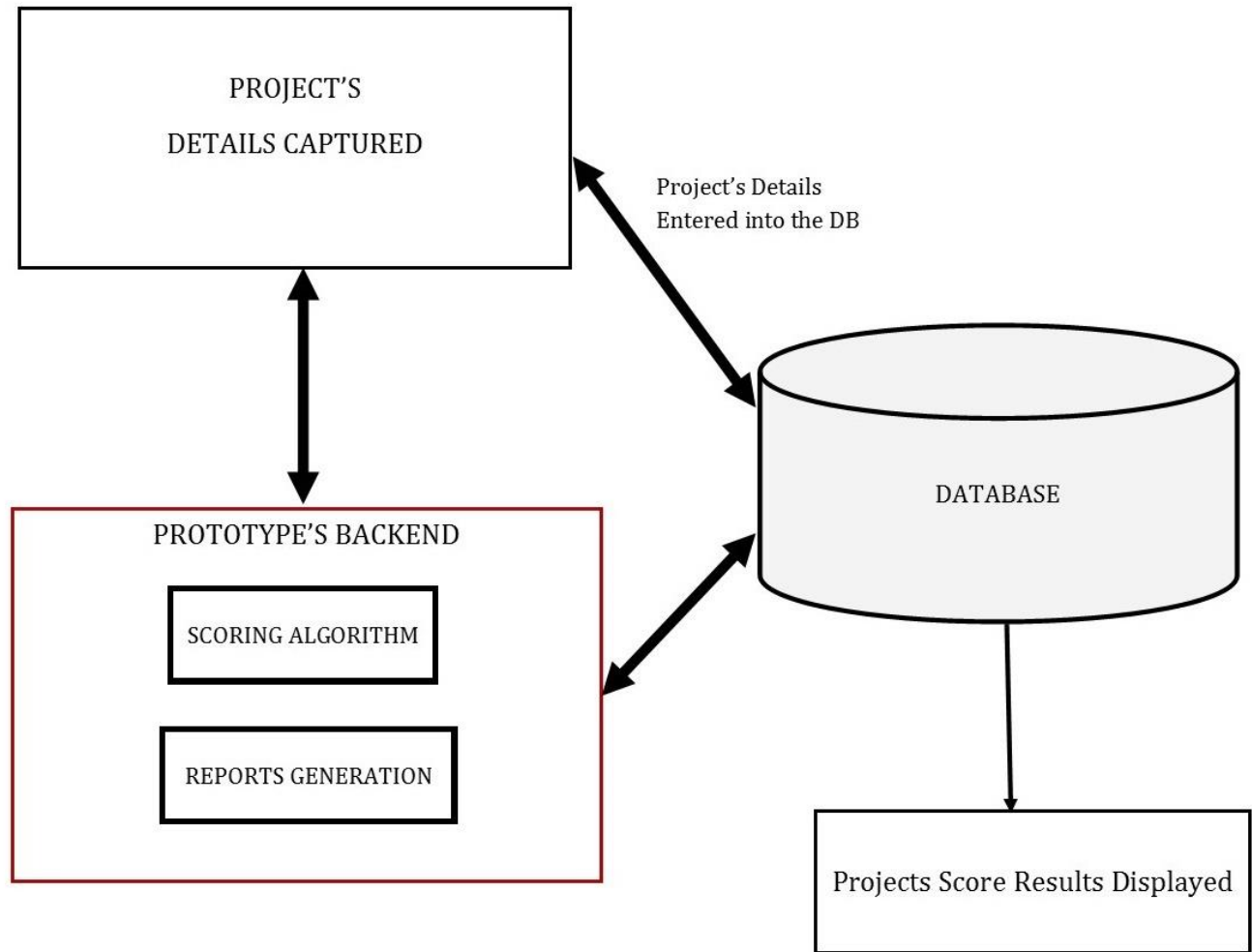


Figure 2.1 : Conceptual Framework for Proposed Prototype

As shown in conceptual framework, once the user has been authenticated, they will be required to enter the new project's details. These details will be validated then sent to the scoring algorithm where scoring and report generation will take place. When completed, the projects details and reports will be saved in the database and can be viewed in the Projects Score Results display.

Chapter 3: Research Methodology

3.1 Introduction

This chapter contains the approach to be used to carry out the study. It also includes the target population of the study, research design that was used, the sample design, method of data collection, and the data analysis and presentation. Potential problems, limitations and ethical considerations are also presented.

3.2 Research Design

A research design can be defined as the plan for obtaining answers to the questions being studied (Kothar, 2004). This was an applied research and used quantitative research method as it aimed at measuring the opinions of the participants regarding the selection process and the proposed prototype. The primary method for data collection used was structured questionnaires and the secondary method was review of literature.

3.3. System Development Methodology

A system development methodology is the framework for structuring, planning, and controlling the process of developing an information system (Center For Medicare & Medicaid Services, 2008). Rapid Application Development (RAD) Methodology as employed by the researcher to develop the prototype. This methodology was chosen because it is designed to take advantage of powerful development softwares like CASE tools, prototyping tools and code generators. This provides for a faster development process that will yield high quality software and low costs (Kikama, 2010).

A typical Rapid Application Development (RAD) methodology life cycle is composed of three broad phases. The requirements planning phase, the RAD Design workshop and the

implementation phase (Kikama, 2010). In the requirements planning phase, users and analysts met and identified objectives of the application and other system requirements. The RAD design workshop is an intense design and refine phase and lastly the implementation phase is where by the developed software is tested and implemented.

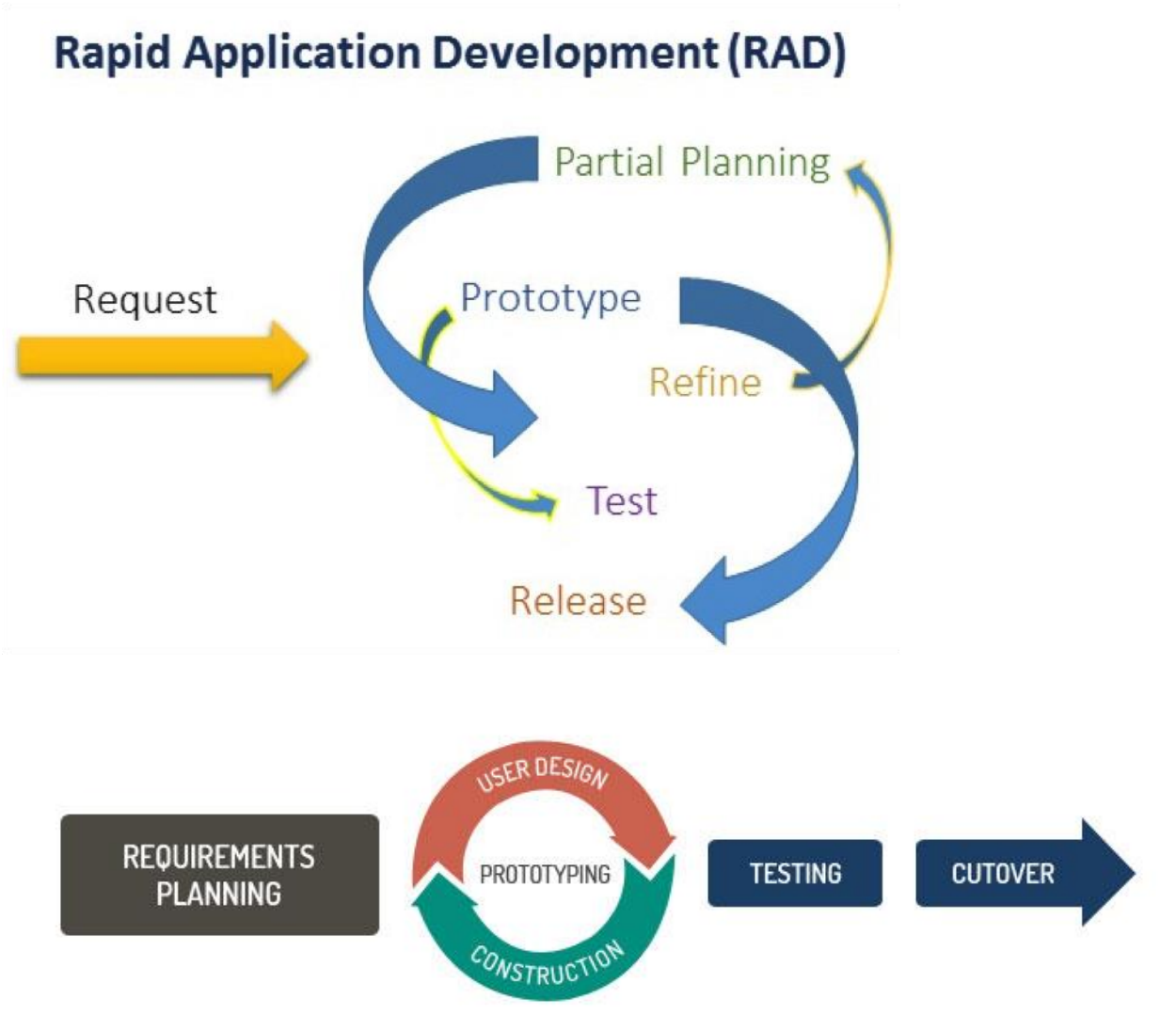


Figure 3.1: Rapid Application Development (RAD) (Kikama, 2010)

3.4 Target Population and Sample Size

Burns and Grove (2003) describe a target population as the entire aggregation of respondents that meet the designated set of criteria. The target population of this study was Westlands Constituency which has a total population of 176,689 as of 2009 (Statistics, 2010). This population is for the entire Westlands constituency, and since the target group of the specific to the youth, physical questionnaires was administered to the various respondents to ascertain the same. Kothari (2004) defines a sample as the selected respondents who represent the entire population. Convenience non-probability method was used to select the sample size.

$$n = \frac{N}{1 + N(e)^2}$$

Equation 3.1 Sample Size Formula Used

Where:

n = Sample size

N = Total Population

e = Margin of Error (10%)

Sample Size Computation

$$n = \frac{176,689}{1 + 176,689(10/100)^2}$$

$$n = \frac{176,689}{1,767.89}$$

$$n = 99.9$$

$$n = 100$$

3.5 Data Collection

Data Collection is the precise, systematic gathering of information relevant to research problems. Different methods are used during this process which includes the use of interviews, observation, case histories among others (Burns & Grove, 2003). The primary method that was used to collect data was the use of structured questionnaires. A questionnaire is a printed self-report form designed to elicit information that can be obtained through the written responses of the subjects. They were simple and easy to understand so as to ensure that the respondents responded as accurately as possible.

