DECISION SUPPORT SYSTEM FOR INVESTMENT PROJECT SELECTION USING MULTI CRITERIA APPROACH THE CASE OF MINISTRY OF PLANNING AND NATIONAL DVELOPMENT.

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DECLARATION

The management project is my original research work and has not been presented for the award of any diploma in any University.

Signed:..... Date: 18.11.99

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This management project has been submitted for examination with our approval as the University supervisors.

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DEDICATION

To the one by whose divine grace and love I have been and will be able to do all things.

To my loved one Lucy Kariuki, our son and our families with whose support the grace and love is transformed into humanly visible signs.

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To be able to successfully accomplish an investment project such as a rigorous Master of Business and Administration program one needs to be fully supported. It is therefore misleading for me to feign that I did it without anyone else support. With this in mind I express my sincere thanks to all who in whatever manner and magnitude did or did not work towards a successful consummation of the entire course.

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Abstract

Project evaluation and selection literature succinctly exhibits deficiencies on adequate treatment of multiple, often interrelated criteria, inability to recognize and treat non-monetary aspects of project management evaluation and selection of projects.

This study, describes and adopts a systems approach to the project selection problem and culminate by designing a Decision Support System (DSS) for project selection using a multiple-criteria approach.

The DSS is two phased:

a) Appraisal phase that uses the Ideal Profile Method and

b) Project selection phase that uses heuristics that are governed by the decision maker's judgment and influences.

The DSS has a database that will contain the project details, factors considered in the selection process, objectives pursued during the selection process. It also allows for expansion to include additional information like the prioritisation criteria to that the ministry follows in ranking its proposed projects and ongoing projects.

The study establishes that though factors and objectives are considered in the project selection process, no evidence was obtained to show a terse procedure of how this is done instead they are used to justify the project and give the investments priorities that form the basis of ranking the projects. The DSS suggested in this study assists in alleviating this by instituting clarity in the selection process and giving an audit trail that improves on transparency and accountability.

LIST OF ABBREVIATIONS

DSS	Decision Support System
IRR	Internal Rate of Return
MCDM	Multiple Criteria Decision Making
MIS	Management Information System
MOLP	Multiple Objective Linear Programming
MPND	Ministry of Planning and National Development
OR	Operations Research
PERT	Project Evaluation Review Technique
PIP	Public Investment Program
ROMC	Representation Operations Memory-aid and Control
V-C	Value Contribution

1 INTRODUCTION

1.1 Overview of Public Investment Project Selection Process.

The project selection process starts in the field under the district focus for rural and poor urban development policies. Projects are proposed both at the sub location and location by *wananchi*. The proposals are passed to the chief who together with the locational action committee prepares a list of projects that the local community would like to have in their locality. The list is forwarded to the divisional head, the district officer, who in conjunction with the Divisional Coordination Committee, consolidates the lists from the locations and forwards them to the district head for further deliberations. The locational action committee and the divisional coordination committee are arms of the district development committee.

At the district level, two teams are involved in the project selection process:

District Development Committee (DDC): which is composed of the District Commissioner (the chairman of the committee), Members of Parliament from the district, Non-Governmental Organisations Representatives, Church Groups Representatives, District Development Officer, District Departmental Heads, Council Chairman and representatives of other prominent groups working with the local community to improve their quality of life.

District Executive Committee team: that comprises of professionals who put in the expertise required to appraise the projects.

The two teams work jointly to produce a document that contains all the proposed projects. This document is called a District Annex. The document is produced annually and covers a period of one financial year. It reviews the achievements of investments on prior period

projects and cites any difficulties that might have hampered the projects' progress. It also gives a list of the proposed projects of the subsequent financial year.

Project appraisal is done based on the social needs of the locality and prioritization criteria established for each project. The sources of funds, location and project status that is new or ongoing are highlighted. The annex is forwarded to the Ministry of Planning and National Development and at the same time each project is forwarded to the concerned ministry, if say a school is proposed the proposal is forwarded to the Ministry of Education and Human Resource Development.

The concerned Ministry appraises the projects a second time based on the Public Investment Programme guidelines.

1.1.1 The Public Investment Programme (PIP)

This is an annual exercise introduced by the government to facilitate forward investment planning that should precede and feed into the forward budget and annual estimates. The PIP provides the instrument for the review, selection and planning of major, priority development investment projects and programmes in all ministries and non-financial state corporations and has made considerable progress towards rationalising on-going project portfolio.

The functions of the PIP are to:

- set out the policy objectives and strategies of each ministry and state corporation that are to guide the development investments proposed for the PIP;
- attribute a relative priority ranking and provide justification for all projects and programmes to be included in each development portfolio;
- provide accurate up-to-date and binding information on the financial requirements of each selected projects and programme;
- lay down an implementation schedule for each project;

- provide mechanism for introducing new project proposals;

The PIP is considered to be a tool for monitoring, coordinating and sharpening management of public expenditure, monitoring investment plans and allowing more accurate forecasting of future recurrent expenditure demands. It is also expected to strengthen project selection, preparation and investment programming, a process expected to stretch over a period of several years.

The PIP whose agenda is to improve the quality of project data and make their investment programmes consistent with the government development strategies and the forward budget ceilings is prepared by the Principal Finance and Establishment Officer(PF&EO) and the finance team of each ministry or state corporations. The major building blocks of the PIP are:

a) the policy statement and list of investments priorities prepared by Ministries and state corporations that sets out a small number of projects designated as "Core" and "High Priority";
b) the project list data which is the information on all projects particularly the one regarding to total estimated costs, balance to complete the project in case of the ongoing and the schedule of the expenditure;
c) the project briefs qualitative and quantitative data which assists in the project review and monitoring and;
d) the proposal briefs which gives summary information on new project proposals.

The PIP is prepared in a consultative manner and gives the investments' prioritization criteria for each project that each ministry proposes. The appraisal of all PIP submissions are done in the forum of sectoral planning group in conjunction with each ministry's planning unit. The forum is chaired by a senior officer of Ministry of Planning and National Development (MPND) and attended by the Ministry's head of planning unit. The selection

criteria in use currently are designed by the MPND and only gives general guide lines on how to select the projects. A project due to start in the 1999/2000 financial year on the strengthening of public investment programme management will seek to introduce and utilize more well defined criteria to guide project selection where the sectors will define their own "Sectoral Selection Criteria". Project appraisal is done based on the project and programme review criteria stipulated by the PIP document. The conclusions of the appraisal are forwarded to the Permanent Secretary Ministry of Finance for inclusion in the forward development budget deliberations that are to be funded during the financial year.

The MPND is a key player in the selection of projects in all the ministries, being the provider of the technical know-how needed in the selection process. The ministry coordinates selection and undertakes an appraisal of all the proposed projects. In summary the office of the Vice President and Ministry of Planning and National Development (OVP & MPND) has been assigned the responsibility for:

i. Coordinating the preparation of PIP by ministries and non-financial state corporations

ii. Understanding an appraisal of all PIP submissions in conjunction with each ministry through the forum of the sectoral planning groups, to be chaired by a senior officer of MPND and attended by the head of the Ministry's Planning Unit. The conclusions of the appraisals are forwarded to the Permanent Secretary, Ministry of Finance (PS/MoF) and will be taken into account during forward development budget deliberations.

iii. Approving the PIP that will be forwarded to the PS/MoF and will be taken into account during programme review and forward budget deliberations.

iv. The production of a consolidated PIP for the government

v. Establishing an operational, monitoring and evaluation system within the framework of the PIP and

vi. Creating a project registry to provide a data bank and profiles on all projects included in the PIP.

This vital role is what this study has set out to strengthen by providing a model that will enhance the performance of the ministry.

1.2 Background of the Study

For the last four or so decades, there has been a large number of publications on the subject of management research and development. A lot of literature is concerned with the application of management science techniques in the areas of project evaluation, selection, planning and control. The extent of usage of these formal techniques has raised concern and many studies in both the developed and developing world have been conducted to establish the usability and acceptability of the management science techniques in solving 'real world problems'.

There are reports on the application and continued popularity of tried and tested methods such as Participative Objective Setting, Progress Charts, Research Planning Diagrams, Milestone Reporting and Project Evaluation Review Technique (PERT). However, some recent publications and conferences have voiced dissatisfaction with the existing methods and in particular with PERT. The reports have in turn suggested approaches involving more sophisticated use of computers that utilizes the development in Decision Support Systems, Simulation and Expert Systems (Watts and Higgins, 1987).

Decision Support System (DSS) usually consists of a database, information processing software and the appropriate decision models. The decision models are what differentiates the DSS from the conventional information system. The Decision making models are a characteristic of the operations research applications. These applications can be divided into two distinct categories:

a) Decision – oriented applications; that is models that assist management in making a one time non-recurring decision for example corporate mergers or acquisitions.

b) Decision – process-oriented applications which are models used to suggest solutions to recurring problems.

Due to the complexity and the counter-effect of decisions on each other, managers look for acceptable feasible solutions as they cannot consistently optimize or continually achieve low-cost solutions.

In deciding which of the proposed projects are to be implemented a number of conflicting criteria has to be taken into account. For example the decision makers may wish to maximise the welfare of the society, minimise the losses from risky projects, consider political affiliation project's contribution to the Gross National Product, personnel development and image the government wants to create. These criteria may not be compatible in that some of them can only be achieved at the expense of others.

The conflicting nature of the criteria make the decision process complicated as managers have to consider multiple objectives and attributes in the decision making process. Cooke and Rusell (1993) in their definition of decision making sums up the position by defining decision making as a struggle to resolve the predicament of conflicting criteria.

In light of this the study views the project selection problem as one that involves Multiple criteria and adopts a Multi-Criteria Decision Making (MCDM) approach towards solving it by designing a suitable Decision Support System (DSS).

Some of the primary models used in multiple criteria decision making are Goal Programming, Multiple Objective Linear Programming(MOLP) and Interactive Computer Based Methods. What is probably the most widely applied multiple-criteria approach is Goal Programming (Cooke and Rusell, 1993)

1.3 Statement of the Problem

Projects performance in the Less Developed Countries is an issue of great concern to their public, donor agencies and the governments. This is because what is actually achieved after the project implementation is often far from what was expected during the appraisal. This scenario is common with many investment projects, as though they are well managed they are still poor investment because they produce the wrong products or satisfy a very low priority need (Kibiku,1998).

Project proposals in any year tend to exceed the resources available by a considerable amount. In deciding which of the proposed projects are to be retained in the portfolio of projects to be implemented, a number of conflicting criteria have to be taken into account. This makes the selection process a critical aspect in the area of project management

Selection involves forming a view or opinion on the decision options, expressing preferences between them and eventually deciding on the option to be implemented (Cooke and Slack, 1991). To effectively make the correct selection in presence of myriad constraining factors and objectives, the manager needs to be equipped with the necessary tools that will provide the assistance he or she needs in order to achieve the desired goal that is to make the 'best possible' selection for implementation. The selection process may be short, but it is often far from easy. What is sometimes called 'decidophobia' is a recognition that making a choice is a commitment to an action which involves some degree of risk with a possibility that we may finish up worse than we started (Cooke and Slack, 1991). However, if the selection process is properly administered, it provides us with projects that are satisfactory to all the stakeholders and that justify their funding. Such projects can form a basis for selecting future projects that are similar in nature.

In view of the difficulties encountered in the selection process, the researcher finds it necessary to revisit the selection process again with a penchant to the selection process at the Ministry of Planning and National Development. The senior officials of the ministry being the key persons involved in the selection process, have found themselves in a quandary of balancing the project's risks and returns to the society and the multiple recommendations from the many stakeholders . This has been in an environment where they do not have a clear path for vetting their projects from a host of viable ones. This issue is further worsened by the public concern on the project pursued by the government. Headlines such as 'Proposals to Treasury need wide publicity" (Daily Nation June 9, 1998), ''Proposals Crucial in Reviving Stalled Economic Growth" (Daily Nation December 5, 1995), "Mombasa Highway Nightmare Far from Over" (Daily Nation March 3,1999),

"Government Should Inform Interest Groups How Executive Decisions Are Arrived At" (Daily Nation January 31, 1999), "For Some Buying a Presidential Jet is a Bumpy Ride" (The East African March 1-7, 1999) and many more appear regularly in our local dailies and magazines.

To assist the officials concerned with the vetting and initial selection of the project, to arrive at better decisions given their environment, we need to provide them with tools that will support them in the decision – making process.

Many Operation Research and Management Science tools have been developed and used to assist managers but their use has encountered hindrances as most of them require quite a size-able technical and mathematical know-how that is found lacking in most managers. This then suggests the need to put these models in a more digestible form if they are to meet the objectives for which they were first developed. In selecting projects most of the Operations Research and Management Science models used hardly apply a single model that combines both the OR and Management Information System capabilities in decision making.

Although many investment decisions in the Less Developed Countries are taken on political or non-economic grounds, the evaluation and appraisal of projects is necessary as it provides the relationship between project costs and benefits.

Looking at the foregoing discussion and at the much needed thoroughly appraised projects, the researcher pose the following questions:

How do we assist the officials at MPND arrive at the most optimal project portfolio and at the same time meet the complex and hard to fulfill selection criteria?

How can we ease the selection process make it more objective and offer reduced public hue?

To address this problem, the researcher proposes to design a Decision support System that can be used in selection of the projects using a multi-criteria approach.

1.4 Objective of the Study

The objective of the study is to determine, with a view of improving, the current project selection process used by the Ministry for Planning and National Development and designing a DSS to be used in the selection process. The DSS will use a multiple criteria approach.

1.5 Importance of the Study

- This study is expected to first benefit the Ministry for Planning and National Development project selection process by providing the Ministry with a tool that will assist and ease project selection. The DSS to be designed can also be used as a base on which to design other DSS for other governmental and non governmental bodies.
    - The study is expected to yield a computerized DSS consequently promote the use of Operation Research and Management Information System tools in solving real world problem.
    - The findings will bring to light how comprehensive the current project selection process is and this will facilitate in improving the process and the quality of selected projects.

- The Study will form a basis for interested scholars and practitioners to research on and also add to the body of knowledge on practical DSS design.

2.0 LITERATURE REVIEW

2.1 Project Selection[1]

Project selection entails making a choice amongst the various alternatives of projects proposed. This selection is based on the priorities of the stakeholders and available resources. Various criteria for project selection can be adopted but they must meet the following requirements:

Realism: The model should reflect the reality of the managers decision and situation. If a project is able to look at reality then we are able to have common measurement system that helps in comparison of projects.