3.6 Data Analysis

The data collected was analyzed in order to make ideal conclusions. The analysis of the data was done with SPSS to establish the degree of reliability of the results. The probability tests were also conducted which were fundamental in developing the prediction of the anticipated results. The excel data sheets were also used so as to determine various types of comparative graphs which were imperative in not only showing the trend but also developing a comparative analysis.

3.7 Validity and Reliability

Reliability refers to the consistency of the scores obtained from one administration of an instrument to another while validity refers to the appropriateness and usefulness of the inferences a researcher makes. To achieve reliability each respondent was asked the same set of questions (Fowler, 2002). Reliability can also be ensured by minimizing sources of measurement error like data collector bias. Data collector bias was minimized by the researcher's being the only one to administer the questionnaires, and standardizing conditions such as exhibiting similar personal attributes to all respondents, e.g., friendliness and support. The physical and psychological environment where data was collected was made comfortable by ensuring Privacy, confidentiality and general physical comfort.

Chapter 4: System Design and Architecture

4.1 Introduction

This chapter aims to analyze the data collected and with it design a prototype for projects selection. System design is the systemic process that involves the complete description of the system's structure, interfaces and components that satisfy the user's requirements. It involves collection and analysis of the user requirements and modeling them in logical and conceptual representations (Saffer, 2006).

4.2 Data Analysis and Findings

In addition to the analysis done on the current models used for projects selection, the researcher analyzed the questionnaires administered to 100 youths at westlands constituency in order to understand how they viewed the current model used in projects selection and how they felt on the proposed changes for the same. The results are as follows.

4.2.1 Fairness in Projects Selection

The research found out per the data collected and analysed that only 18% of the respondents thought that the process for selecting projects to fund was fair and free of any malpractices. 9% of the respondents strongly disagreed, 42 % disagreed, 26 % were neutral on the matter and only 5 % strongly agreed. This goes to show that the current method used for selecting projects to fund is not fair. The figure 4.1 illustrates the data in pie chart form.

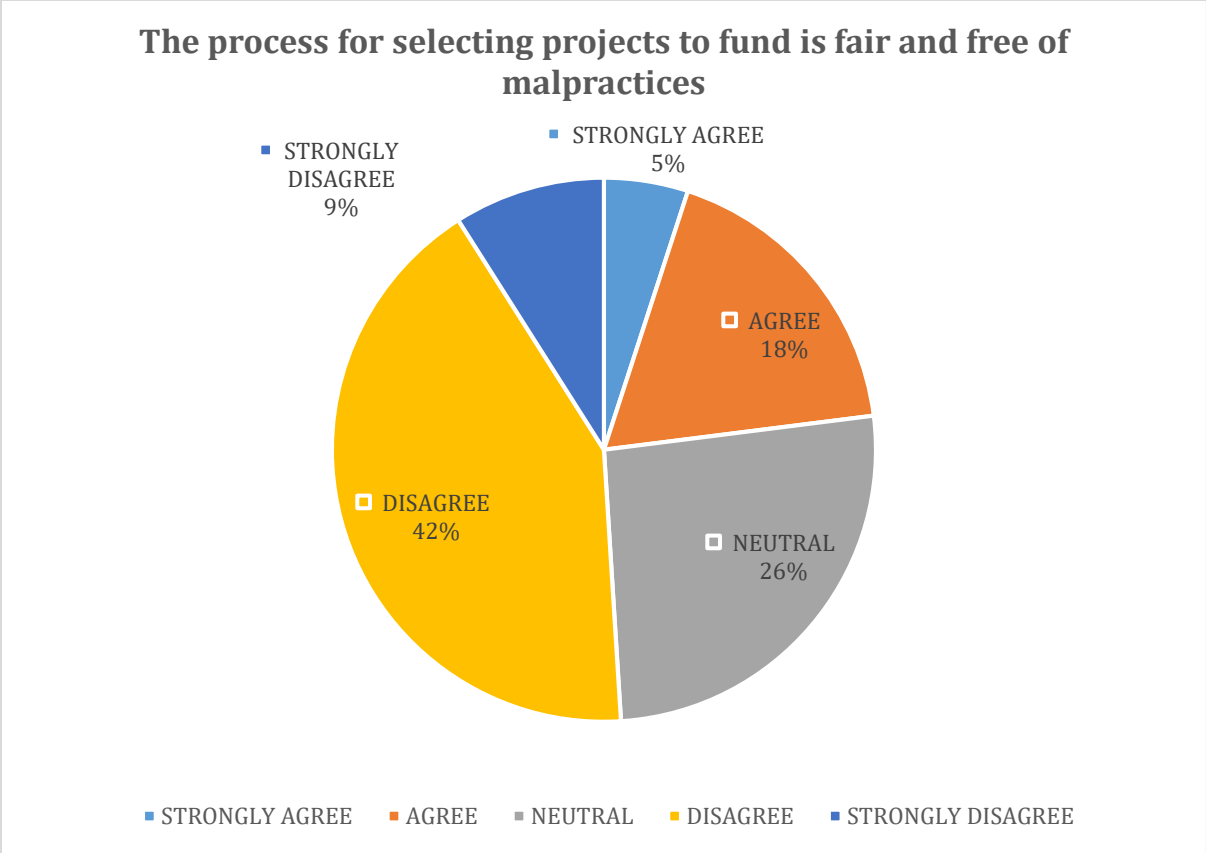


Figure 4.1: Fairness in Projects Selection

4.2.2 Nature of Projects Selected and Selection Process

According to the analyzed data, the researcher found out that 36 % of the respondents agreed that the projects selection process determines the nature of the projects selected. 6% strongly disagreed, 9% disagreed, 19 % were neutral in the matter and 30% strongly agreed. This goes to show that there is a strong connection between the selection process used to select the projects and the nature of the projects selected.

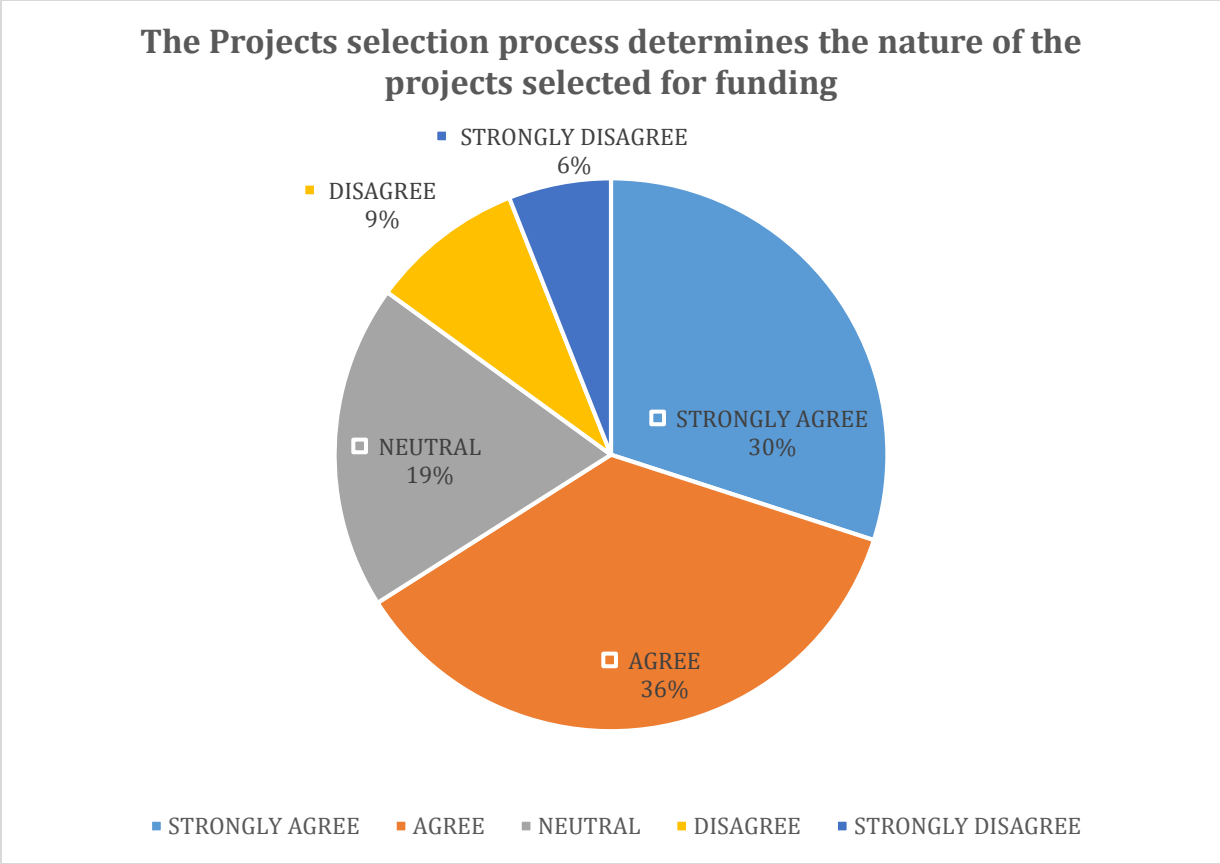


Figure 4.2: Nature of projects selected and Selection process

4.2.3 Success Rate of Selected Projects.

The researcher found out that 36 % of the respondents strongly agreed that most of the projects selected for funding end up failing rather than succeeding. However,4 % of the respondents strongly disagreed, 13 % disagreed, 21 % of the respondents were neutral and 26 % of the respondents agreed. This shows that many projects selected end up failing and since there is a strong connection between the projected selected and the selection process as shown in figure 16, then there is problem in the selection process.

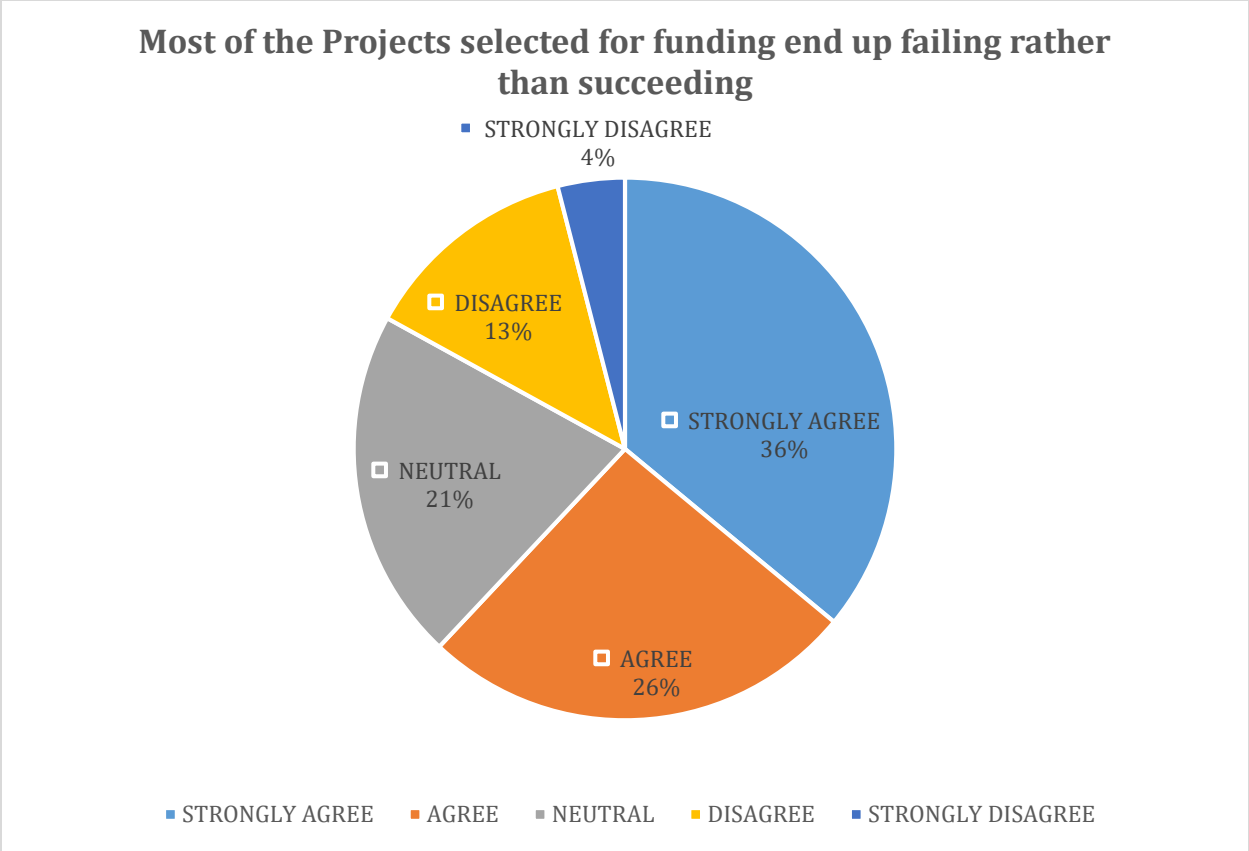


Figure 4.3: Success rate of Selected Projects

4.2.4 Prioritization In Project Selection Process

From the data analysed 40 % of the respondent felt that the selection process did not give priority to those projects that benefited the community the most. Only 3 % strongly agreed, 10% strongly disagreed, 34 % remained neutral in this and 13 % agreed. This goes to show that the selection process does not prioritize projects for selection on basis on need of the community.

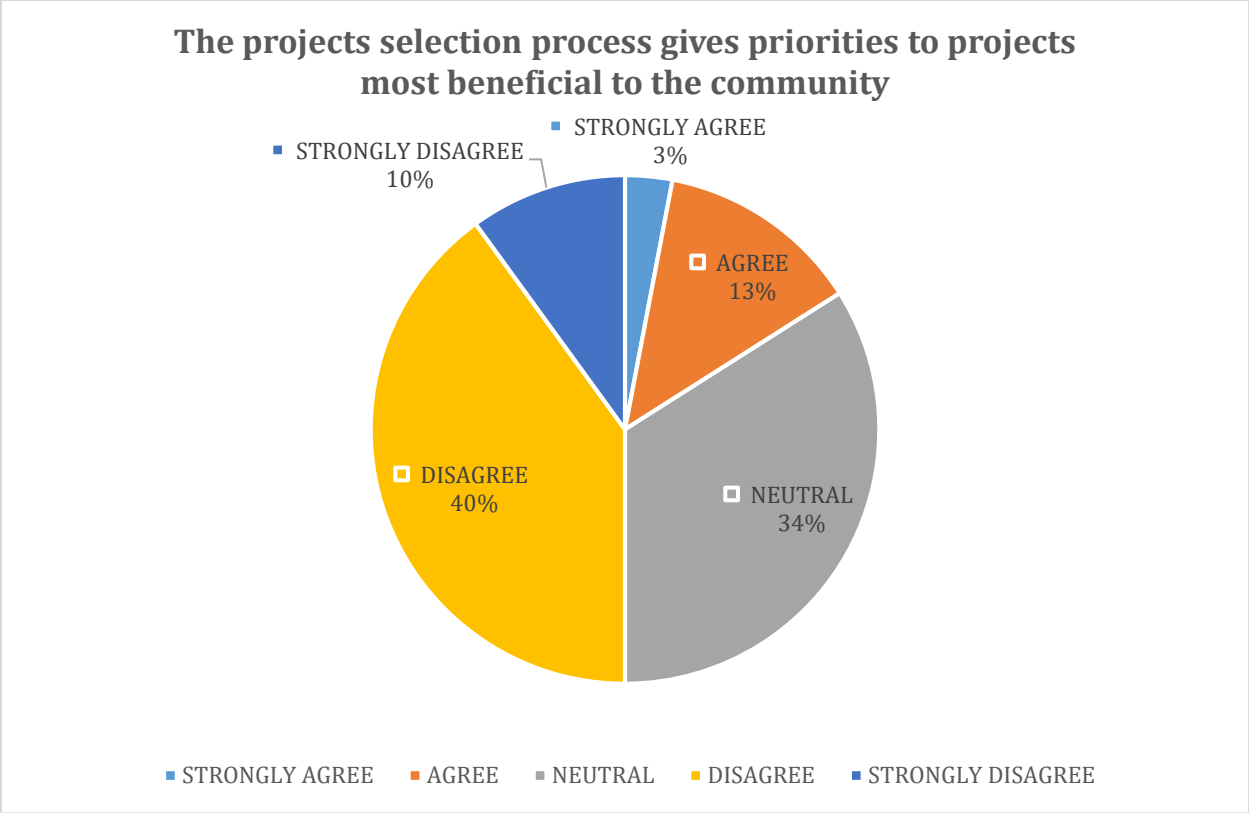


Figure 4.4: Prioritization in Project Selection Process

4.2.5 Comprehensive Business Plan Inclusion While Applying for Funding

For the inclusion of a comprehensive business plan in the application for the funds, 39 % of the respondents agreed that it ought to be included. 26 % strongly agreed to the same, 7 % remained neutral, 13 disagreed and 15 % strongly disagreed. This shows that there are there in need to include a comprehensive business plan while apply for funds.

Comprehensive business plan details should be included as requirements for funds application

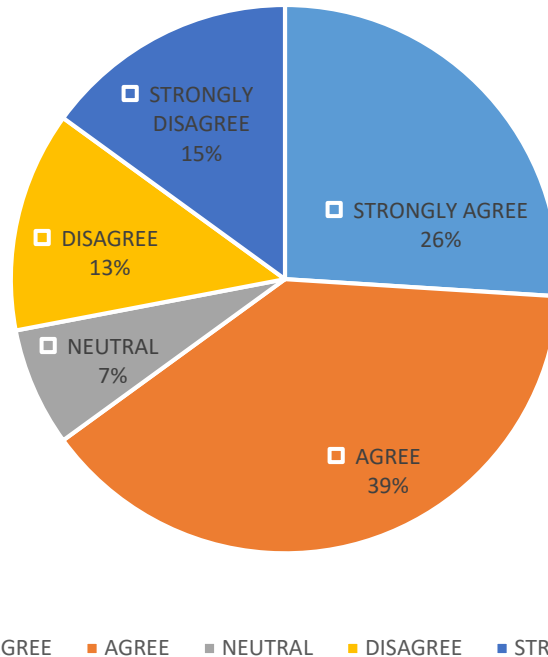


Figure 4.5: Inclusion of Comprehensive Business Plan while applying for funding.

4.2.6 Results Feedback Turnaround Time

A huge majority of the respondents, 54 %, disagreed that results feedback are relayed back within a short time. 16 % strongly disagreed, 15 % agreed, 13% remained neutral and only 2 % strongly agreed. This goes to show that it takes a long time for the applicants to get their results feedback.