Capability: The model should allow the manager to remain focused on the organization's ability, consider the likely risks benefits and costs and select the alternative putting into consideration the multiple changes so as to optimize the decision.

Flexibility: This needs the model to be easily modified to accommodate changes within the environment. The model should be in most cases self-adjusting or response to changes in the firms environment with speed and accuracy required.

Ease of Use: A model should be easy to use and understand. Specialist interpretation should be avoided fully and if not fully be executable without specialist intervention. The model should be reasonably convenient and not take a long time to execute. It should not require data that is hard to acquire, or require excessive personnel or unavailable equipment.

Cost: The cost of data gathering and modeling costs should be low. They should be realistic in comparison with the cost of project and be lower than the potential benefits of the project. Selection takes place after the project has been accepted by policy makers and funding organizations as meeting the feasibility criteria

The design function including the formal implementation plan has been completed (Goodman, 1988). The selection of one project over another is made on the basis of several criteria. Project selection requires negotiations to obtain formal approval from national authorities, funding agencies and other contributors.

2.2 Project Selection Decision Process[1]

To select a project, policy makers consider the feasibility of the project and the priority of the project area. Funding agencies however, have a variety of techniques for determining whether resources will be allocated to a particular project. According to Goodman (1988), the techniques range from cost-benefit analysis to other complex forms of analysis. However, the two parties must concur that the project has a priority claim for the resources it requires. The selection process is hence very competitive and uses models in the different phases of selection.

Project selection process is dynamic as screening and evaluation is continually done in response to the changing information states, resources and funding levels, changes in

1. *This section borrows from the works of Souder.*

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project achievements or the arrival of new projects proposals. Selection is accomplished with the assistance of certain models. The models are classed as either screening models or evaluation models that assay the projects to the most refined level of details so as to justify their findings.

2.2.1 Screening Model

Profile Models: These models use qualitative ratings. No numerical assessments are made but the project proposals are compared on the basis of a subjective evaluation of their

attributes. The evaluations could be done by one individual or by group consensus. They display project characteristics and ratings in such a way that they are easily communicated and readily visualized. Though they are simple to use, they do not tell us anything about trade-offs among the criteria.

Checklists: The model evaluates the project based on a finite level of criteria or requirements. The decision maker assigns a score on each criterion or requirement. The criterion score is ascertained from a predesignated scoring scale that translates subjective evaluations into numerical scores. A total score is obtained for each project by summing its criterion scores. This is an improvement on the profile modes. A cut-off mark is specified for acceptable project proposals.

Scoring Models: Its slightly different from the checklist model. Each project is scored on each criterion or requirement. The criterion scores for each project are then combined with their respective criterion vitality weights to achieve total score for each project.

Frontier Models: The projects are plotted in such a way as to show their relative risks and returns Risk expresses the project's chances of failure whereas returns expresses the project's anticipated profits, sales or some other measure which is of value to the decision maker. They are useful for examining the return-risk trade-offs within an organization.

2.2.2 Evaluation Models

Economic Index Models: This is a ratio between two variables various index models for project evaluation have been developed. Examples of such models include: Ansoff's Index, Olsen's Index, Viller's Index and Disman's Index. The single number or score that is produced by the index model is used to rank or rate the candidate projects. These models are inappropriate as they involve internal trade-offs, unless the trade-offs are representative of those decision maker would actually be willing to make. Other weaknesses of the model include:

- Sensitivity of the index changes in some of their parameters
- Inability to consider multiple objectives
- No single index model can include everything

The models are appealing due to their ease of use.

Risk Analysis Models: These models provide a complete picture of the distribution of outcomes for each alternative project. This approach makes the risk-averse and risk-taker strategies more visible, thereby permitting a decision-maker to consciously select decisions consistent with one of these chosen strategies. Common methods used are curve-Fitting Techniques, Financial Management Techniques and Monte Carlo Simulation amongst many more.

Value-Contribution Models: Value-Contribution (V-C) models allows the decision maker to examine the degree of contribution which a project makes to the organization's hierarchy of goals. To develop a V-C Model, first you list the organizational goals as a nested hierarchy (e.g. have super goals, goals and sub-goals). The second step is to value weight the goals according to their relative importance. The actual scaling and scoring of the candidate projects within a V-C model can be done individually or by consensus. The value-weights and scoring scales can be constructed using the value assessment methods or scoring model techniques. Since the total costs of the projects vary, the total value-contribution scores must be normalized by dividing them with the respective project costs. The resulting normalized V-C Scores are then used to rank the candidates.

Mathematical Models: A mathematical model is simply a representation of the salient features of a problem by mathematical relationships, from which a solution may be derived (Gregory, 1988). The models are intended to simplify the reality but not to mimic every aspect and feature of the situation. In a Mathematical model, the controllable properties of the entity are modeled in quantifiable terms.

Mathematical models are further classified into:

- **Descriptive Models**: these attempts to accurately describe some situation without suggesting any potential decision or course of action. Such models according to Wisniewski (1990) are used to allow us observe the behaviour of some mathematical business system.

- **Predictive**: They are the forecasting models. They are built upon some descriptive model but in addition to observing behaviour, they predict such behaviour too. The models are further classified into causal (e.g. regression or econometrics) that seek to determine the causes of change or Non causal (e.g. trend analysis) that are concerned with predicting the future movement of some manner.

Planning Models: They are normative models and they attempt to suggest some desirable course of action. They are set and built onto them some goals or objectives. These models are broadly categorised into two broad types, the heuristic and the optimization.

Heuristic models identify the approximate or satisfactory solutions as opposed to optimal solutions (Wisniewski 1990). It might be that the problem is so complex or indeterminate that it may not be possible to determine the optimal solution.

Optimization models, which are concerned with identifying the 'best' solution to the stated problem. The focus of this study is to use an optimization model in the selection of the project. The optimization model can be deterministic that is its based on the assumption that all the data pertaining to the problem, and all relationships specified in the problem can be treated as certain and known. It can also be stochastic where the model allows for both relationships and data to be treated as uncertain, through use of probability.

2.3 Project Selection Process

Perhaps to an organization, the most difficult change is the choice of a project. A project is not a product or service that can be purchased at will. It is a venture that demands not only the requisite money or technical experience but also a desire and aptitude for running and managing it. It is also risky hence a need for careful and thorough evaluation before one embarks on it.

Selection is not, and cannot be, a single step decision. It has a cycle of evolution from the time the opportunity is perceived to the time decision is taken. Ideally, it involves a step-by-step process of exploration, scrutiny and appreciation of plus and minus points of competing claims and alternatives and the gradual narrowing down of options leading to the project that may be finally selected. (Sinha and Sinha, 1983) The selection of a project or a set of project is therefore not a one-time exercise nor is it a snap or an impromptu decision but rather a rigorous process of elimination. There are four steps towards this end. According to Sinha and Sinha (1983) the steps are:

Exploration: This entails a deliberate effort to know, understand, analyse and assess the relevant material and data that is necessary for us to achieve a balanced picture about the desirability and feasibility of the project.

Identification: This considers the potentialities of the project in view of the available technological know-how, government regulations and other external environment variables.

Consideration: After the exploration and identification the project selector moves a step further to include the specific factors of selection that are to be juxtaposed to the project data and pros and cons that have to be examined in light of historical experience, market conditions management competence and capability.