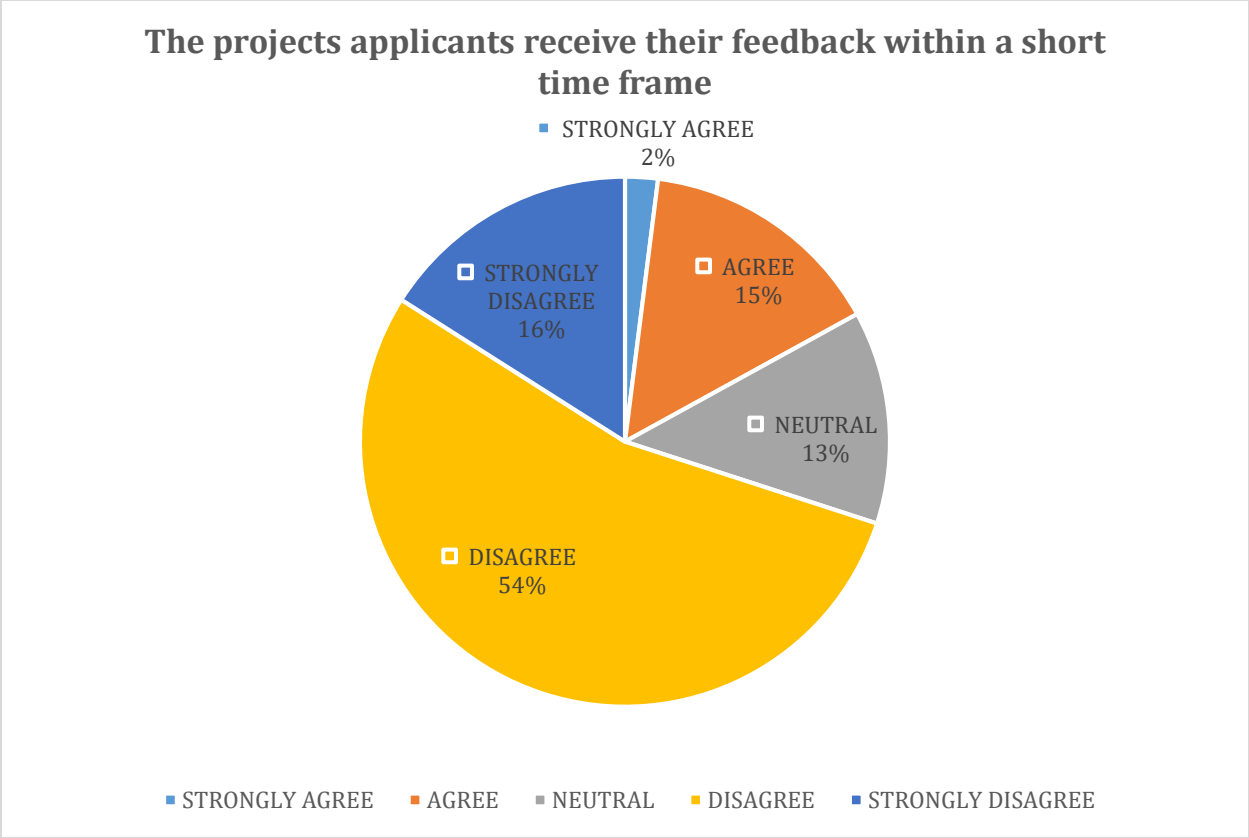


Figure 4.6: Results Feedback turnaround time

4.2.7 Need for a New Project Selection Method

52 % of the respondents agreed that the current project selection process need to be changed. 20 % strongly agreed to the same, 13 % remained neutral, 13 % disagreed while only 2% strongly disagreed. This goes to show that there is need for a new model in place for selection of projects to fund.

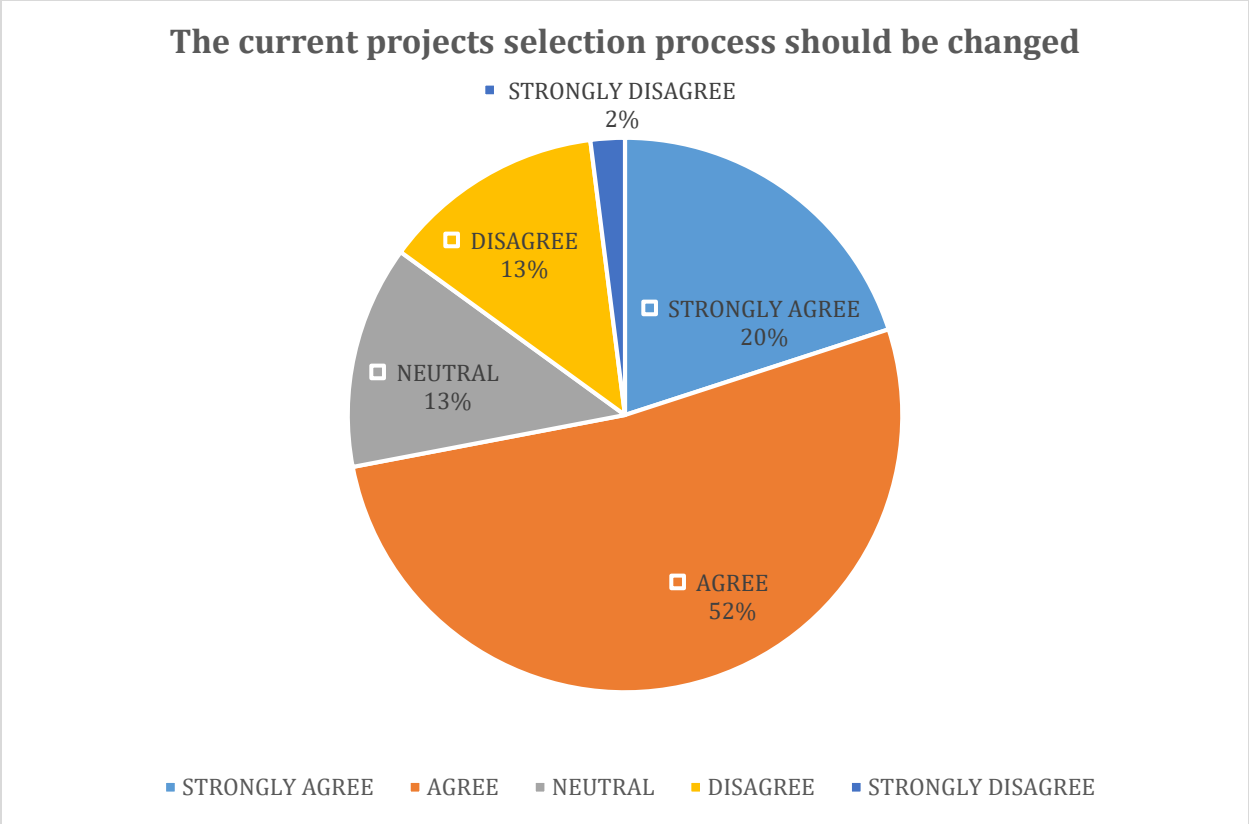


Figure 4.7: Need for a new project selection method

4.3 Proposed System Requirements

4.3.1 System Requirements

The proposed system will have a relational database management system for easier organization and storage of data. This will facilitate fast data assess and manipulation. A user friendly graphical interface will be provided to facilitate easy interaction with the system. The system will be very secure to ensure assess to only authorized personnel and maintain data integrity.

4.3.2 User Requirements

User requirements are what the users expect the system to be able to do. The following user requirements were determined from the questionnaire administered:

- i. A system that would fairly select high priority projects for funding.
- ii. A system that would select projects with high success probabilities.
- iii. A system that would fasten the project selection process.
- iv. A system that would analyse projects submitted and objectively score them for selection.
- v. A system that would be able to give reports on projects scores.
- vi. A system that would store all the projects selected and their scores for future referencing.

4.3.3 Functional Requirements

Functional requirements are those operations, data manipulations and processes a system must be able to perform. Among others they include descriptions of data to be entered into the system, operations performed, who can enter data into the system and system outputs descriptions. For the projects selection prototype, the functional requirements include:

- i. The system can only be assessed by authorized personnel only whom need be registered first by the system administrator.
- ii. Authorized parties shall be able to set the different selection criterions and their score values.

- iii. The system to should allow users to input new projects details for scoring.
- iv. The system should be able to generate reports on every project's score.
- v. The system should be able to report errors in user inputs.

4.3.4 Non-Function Requirements

Non-Function Requirements are those requirements that a system should possess and can be used to judge a system's operation. They include:

- i. A secure system
- ii. The system should ensure data integrity.
- iii. The system should be easy to maintain and customize.
- iv. The system should be scalable.

4.4 Process Modelling

Software process modeling is a standardized format for planning, organizing, running and developing a project. It entails simplified and abstract description of software process that represents a networked sequence of activities, objects, transformations and events (Eichberg, 2001).

4.4.1 Data Flow Diagram

This is simply a graphical representation of the flow of data through an information system.

4.4.1.1 Context Level Diagram

The project selection prototype will have three main users, the Users, selection official and the system administrators. The main objective of the system is to score different projects and rank them. The system administrator registers the users and selection officials and provides them with credentials for assessing the system. The user's main task is to input the project details into the system for scoring. The selection officials are responsible for setting selection criteria and score values. They also view reports on the scored projects and make decisions based on the reports.

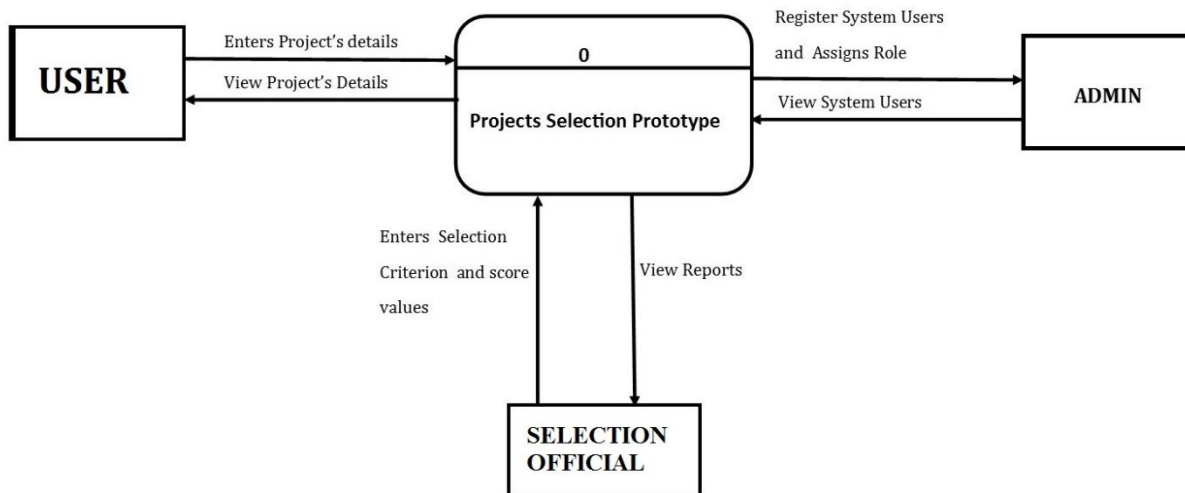


Figure 4.8: Context Level Diagram

As illustrated in context diagram figure 4.8, the main process involved in the projects selection process includes:

i. Managing Users

This is handled by the systems administrator. It involves registration for a new system user and assigning them a role. The Credentials include a username and a password. The roles assigned could either be user, Selection Official and system administrator. The system administrator can also modify user details and delete existing users.

ii. Entering Projects Details

This process is handled by the users. It involves entering of the projects details i.e. the name and score metrics details. The users can also modify the projects details but cannot alter projects score metrics information.

iii. Scoring a Project

Scoring a project can both be done by the selecting official or the system users. A project can only be scored once all its scoring metrics details have been processed and analyzed by the system. This process is achieved by clicking the score button against a given project which calls the scoring algorithm and uses creation and score values stored in the creation DB.

iv. Viewing Reports

Project score results are only available to the selecting officials. They include a breakdown of the project score against all the selection metrics. The reports are assessed through a special reports user interface where by the selecting official enters the project name and clicking the view button.

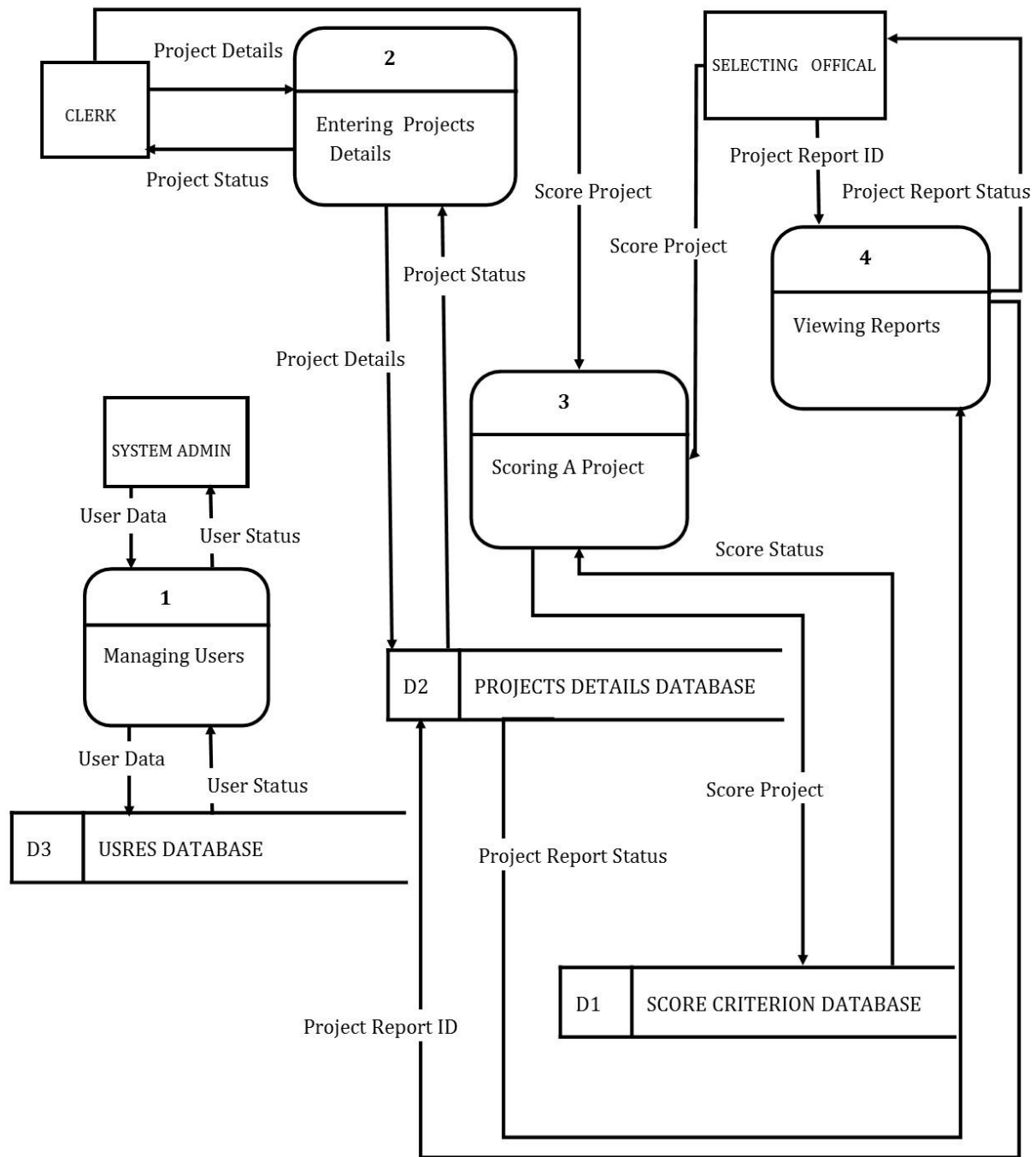


Figure 4.9: Contextual Diagram Processes Illustration

4.4.2 Use Case Modelling

Use cases also referred to as behaviour diagrams are used to describe set of actions that a system can or should perform in correlation with one or more external users of the system. Process that occur within the system are referred to as cases, while entities outside that interact with the system are referred to as actors (Kettenis, 2007).

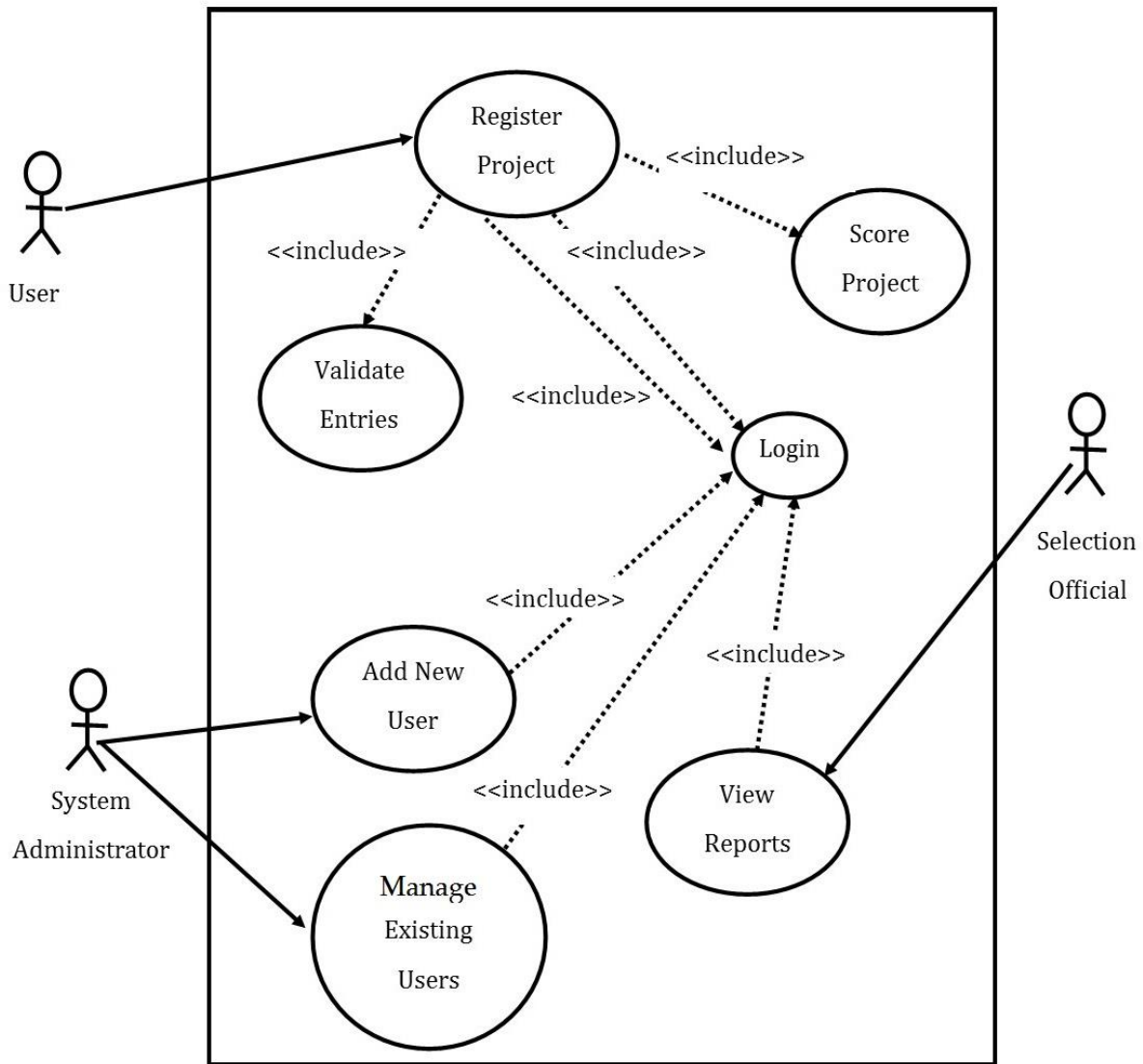


Figure 4.10: Use Case Diagram

4.4.2.1 Use Case Narrative

i. Register Project

Use Case Name:	Register Project
Scenario:	Add new project to projects database
Triggering Event:	User wants to add a new project
Actors:	User
Flow of Events:	<ol style="list-style-type: none">1. The actor clicks on Register New Project2. The use case provides new projects fields details3. The actor enters the new project's details4. The actor clicks on the save button5. The use case displays a Registration Success message box
Preconditions:	Actor is Logged in
Post conditions:	New Project Added to the projects database

In this use case, the user registers a new project by entering its details into the system which is saved in the projects database.

ii. Add New User

Use Case Name:	Add New User
Scenario:	Add new System user
Triggering Event:	System Administrator wants to Add a New User
Actors:	System Administrator
Flow of Events:	<ol style="list-style-type: none">1. The actor clicks on Add New User2. The use case provides Fields for new user details3. The Actor Enters the New Users Details4. The Actor Clicks on the Save Button5. The use case displays a User Successfully Added message
Pre-conditions:	Actor is Logged in
Post-conditions:	New User Added to the Users database

iii. Manage Existing User

Use Case Name:	Manger Existing User
Scenario:	Update system users details
Triggering Event:	System Administrator wants to update user's information
Actors:	System Administrator
Flow of Events:	<ol style="list-style-type: none">1. The actor clicks on Modify User Details2. User case asks for user ID3. Actor enters user ID and clicks search4. Case Displays user information5. Actor modifies specific user detail and clicks save6. Use case displays User Details Updated Successfully
Preconditions:	Actor is Logged in User Already Exists in the system
Post-conditions:	User information update in the Users database

In this use case the system administrator can modify or delete particular user information by searching the user using their Id, making the necessary changes then clicking update.

iv. Score Project

Use Case Name:	Score Project
Scenario:	Score a project for ranking
Triggering Event:	Project Registration Completed
Actors:	User, Selecting Official
Flow of Events:	<ol style="list-style-type: none">1. The actor clicks on save project2. The use case scores the project3. The use case stores the project scores in projects database
Preconditions:	Actor is Logged in Project Already Exists in the system
Postconditions:	Projected scored and updates the projects database

In this use case the ones a project has been registered successfully. It is scored and the results save in the projects database.

v. View Report

Use Case Name:	View Report
Scenario:	Actor wants to see a project score report
Triggering Event:	Actor clicks on view reports
Actors:	Selecting Official
Flow of Events:	<ol style="list-style-type: none"> 1. The actor clicks on Score Project 2. The use case provides projects list 3. Actors searches or selects the required project and clicks on score 4. The use case scores the project and displays score results
Preconditions:	Actor is Logged in Project Already scored
Postconditions:	Projects score report displayed

4.5 System Sequence Diagram

A system sequence diagram is an interaction that shows how objects interact with each other and in what order for a particular use case scenario (Monsalve, 2015). Figure 4.12 illustrates the system sequence for registration and scoring of a new project.