Selection: This is the last stage in the selection process. It is the exercise of the managerial choice to take up a particular project from amongst available alternative proposals. It's the decision to take up a project for implementation. The feasibility study report forms a good base from which data to assess the projects can be obtained. This study also looks at state of the art on the area of decision support system. The study's objective is to design a DSS that uses a multi-criteria approach and assists in the selection process. However, before we fully address the DSS design a quick review of system design is done.

2.4 System Design

According to Bruch et. Al. (1986), system design is the drawing planning sketching or arranging of many separate elements into a viable, unified whole system design deals with how the system is done to meet the needs of the users. The design of an information system is the overall plan or model for the system that lays down the system's structure. In designing systems either of the following tools can be used:

Prototyping: this is a step by step process that avoids the structure and periodic formal approval process of the phased approaches. It relies on an working model to allow an initial view and discussion on how to improve the prototype. Users are allowed to revise the system until their desired level of satisfaction is achieved.

Structured charts: this advocates for a top-down strategy in system development. Computer programs are factored into separate modules. The major principle of structured

design is that a system should be designed from the top in a hierarchical manner and decomposed to more level of details.(Burch et.al. 1986).

Hierarchical Input-Process-Output: this was originally developed by IBM for her operating system but has become a widely used tool for documenting application designs. According to Laudon et al (1988), this methodology is used to display a program or a procedure graphically in a system as per the functions to be performed.

2.4.1 Decision Support System (DSS)

The philosophy of DSS has been with us for over two decades and the lure of DSS continues (Kottemann and Remus, 1987) It is still appealing to visualize the use of interactive, user-friendly and flexible computer system in carefully analyzing a poorly or ill-structured problem.

One of the main if not the primary goal of DSS is to help decision makers bring structure to ill-structured decisions. This structuring applies either explicitly or implicitly to the decision making process (Kottermann and Remus, 1987). The DSS provides either normative or clerical support to the degree which in the case of normative, it provides predefined structures for decision problems and for decision making process, whereas in the case of clerical, it provides passive support for recording and organizing facts and thoughts.

The term decision support system (DSS) has variously been defined. Scott-Morton (1978) is one of the developers of the concept of a decision support system. His definition of a DSS is "an interactive computer-based system which helps decision makers utilize data

and models to solve unstructured problems." Elsewhere a DSS has been defined as "a tool, usually computer-based, for the purpose of executive mind support." There seems to be is no universally accepted definition of a DSS. For purposes of this study we shall define a DSS as:

an interactive computer-based information system that possesses some decision-making or decision-aiding capability. It utilizes heuristic decision rules, models, and a comprehensive database to augment the decision-maker's own insights.

The term decision stands for a conclusion that is arrived at following analysis of alternatives. It is the judgment that one comes to. At this point the key question for anyone working on a DSS is what are the specific decision or decision processes are we trying to support. The decision may be repetitive and ongoing or a one-shot situation. The decision support focus assumes that the problem the manager is facing is not trivial and that it cannot at any moment be automated.

The term support indicate that DSS supports but does not replace the manager. This emphasizes on enhancement of decision-making exploits those aspects of computers and analytical techniques that are appropriate for the problem and leaves the remainder to the manager. The key point for a DSS is to support or enhance the manager's decision making ability. (Keen and Morton, 1978)

System is the other term in the expression– this implies both the manager and the equipment that facilitate decision-making. It is the set of inter-related activities performed by the manager supported by the equipment or machines. This makes a DSS more of a service than a product.

The main characteristics of a DSS as discussed by Lucey (1991) are:

1. Computer based provides and support but does not replace the manager's judgment nor does it provide pre-determined solutions.
2. DSS are best suited to semi-structured problems where parts of the analysis can be computerized but the decision maker's judgment and insight is needed to control the process.
3. Effective where problem solving is enhanced by interaction between the computer and the manager.

2.4.2 The Value of Using a DSS

Using a DSS, a manager is able to get the information needed to assess and plan a business activity. The Manager plus the system can provide a more effective solution than either alone. The DSS are of particular value in finding solutions to semi-structured problems that is problems for which the solutions requires managerial judgment and subjective analysis of information derived from a large number of, or complex, computations. DSS is for control and planning by both top and middle management and includes models of operational research and management science (Hussain and Hussain, 1995). To this end also, the DSS tend to be used in modeling, analyzing alternatives and decision making.

Using a variety of tools and procedures the manager (i.e. user of DSS) can develop his own system to help him perform functions more effectively. This active involvement of the manager and the focus on decision making is what makes the DSS different from a Transaction Processing System. The focus is on support for decision making not on

automated decision making (Lucey, 1991). The system designed should be small, simple modeled easily understood and used by the manager, rather than complex integrated systems which need information specialists to operate them.

2.4.3 Where to Apply DSS

To apply a DSS, the problem must be important to the manager and the decision required must be a key one. Apart from this, the criteria that should be met is:

- There should be a large database. A database is a collection of structured data with minimum duplication of data items.
- Voluminous computation or data manipulation
- Inter-relationships where there are numerous factors involved creating complexity in the relationships.
- In complex situations where we need judgment to determine and solve a problem.
- Where a group of people is involved in the problem solving process as co-ordination is required.
- Analysis is by stages. The problem is an iterative one with steps for re-assessment.

2.5 Designing the DSS

The systems approach is a method or framework which helps us to analyze and explore the operations and interactions which exist in the system around us. There are many definations of the term 'system' (Lucey, 1991). A comprehensive defination should however be one that contains the essentials of a system that is the parts, relationships and objectives.

The designing of a system is done at two main levels:

2.5.1 The Conceptual Design

This establishes a more complete user-oriented design for the application. It emphasizes the application as seen by those who will operate or use the output of the system. It establishes the inputs and outputs, functions to be performed by the application, and application audits and controls (Davis and Olson, 1985)

2.5.1.1 The Physical Design

This is the detailed design and it consists of activities to prepare the detailed technical design of the application system. It is based on the information requirements and the conceptual design. According to Davis and Olson (1985), the results of the physical system design phase are specifications and designs are:

- System design showing flow of work, programs and user functions
- Control design showing controls to be implemented at various points in the flow of processing
- Hardware specifications for the applications if new hardware is required.
- Data communications requirements and specifications
- Overall structure of programs required by the applications with procedural specifications on functions to be performed by each.
- Security and back up provisions
- An application test or quality assurance plan for the remainder of the development.

2.5.2 Model Construction

Model construction consists of identifying the problem or opportunity and finding a matching technique to solve the problem or take advantage of the opportunity. A model is

a form of abstraction or representation of reality. It can be built by following the process of observing, and conceptualizing the situation, formulating the model and testing it (Burch and Grudnitski, 1986) For purposes of our discussion, models are classified as procedural that is those composed of a set of declarative statements and describe tasks and personal activities. Logical models that are more embedded in information systems to remove the burden of routine decision making like the expert systems and Mathematical models that are the quantitative representations of reality implemented in systems to support an organizations day-to-day transaction processing and provide information for planning and control functions. (Burch and Grundnitski, 1986)

3 METHODOLOGY

3.1 Research Design

The research design is a plan that specifies type and source of data or information pertinent to the research question. It is also a blue print that specifies the approach that will be used to gather and analyze data. The researcher has in this chapter specified the data to be collected and how it will be analyzed

3.2 Subject of Study

The selection or vetting process of Ministry for Planning and National Development will be studied. This will be a case study conducted at the Ministry 's Offices in Nairobi. The case study is deemed appropriate as it allows conducting of detailed investigation. In designing a DSS a thorough understanding of decision process to be supported is required and due to the unique nature of the process, it may not be viable to design a DSS for more than one organisation concurrently. Similarly trying to design the DSS for another organisation after the completion of the first one, may not be possible given the limited time and financial constrains.