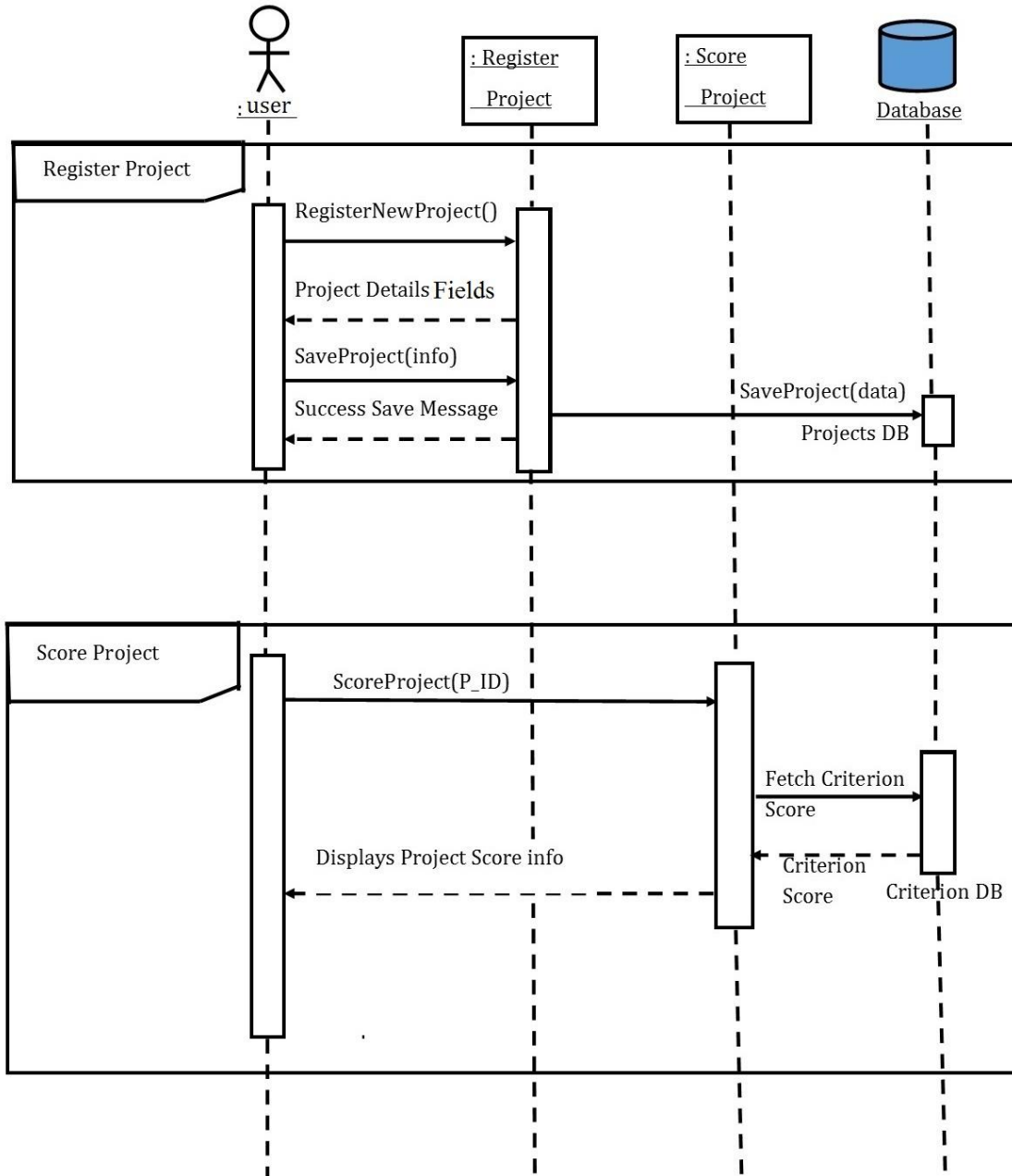


Figure 4.12: Project Registration and Scoring Sequence Diagram

4.6 Prototype Architecture

The project selection prototype will be designed using 2 – tier client server architecture. The server side will host the databases and the clients will host the project selection application. This architecture was chosen because of the ease of updating the user and criterion database and availing the changes to all the client’s applications. The client’s side application will have a simple interactive GUI that will require them to login first before assessing the system.

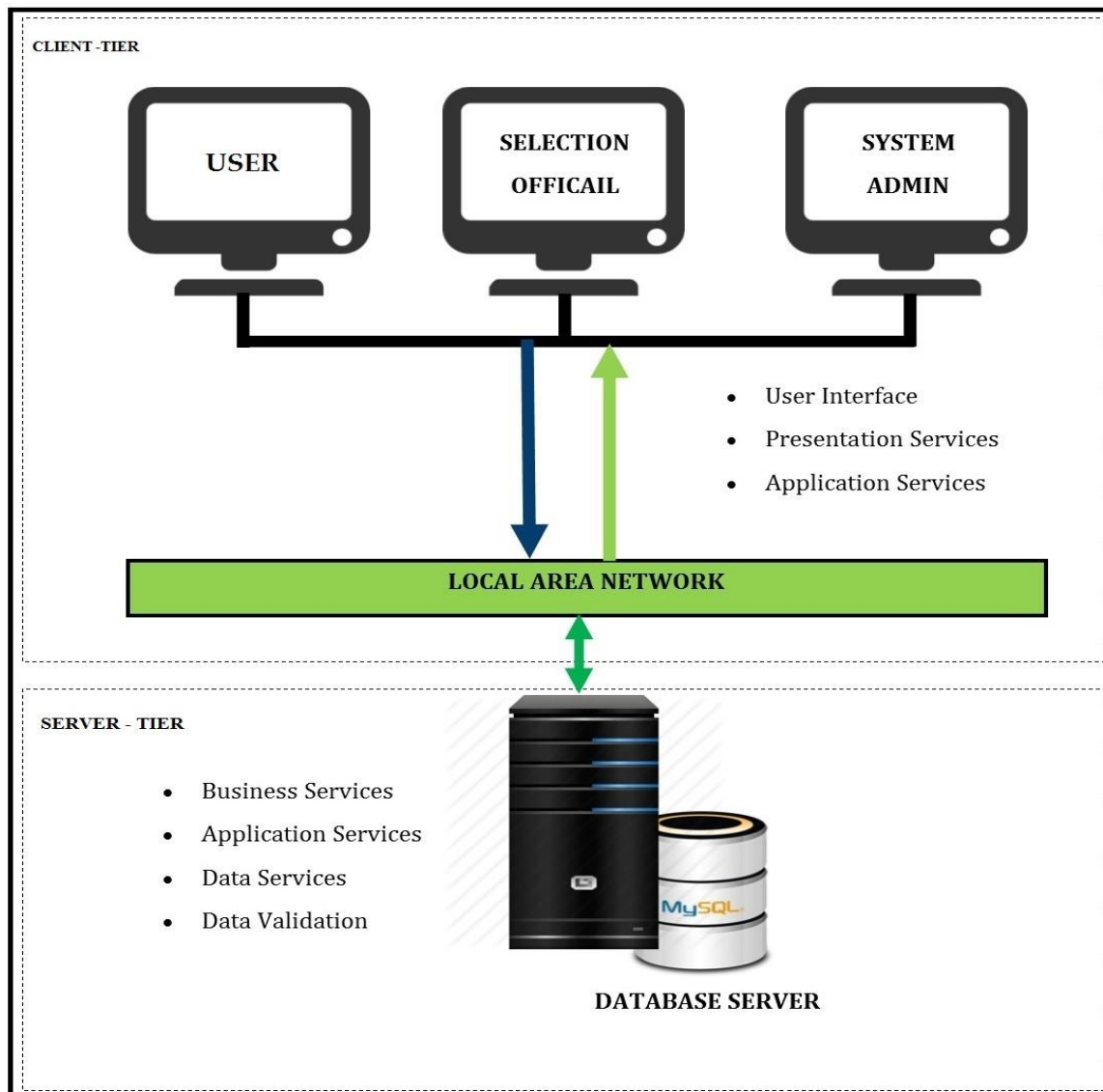


Figure 4.13: Projects Selection Architecture

Chapter 5: System Implementation and Testing

5.1 Introduction

The development environment refers to the different tools employed for the development of the prototype. The project selection prototype was developed using a 2-tier client server architecture. The application was developed using C# and MySQL for database management. The researcher chooses to use C# because of its simplicity and speed of designing the user interface provided in Visual studio. C# also provides ease of data validation to ensure and easy deployment of the application.

5.2 System Functionality

After a user has been successfully logged in, they can perform various tasks as per their roles. For the system administrator, ones logged in they can add or modify user information. The Selection officers can score projects and view reports and the users can register new projects and score them too.

5.2.1 System Inputs

For the prototype to function as expected, certain inputs need to first be captured. These details are either provided by the user or are fetched from the database. Forms were used to capture all the information that was required by the user. Some of the forms used include:

i. User Log in

For any user to be granted access to the system, they first need to provide their credentials which were captured in the log in form where by the user name and password was requested.

ii. Project Registration

Before a new project was saved into the projects database, details pertaining to the project were captured in the project registration form. This was done by filling in specific detail of the project which included the project name, type, project proposer's information just to mention a few. Each project got assigned unique project ID that could be used to uniquely identify it once it was added to the project database.

iii. Selection Criterion & Score Values

Project selection creation and score values were of most importance. This is because they are to set a standard through which all the projects were to be checked against and scored. The higher the score value of a project the higher its chances of being selected. These criteria were agreed upon by the selecting officials and entered into the creation database with their respective score values.

5.2.2 System Outputs

System outputs are very important to the users as they help inform them what is happening by providing curial feedback. Some of the outputs provided by the project selection prototype include:

i. Project Details

This window displays details regarding saved projects. Using this window, one also other action such as search and modify projects details.