Ministry for Planning and National Development was particularly chosen based on the key role it plays in the preparation of the Public Investment Programme. The Ministry has been assigned the responsibility of coordinating the PIP preparation, appraising all the PIP submissions and approving them, production of a consolidated PIP and establishing an operational monitoring and evaluation system of the projects. Further to this, the researcher is concerned about the current selection approach that seem to be deficient in logical prioritization of the projects. Government funded projects have come under heavy

criticism the most noticeable ones being the Presidential Jet, Eldoret International Airport *inter alia*.

3.3 Data Specifications

Data collection was from both the primary and secondary sources. The set of data obtained was used design the DSS. Primary data was obtained by conducting personal interviews conducted at the MPND head office. Secondary source were also reviewed. The data was also used to design the database which is a key part of the DSS.

3.4 Data Collection

Two methods were used in collecting data:

- Personal Interviews
- Document review

3.4.1 Personal Interview

Simply stated, it is a face-to-face exchange of information (Burch J et al, 1991). Within an organization, interviewing is the most significant and productive fact-finding technique available to systems analyst. This method is designed to collect information on what is currently done in the Ministry and what the DSS users would like done. The interview approach was preferred as it allowed the researcher capture issues that are not addressed explicitly in the interview guiding questionnaire and are relevant to this study. The senior officials involved in the selection process were interviewed. An interview guiding questionnaire is attached see appendix II

3.4.2 Document Review

This entails the collection of exhibits of documents worksheets, reports and other literature. Documents currently in use during the selection process and were considered relevant to the study were reviewed and taken up as valid sources of data.

The data collection will also be done keeping in mind the requirements of the approach suggested by Sprague and Carlson (1982) of designing a DSS.

3.5 Data Analysis Techniques

The data was collected to meet the following needs:

- Designing the Decision Support System (DSS)
- Designing the database which is a key part of the DSS.

In meeting the needs, the researcher used primary data as this represents the correct situation that is needed if the model designed is to add any value to the current selection models.

The Chi-square was used to test for the independence or dependence of project ranks to ministries, for all the projects invested in by the government. The test was done for the various sectors of the economy which were involved in the project selection process. Spearman rank correlation was also used in model validation. The model was used to check whether there is any association between the projects selected using the proposed model and the current selection approach. This correlation model was deemed appropriate because of its ability to measure association between two independent observations from one subject, especially where we are using ordinal data which is the case with this research.

3.6 Structure of the Decision Support System (DSS)

To design the Decision Support System, the approach suggested by Sprague and Carlson (1982) was used. They developed an approach to the design and description of a DSS that they call ROMC model. ROMC is an acronym that stands for Representation, Operations, Memory-aids and Control.

Representation: This refers to the decision context, that is whether the decision can be represented in form of a chart, a diagram, a figure or the representation will be using any application software like a spreadsheet.

Operations: This refers to how the decision will be made. For example Herbert A Simon argues that the process of decision making is three phased: Intelligent Phase, Design phase and Choice Phase. In the three phases, we are required to decide on what we need in terms of data. We also consider data manipulation and collection methods and the alternatives generation. Modifications are done to alternatives generated and a particular alternative chosen.

Memory – aids: These are the representation of the decision made and data operations. Representation could be in form of models and or a database is designed where data is stored and retrieved as needs arise.

Control: Here the system designer organizes the tools and data that are to be used in decision making, user interface controls and database controls.

3.7 Model justification

The model justification is done at the two main levels that are addressed its development. This is as follows:

3.7.1 Multiple-criteria Approach

Multiple-criteria analysis is aimed at studying the decision problems in which several points of view have to be taken into consideration (Balestra and Tsoukias, 1990). The Multicriteria paradigm assumes that:

(i) Many criteria characterize a system and drive its evolution

(ii) These criteria are conflicting

(iii) Their tendency is to generate a compromise or to request an arbitration and

(iv) This compromise or arbitration has a reference point even if it is transitory.

The adoption of multiple-criteria decision making approach is deemed fit because:

- There is increased recognition that most decision problems are inherently multiple-objective. Even many problems addressed by classical single-objective models can be easily viewed as multiple-objectives in nature. Examples of such problems include Project Management (Talbot, 1982) Inventory planning problems (Kendall and Lee, 1980) location problems, scheduling problems and capacity expansion problems. The reason for the multiple-objective nature of these problems is simply that the outcomes associated with the decision are multidimensional (Evans, 1984).
- The recognition of numerous stakeholders in many problems (Balestra and Tsoukias, 1990). This manifests in the increasing regulations by governments and the enormous problems of planning in the public sector.
- The factors, objectives and prioritisation criteria that are used to justify selected projects demonstrate strongly the multiple criteria nature of the project selection problem which involves a maximisation of each benefit both qualitative and quantitative, or minimisation of each cost and minimisation of deviations from the desired balance.
- Availability of computing facilities that are fast and user-friendly.

3.7.2 Decision Support System

A systems approach to investment project selection was deemed fit for this study as:-

- It assists in looking at all inter-related factors and parts in an organization.
- Not all problems can be reduced to mathematical models and a DSS assist in establishing such problems with more clarity by allowing the user's judgment and personal influence to be incorporated in the decision making process.
- It enhances the knowledge and sharing of experiences of the government officials who select the projects as they are able to harmonize their ideas in the selection process.
- Project selection being purely a thought provoking and tiring process, any support that cuts on time spent is a welcome idea. This sort of support is offered by decision support systems.

4 FINDINGS AND MODEL VALIDATION

4.1 Findings

The government through the PIP selection, review and monitoring process has invested in projects worth Ksh. 105 bn. These projects are as summarised in the table below:

Sector	Category	Sources of Fund	Number of Projects	Percentage of Total Projects in the Sector.
Economic	Ongoing	Government of Kenya	517	52
	Ongoing	External	210	21
	New	Yet to be Established	274	27
Social	Ongoing	Government of Kenya	198	66
	Ongoing	External	65	22
	New	Yet to be Established	37	12
Public Administration	Ongoing	Government of Kenya	152	42
	Ongoing	External	84	23
	New	Yet to be Established	130	35
Sub Total	Ongoing	Government of Kenya	867	52
	Ongoing	External	359	22
	New	Yet to be Established	441	26
Grand Total			**1667**	**100**

Source: Public Investment Programme 1998/1999-2000/2001

One Thousand Six Hundred and Sixty–Seven projects were included in the 1998/1999 – 2000/2001 PIP. Out of these 74% of the projects are ongoing whereas 26% are new proposals.

The projects were categorised based on:

- Their status, that is either ongoing or new;
- The sector which, could be either Economic, Social or Public Administration sector and
- The sources of fund, the project can either be fully funded by the government or funded from external sources or from both sources. According to the 1998/1999 – 2000/2001 PIP most of the projects fell in the latter category. The categorization criteria apply to all the projects and they form an integral part in the selection process.