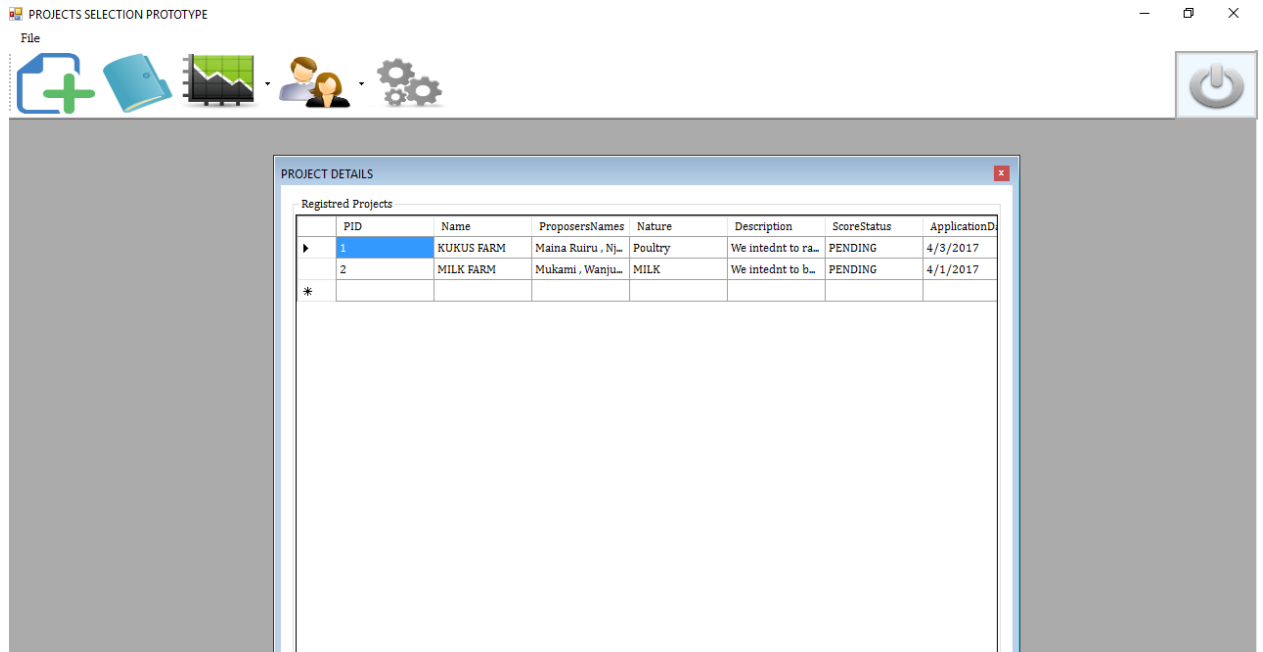


Figure 2.1: Project Details View

ii. Project Score Report

This window displays the project score breakdown. The user first needs to enter the project ID to search the desired project score breakdown.

iii. User Management

This window can only be accessed by the system administrator and its used to display and manipulate user information. The admin can search and select any user they desire to alter their information or delete completely from the system.

5.2.3 Prototype Validation

The prototype used form validation to validate user input into the system. This was done so as to ensure that all the required data at any given entry point was captured. Interactive dialog windows were used to notify the user of any error in data entry or missing data that is required. Below is a sample of how missing field form validation was brought to the user's attention.

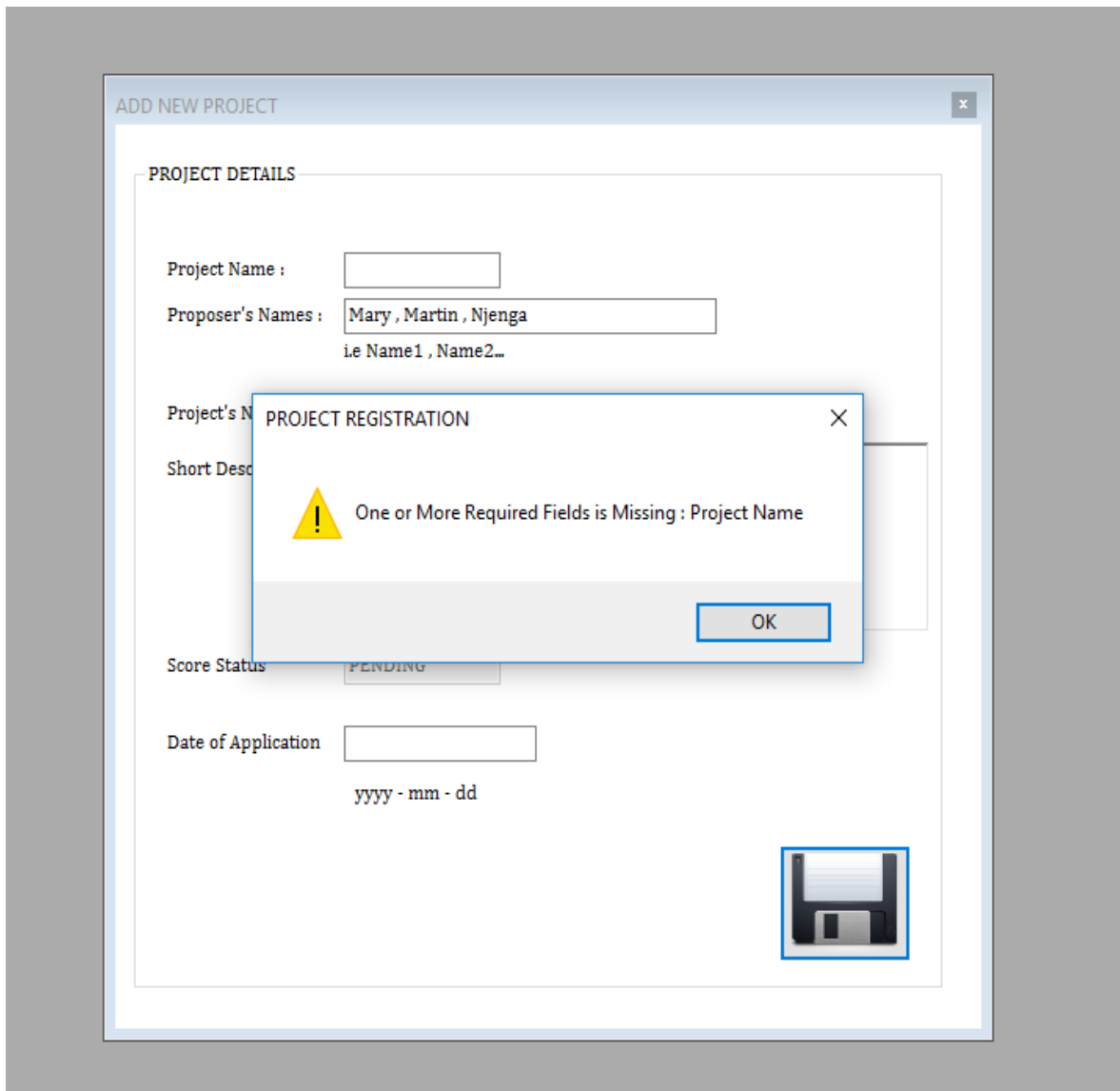


Figure 5.2: Project Details Entry Validation

5.3 System Requirements

For the prototype to run efficiently, the following system specification were required.

5.3.1 Client Software Requirements

Software	Minimum Requirements
OS	Windows 7

.Net Framework	3.5

5.3.1 Client Hardware Requirements

Hardware	Minimum Requirements
Processor	Windows 7
Hard disk	10 GB
Network Interface Card	100 MB/S

5.3.3 Server Side Software Requirements

Software	Minimum Requirements
OS	Windows 2000 Server
Database Management System	MySQL 5.0+

5.4 User Roles and Assess

The project selection prototype has 3 main users. The system Administrator, the Selection Official and the user. Each of the users has different roles and different assess levels.

5.4.1 System Administrator

The system administrator's main role is to add, Modify or delete system users. The system admin can assess user's data by logging into the system and selecting manage system users. Ones there they could search or select a user and modify their data. They are responsible also for adding new system users by assigning them a username and password which they can later change.

5.4.2 Selection Official

The selection official main role is to select projects for funding based on the project's score report. They get to do this by logging into the system and selecting view projects score reports. Once logged in, they could also score a project and view all project details and reports.

5.4.3 User

The Users main role is to enter new project details and score them. They get to add a new project by logging into the system and clicking on enter new project. Required detail fields for the new project are displayed and ones all the data is entered correctly and saved.

5.5: Sample Forms Used

The prototype provided simple to use user interfaces for interaction with the prototype. Each of the interface was for a different and specific task. Different users have different access to the interfaces. These are some of the form that the users use to interact with the system.

5.5.1 User Management

The user management form provides the system administrator with an interface to register system users, modify existing users' information or delete a user all together. To register a new user, the system administrator clicks the add new user button. The interface provides fields to capture the required user information and ones all the details are filled in, the save button is clicked to post the user details to the users' database.

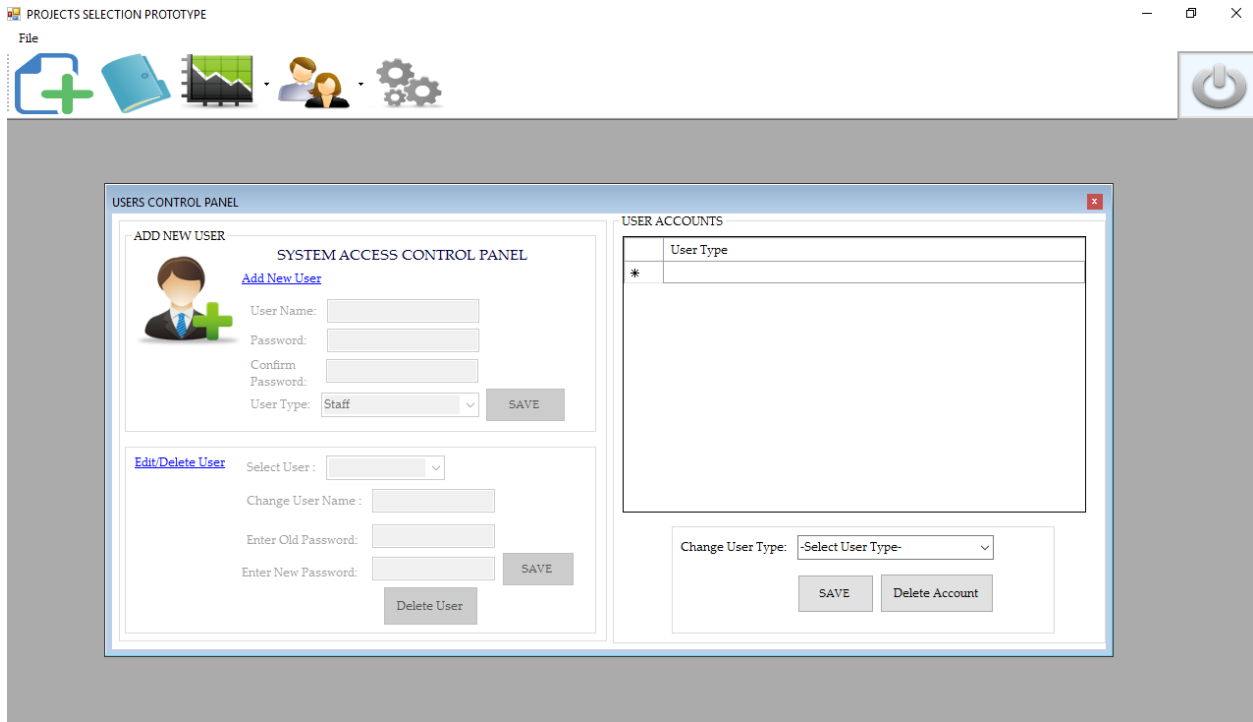


Figure 5.3: User Management Window

5.5.2 Project Registration

The project registration form provides an interface to register new projects. This is done by clicking the add new project button. This interface can only be accessed by the users. Once the button is clicked the interface provides fields necessary to capture the required details for the project and once completed the save button is clicked to post the data into the projects database.