A summary of the projects per the categories is as shown in the table below:

Status		**Sector**			**Sources of funds**		
Ongoing	*New*	*Economic*	*Social*	*Public Administration*	*GK*	*External*	*Yet to be Kwon*
1226	441	1001	300	366	867	359	441

Source: Public Investment Programme 1998/1999-2000/2001

The selection process is continuous through out the year although the PIP is prepared annually. As earlier noted, the selection process starts with the Wananchi within a certain locality. Minimal feasibility studies are done for the government funded project the most cited reason for this poor approach being lack of funds. For projects requiring an initial investment of more than Kshs. 100m an economic analysis is done and they must have positive Internal Rate of Return (IRR) before they can be considered for inclusion in the PIP. The selection process is entirely manual and entails use of committees that evaluate

the projects based on certain attributes. The MPND selection committee is guided by the following list of factors while selecting the projects:

i. Initial Investment costs

ii. Full operating and maintenance costs

iii. Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget, user charges or self-financing

iv. Internal Rate of Return for projects with an initial cost of more than Kshs. 100m

v. Balance of funds to complete ongoing projects

vi. Phasing of expenditure

vii. Availability of cheaper alternatives to the project

viii. Centrality and criticality of the project towards carrying out the Ministry's function

ix. Expenditure to be written-off if the project is to be discontinued

x. Provisions of the prior year Finance Bill

xi. Provisions of national and sectrol policies defined in Government Development Plan Sessional Papers and other similar documents

xii. Sustainability of the project after inauguration

xiii. Level of project completion

xiv. Available level of human skills

xv. Contracts entered into and their legal implications

xvi. Technology level required to support the project

xvii. Nature of the project that is whether it involves rehabilitation of existing facilities or creation of new ones.

xviii. Costs associated with reducing the project size or delaying project implementation

xix. Growth prospects (ability to expand the project in future)

xx. Infrastructure (Transport and Communication facilities)

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xviii. Costs associated with reducing the project size or delaying project implementation

xix. Growth prospects (ability to expand the project in future)

xx. Infrastructure (Transport and Communication facilities)

xxi. Project location in the country

xxii. Availability of utilities such as water and electricity and other resources

xxiii. Gender issues focusing on the respective roles of women and men within the context of national socio-economic development

xxiv. Sources of fund (Internal or External)

xxv. The effect on the environment degradation and

xxvi. Staff motivation and the working environment.

The stated factors apply irrespective of the project category or the Ministry through which the project is proposed and irrespective of the level at which the selection is done. However, the objectives that each project must address are dependent on the Ministry's objectives. Each project must contribute towards some of the objectives the Ministry that proposed it seeks to achieve. The objectives that the Ministry of Planning and National Development seeks to achieve and those that the project must in someway contribute towards are:

a) Develop appropriate economic models for analysing and assessing economic trends in order to facilitate development;

b) Formulate, prepare and monitor the implementation of national development plans, including mid-plan revisions and sessional papers on development prospects, strategies and policies;

c) Improving the effectiveness and efficiency of Government public investment programme and the management of its implementation;

d) Advice the government on economic issues relating to consultative group meetings stand-by arrangements and external finance resources;

e) Promote regional economic growth through integration and cooperation;

f) Coordinate and manage all sectoral planning related to economic and basic infrustructure, trade and industry policy issues;

g) Provide well integrated and effective economic policies through continuous monitoring evaluation and review;

h) Coordinate and manage all issues related to human resource development and planning;

i) Promote rural development through appropriate policies, programmes and projects that enhance capacity for growth;

j) Provide an inventory of the country's physical and natural resources through surveys and remote sensing hence facilitate proper management and resource utilisation.

k) Research on population trends and formulation of policies and programmes designed to reduce fertility and generally improve quality of life and ensure desired population growth rate.

l) Maintain and manage a databank arising out of the resources surveys and remote sensing for purposes of providing the appropriate signals with regard to resource monitoring;

m) Undertake macro and micro economic and public policy research and analysis.

The MNPD considers the stated factors and objectives and derives from them a prioritisation criteria that it uses to rank the projects. The prioritisation criteria for the MPND according to the 1998/99-2000/2001 PIP document is:

> "The investment priority of the Ministry is geared toward setting up the macro-economic environment in which both public and private sectors can function effectively to promote growth. The Ministry does this through continuous formulation, review and appraisal of economic policy through development plans, sessional papers and other policy documents that facilitate planning and development. Thus top in its agenda is addressing issues pertaining to agriculture and rural development, industrial trade policy, population planning and development, mobilisation and utilisation of human and physical resources.

In line with its objectives, the Ministry lays emphasis on those projects and activities that facilitate formulation and continuous monitoring, assessment and appraisal of Government policies and strategies and enabling the successful completion of all donor assisted projects".

With the prioritisation criteria in mind and the factors and objectives that gave birth to the criteria, the selection team evaluates and ranks the newly proposed and ongoing projects. The priority rankings are:

- Core Projects, which are accorded first priority for funding, allocations in the budget exercise. These are projects and programmes that are absolutely critical and central to the Ministry's functions. Explicit justification for all core projects is required.
- High Priority Projects, which are given second priority for funding allocation. These projects are those that demonstrably implement priority national and sectoral policies of the 8th National development Plan.
- Medium Priority Projects, which are projects justified against policy objectives. These projects receive funds for implementation once the core and high priority projects have been allocated full funding and sufficient provision made for the settlement of pending debts.

The priority rankings are applicable in all government ministries and caution is given on the numbers of the projects that a ministry can designate as core or high priority.

The MPND has proposed seventeen core projects during the 1998/99-2000/2001 period. There are thirty-two ongoing projects out of which eight are funded by the government. All the projects are justified based on the earlier stated investment priorities. Similarly the end product of the DSS is a list of ranked proposed projects. The model allows subjectivity in the decision-making process.

4.2 Decision Support System (DSS) Design

To ease, make faster and clearer the selection process, the researcher has designed a Decision Support System that can be used in the selection process. The DSS as earlier noted adopts the Sprague and Carlson ROMC structure. Initially a prototype was designed to facilitate discussions with the selection committee and see what improvements need to be done to it. This prototype is described below:

Representation of the decision is with the use of using a spreadsheet (the one available to the DSS user) as they are readily available and easy to use.

Operations are two phased in the DSS.

The Appraisal Phase: The projects are appraised at this phase.

The DSS prototype developed adopts a multiple-criteria approach due to the conflicting criteria that is used in making the selection. The Ideal Profile method is used at this stage. This method involves attaching importance weights to attributes and then scoring the attributes in view of the option and the decision-makers preference. We also choose target scores for each attribute which when put together represent the profile of the ideal option. With this we derive the overall merit value which is the weighted sum of the distances of each attribute from the ideal score. This overall merit value would then be:

Overall merit value for project $= [\sum_{J=1}^{n} w^2(a_j - t_j)^2]^{1/2}$ for j = 1,2,3,...n

Where:

t_j = target score for attribute j

a_j = attribute score for attribute j

The projects are selected on the basis of their overall merit score. The lower the score the better the project. A project ideal score is zero that is nil distance from the ideal position. The nadir score is arrived at by summing the weighted maximum possible distance from

the ideal position. If you are using a scale that ranges from the zero to ten and factor weights ranging from zero to five, if the factor is a key one such that it scores a weight of five and at the same time it is a desired one and we want to maximise it the ideal score would be zero whereas the nadir score will be 5*(10-0) = 50 where 10 is what an ideal project should score and zero what a nadir project scores. This model is considered fit for the selection as based on the characteristics of the decisions to be made, meaningful quantitative measures of progress towards the achievement of each decision objective can be established and relative priorities for achievement of the objectives can be expressed.