ADD NEW PROJECT

PROJECT DETAILS

Project Name : Kukus Farm

Proposer's Names : Maina Kimani, Josua Lelei , Mary Njeri
i.e Name1 , Name2...

Project's Nature : Poultry

Short Description : We intend to purchase 1000 chicks and rare them for eges.
We seek 30000 ksh capital to purchase the chicks and build the nesseeary infrustrure.

Score Status : PENDING

Date of Application : 4/ 3/2017




Figure 5.4: Add New Project Form

5.5.3 Projects Reports

When the selection officials want to select a project for funding, they open the project score reports. These reports provide them with the project scores and their breakdown in a descending order. This information is very helpful as it helps them select projects that are best matches to their set criterion. These reports are assessed by clicking the view reports button that is only availed to the selection officials.

PROJECT SCORE DEATILS

Enter Projects ID :

Enter Projects ID :

Project Name : KUKUS FARM **Short Description :** We intend to purchahse 2000 Chics and rare them for eges in Gatimu Ward. We seek 35000 capital to purchahse the chicks , chicks food and biuld required chichen house

Project Nature : Poultry

Project Proposer's : Martin Wanga , Lucy Mwere , Faith Wafula

Select Demographics

Male > Female

Male = Female

Male < Female **6**

Select Number Of Employees

1 - 5

6 - 10

10 > **2**

Select Repayment Period

< 6 Months

6 > < 12 Months

12 > < 18 Months

> 18 Months **7**

Do you Have Existing Loan?

Yes

No **10**

Opertaing Expense Ratio

Operating Expense Ration is : 1 - 5 **7**

Project Score :

32

Figure 5.5: Project Score Report

5.6 Prototype Testing

System tests are compliance checks to evaluate whether the system is per the requirements specification. To ensure that the projects select prototype met the specifications, a series of test were conducted and the results are as how below:

ID	Case	Expected Outcomes	Comments
1.0	Login		
1.1	Wrong Password or username	Error Dialog Box	Pass
1.2	Missing Password or username	Error Dialog Box	Pass
1.3	Maximum login trials reached	Exclamation Dialog Box	Pass
2.0	Project Registration		
2.1	Required field missing	Information Dialog Box	Pass
2.2	Database connection lost	Exclamation Dialog Box	Pass
3.0	Add new User		
3.1	Required field missing	Information Dialog Box	Pass
4.0	Remove Existing User		
4.1	Delete confirmation	Warning Dialog Box	Pass
5.0	Score Project		
5.1	Project not select	Information Dialog Box	Pass
5.1	Project Already Scored	Information Dialog Box	Pass
6.0	View Reports		
6.1	Report range not selected	Information Dialog Box	Pass
7.0	View Project Details		
7.1	Project ID missing	Information Dialog Box	Pass

Chapter 6: Discussions

6.1 Introduction

This chapter discusses the findings and observation made from developing, testing and implementing the prototype. The prototype aimed at improving the project selection process so as to facilitate selection of project that have a high success rate probability. This chapter therefore analyzes the findings in relation to the research objectives and to what extent the findings agree with the literature review.

6.2 Factors Considered During Projects Selection

The first objective was to analyze factors that are considered while selecting a project. From the study findings, it was found that most respondents agreed that a project would be selected in line with current needs and objectives of an organization. This was in harmony with the literature review section 2.2 that indicated that various factors came into play before the final decision is made and it is essential to ensure that the project selected is in line with the organisation's goals and strategy.

6.3 Approaches to projects Selection

The second objective of the study was to analyse the models used in project selection. As seen in the literature review section 2.3 there are three major projects selection methods which include scoring model, benefit measurement model (Economic model) and mathematical models (Constrained Optimization). The project nature is what that determines which approach to be used. The more complicated a project is the more complex the selection method used to determine which projects was to be selected over the other.

6.4 Project Selection Prototype Testing

40 % of the respondents agreed that selection was done faster and more effectively. This meant the project selection process was done quicker and in a more efficient manner. 15 % of the respondents strongly agreed, 10 % remained neutral, 20 % disagreed and 15 % strongly disagreed.

6.5 Advantages of Using Project Selection Models

65 % of the responded agreed that projects score matched the selection criterion set. This meant that the prototype was highly accurate and is reliable. 15 % strongly agreed, 5 % strongly disagreed, 5 % disagreed and 10 % remained neutral in this regard. This presented great advantages to both the project applicants and the people mandated with the selection of projects. Is was so because projects selection was highly efficient and consistent across board. This also increase transparency in the selection process.

6.6 User Recommendation

When asked whether they could recommend the prototype to other users 45 % of the respondents said they would. 30 % said they would but with changes and only 20 said they wouldn't. This showed that there was a high interest with the prototype and that many respondents felt the prototype would do much good if widely adopted.

6.7 Limitations of The Prototype

As much as the prototype managed to achieve most of its set out objectives, it had limitations of its own. The greatest limitation was in its inability to capture some criteria as they were too complex to metricize. The prototype does also not address notification of results feedback to the applications which would have made communication between the Uwezo fund officials and applicants much faster and easier. Another limitation to the prototype was it was not cross-platform in regards to the operating system. This means that it could only run in a windows environment as was developed in a Net framework using Microsoft visual studio.

Chapter 7: Conclusion and Recommendations

7.1. Conclusion

This research focused on the development of a prototype for project selection. It was aimed at assist in the selection process of projects for funding for Uwezo funds. During the course of the study many techniques employed in projects selection were reviewed as shown in the chapter on literature review. The researcher came across various techniques and models for projects selection whose application varied from one project to the other. The more complex a project is the complicated the selection model employed.

The prototype developed at the end of the study provides a much efficient and effective model for projects selection. The prototype employed scoring technique which scored the projects against predefined criteria each with its own score value. For the prototype to work effectively, clear and precise selection criteria's need first be defined and assigned their score value.

The prototype allows registration of project details which are checked against the set criteria for scoring. For purposes of this research the prototype was developed in a bid to demonstrate project selection against these criteria: Applicant's gender demographics, repayment period, existent of previous loans, operation expense ratio and number of employees. These criteria were selected based on the current Uwezo application form.

7.2. Recommendations for Further Research

In order to have a more robust project selection model in place, the researcher recommends more study to be done these areas:

- i.** Dynamic addition of more selection criteria into the selection model so as to enable hosting of as many and varied selection criteria as the need arises without having to change the entire scoring algorithm.
- ii.** Inclusion of language processing capabilities to expand the ability of setting the selection criteria
- iii.** Inclusion of a feedback mechanism that would give alerts to the applicants in real time via email alerts or SMS.
- iv.** Inclusion of a digital way for the applicants to submit their project proposals so to quicken the processing time of the projects.

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Appendices

Appendix A: User Requirements Questionnaire

Questionnaire

Researcher: Anthony Ng'ang'a Karanja

Msc. IT, Strathmore University

This Research is only going to be used for academic purposes only. Its main Objective is to seek understand people's perspective of the process of projects selection for the Uwezo Funds. The data collected will be used to design a prototype that will be used to aid the projects selection process. Kindly provide answers to the best of your understanding. All responses will be kept private and confidential.

1. The process for selecting projects to fund is fair and free of malpractices.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

2. The Projects selection process determines the nature of the projects selected for funding.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

3. Most of the Projects selected for funding end up failing rather than succeeding.

- Strongly Agree

- Agree
 - Neutral
 - Disagree
 - Strongly Disagree
4. The projects selection process gives priorities to projects most beneficial to the community.
- Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
5. Comprehensive business plan details should be included as requirements for funds application.
- Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
6. The projects applicants receive their feedback within a short time frame.
- Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
7. The current projects selection process should be changed.
- Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree

Appendix B: System Usability Questionnaire

System Usability Questionnaire

Researcher: Anthony Ng'ang'a Karanja

Msc. IT, Strathmore University

This Research is only going to be used for academic purposes only. Its main Objective is to seek people's perspective of the usability of the project selection porotype. The data collected will be used to improve on the functionalities and user interface of the prototype. All responses will be treated as private and confidential.

8. The user interface is very user friendly.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

9. I can use this prototype with little training.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

10. I can select projects more efficiently and effectively.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

11. Projects scores matched the selection criterions set.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

12. Would you recommend that this system to be used other counties?

- Yes

- No
- Yes, but with Changes

Appendix C: Turnitin Report

The screenshot displays the Turnitin Document Viewer interface. The main document area shows the title "A PROTOTYPE FOR PROJECT SELECTION: A CASE OF UWEZO FUNDS IN KENYA" by ANTHONY NG'ANG'A. A red highlight on the text "Research Thesis Submitted in partial fulfillment of the requirements for the degree in Master of Science in Information Technology of Strathmore University" is marked with a red '1'. The sidebar on the right, titled "Match Overview", lists 12 matches with their respective similarity percentages.

Match Number	Source	Similarity Percentage
1	Submitted to Strathmo... Student paper	1%
2	www.ais.up.ac.za Internet source	1%
3	Submitted to Abu Dha... Student paper	1%
4	uir.unisa.ac.za Internet source	1%
5	Submitted to Curtin Un... Student paper	1%
6	Submitted to Universit... Student paper	1%
7	Submitted to Colorado... Student paper	1%
8	Submitted to Oxford Br... Student paper	<1%
9	Submitted to Universit... Student paper	<1%
10	www.slideshare.net Internet source	<1%
11	Submitted to Higher E... Student paper	<1%
12	Submitted to Universit... Student paper	<1%