The Evaluation Phase: The projects that pass through the screening are subjected to a more vigorous evaluation.

The goal programming approach is adopted during this phase

Goal programming (GP) is a method that requires ordinal and cardinal information for multiple objective decision making (Tabucanon, 1988). In GP, deviation variables (from goals) with assigned priorities and weights are minimized instead of optimizing the objective criterion directly as in Linear Programming (LP). The general form of goal programming is expressed as follows:-

$$\text{Minimize } Z = \sum (P_i d_i^{+} + P_i d_i^{-})$$

$$\text{Subject to: } \sum (a_{ij} x_j) + d_i^{-} - d_i^{+} = b_i$$

$$X_j, d_j^{-}, d_i^{+} >= 0 \text{ for } i = 1,2,3...m$$

$$j = 1,2,3...n$$

Where xi are the variables in the goal equations, b_i are the targets or goals, a_{ij} are the coefficients of basic variables d_i- represent underachievement of goal i, d_i+ represent the over-achievement of goal i, P_i is the priority associated with d_i- and P_i is the priority associated with d_i+.

If over-achievement is acceptable, d_i+ can be eliminated from the objective function; if under achievement is satisfactory d_i- should be left out of the objective function and if the goal must be achieved exactly as defined, both d_i+ and d_i- must be in the objective function. The deviational variables must be ranked (r) according to their priorities, from

the most important to the least important. Priority factors have the following relationship $P_r >>> NP_r + 1 (r=1---r-1)$ which implies that multiplication with N, however large it may be, cannot make P_{r+1} greater than or equal to P_r. With the current development in computer technology, the algorithm has been programmed and is cheaply available on programs such as Micro Manager and LINDO amongst others.

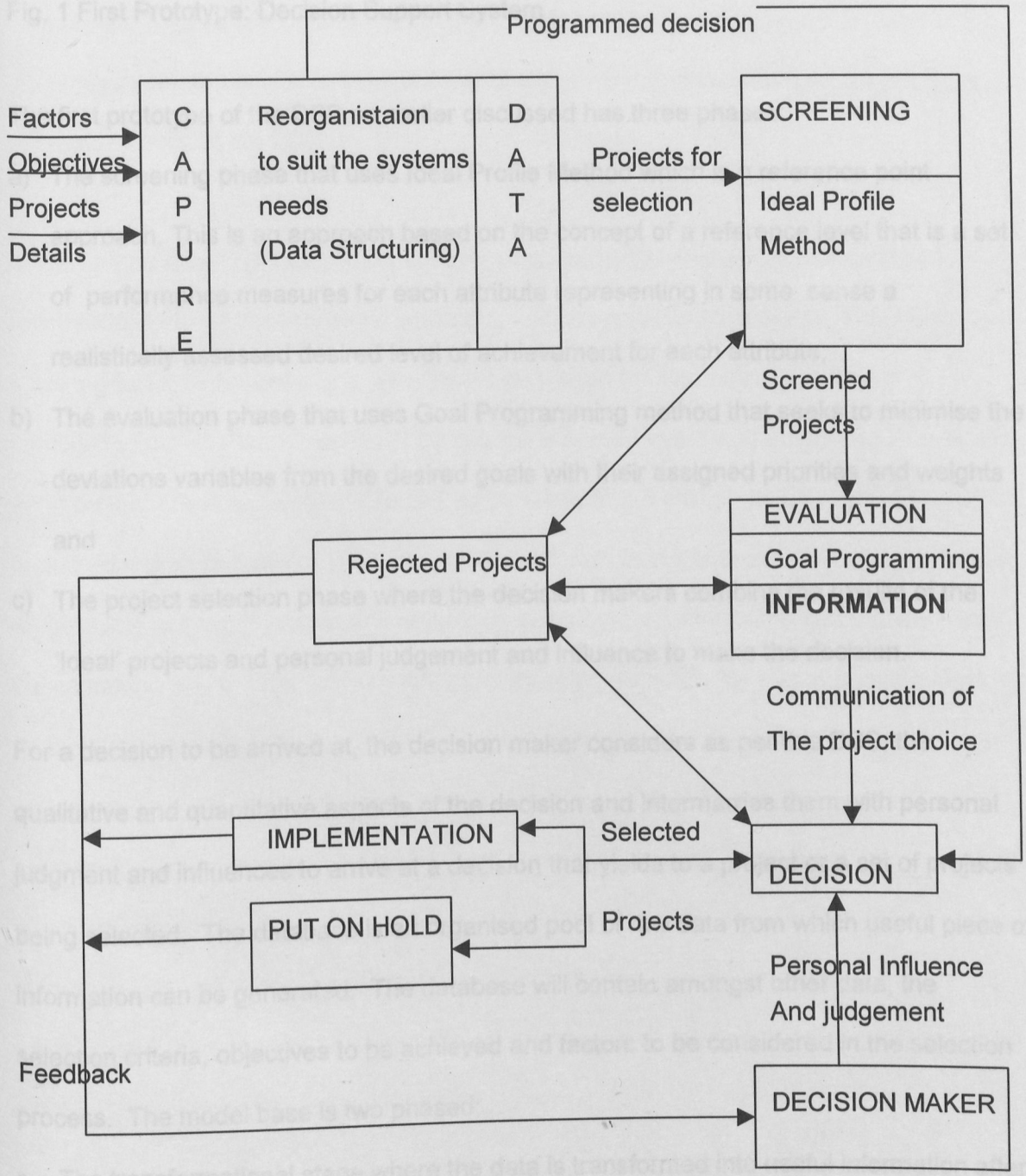
Goal Programming models unlike the linear programming models, have the ability to consider more than a single objective which is the characteristic of many real world problem.

Project Selection Phase: At this point the decision maker combines the results of the 'ideal' projects from the appraisal phase and his or her personal judgment and influence to make a choice from the ideals. Personal judgment is based on the emphasis put on the various project performance measures, benefit to be obtained from the project, likelihood of generating public hue and cry, the justification of needs the project satisfy and performance of similar projects in other countries. The justification has to be documented to augument the appraisal and to provide evidence of the proposals having been assessed. At this juncture it is important to note that the co-operation of staff involved in the selection process important, as this DSS requires consultations and it may not work well without this consultation.

Memory-aid: The DSS has a database that is frequently updated. Data stored vary depending on the sort of projects that are to be selected. The database was designed using Microsoft Access as it can handle the Ministry's volume of data quite well. Databases designed using the software can also be linked easily to a spreadsheet.

Control: The DSS being computerized needs controls relating to access to the hardware, where physical restrictions will be put and to software where limits have to be set to users through passwords and operator identification codes depending on the member's authority in the selection process. Operative controls will also be considered.

The DSS described above can be figuratively expressed as follows:


Programmed decision
Factors
Objectives
Projects
Details
CAPURE
Reorganistaion
to suit the systems
needs
(Data Structuring)
DATA
Projects for
selection
SCREENING
Ideal Profile
Method
Screened
Projects
EVALUATION
Goal Programming
INFORMATION
Rejected Projects
Communication of
The project choice
IMPLEMENTATION
Selected
Projects
PUT ON HOLD
DECISION
Personal Influence
And judgement
Feedback
DECISION MAKER

Fig, 1 First Prototype: Decision Support System

The first prototype of the DSS as earlier discussed has three phases:

a) The screening phase that uses Ideal Profile Method which is a reference point approach. This is an approach based on the concept of a reference level that is a set of performance measures for each attribute representing in some sense a realistically assessed desired level of achievement for each attribute;

b) The evaluation phase that uses Goal Programming method that seeks to minimise the deviations variables from the desired goals with their assigned priorities and weights and

c) The project selection phase where the decision makers combine the results of the 'Ideal' projects and personal judgement and influence to make the decision.

For a decision to be arrived at, the decision maker considers as per this DSS, the qualitative and quantitative aspects of the decision and intermarries them with personal judgment and influences to arrive at a decision that yields to a project or a set of projects being selected. The database is an organised pool of raw data from which useful piece of information can be generated. The database will contain amongst other data, the selection criteria, objectives to be achieved and factors to be considered in the selection process. The model base is two phased:

- The transformational stage where the data is transformed into useful information after being designed and structured to fit the DSS requirements.
- The decision making phase where the information obtained from the first phase is combined with personal influence and judgment to make a decision. The model recognizes instances where they are already programmed decisions that do not give

the decision maker the leeway. For such projects once the data is captured and properly organized in the database the decision is made. The implementation of the project selected is vital to this model as it is from this that we can analyze or gauge the performance of the DSS.

In view of the data collected, the screening and evaluation phase can be combined together and one of the proposed methods used to appraise the projects. This holds as following further interviews and discussions based on the first prototype, it was established that the two phases will be using the same factors and objectives to evaluate each project at the two levels. This will be tedious without adding much value to the entire project selection process. It also was also established that it is highly unlikely that different weights and scores of factors and objectives will be set a fresh for the projects that pass the screening phase. This implies that in an objective ranking, the two methods should produce the same results that is similar ranks for the projects proposed. The use of goal programming is over-ruled as though the system during the appraisal generate a 'best' solution, in some sense particularly in view of the complex combinations of constraints, it is almost impossible to generate a good feasible solution from scratch while using goal programming. This leads to a DSS that is two-phased using the Ideal Profile Method at the appraisal stage and heuristics at the second phase of project selection. This structure can be diagrammatically represented as follows:

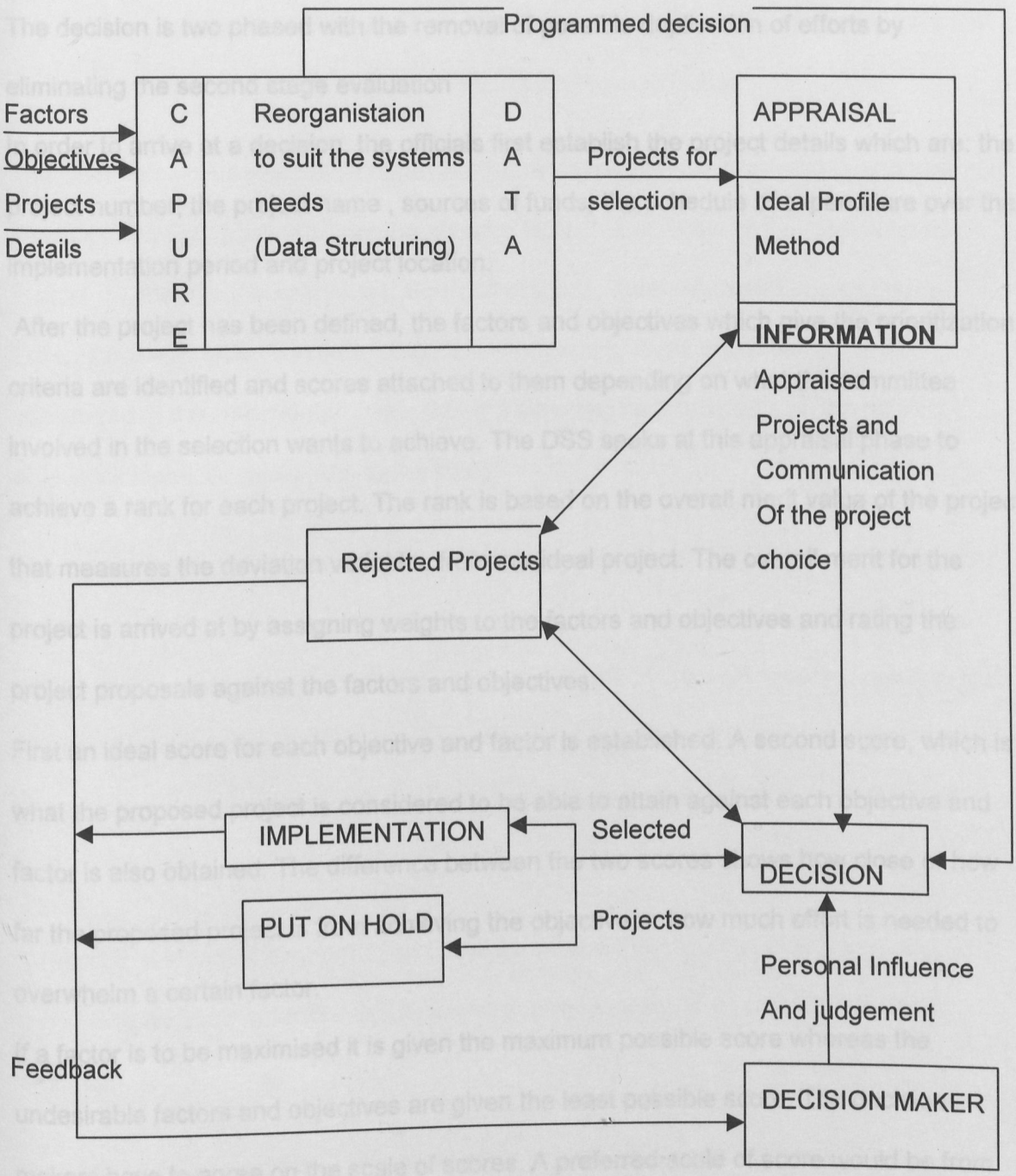

Programmed decision
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Fig.2 Second prototype: Decision Support System

The decision is two phased with the removal of possible duplication of efforts by eliminating the second stage evaluation

In order to arrive at a decision, the officials first establish the project details which are: the project number, the project name , sources of funds, the schedule of expenditure over the implementation period and project location.

After the project has been defined, the factors and objectives which give the prioritization criteria are identified and scores attached to them depending on what the committee involved in the selection wants to achieve. The DSS seeks at this appraisal phase to achieve a rank for each project. The rank is based on the overall merit value of the project that measures the deviation variables from our ideal project. The overall merit for the project is arrived at by assigning weights to the factors and objectives and rating the project proposals against the factors and objectives.

First an ideal score for each objective and factor is established. A second score, which is what the proposed project is considered to be able to attain against each objective and factor is also obtained. The difference between the two scores shows how close or how far the proposed project is from achieving the objective or how much effort is needed to overwhelm a certain factor.

If a factor is to be maximised it is given the maximum possible score whereas the undesirable factors and objectives are given the least possible score. The decision makers have to agree on the scale of scores. A preferred scale of score would be from zero to ten with the ideal and most desirable proposed projects scoring ten on most of the factors and objectives to be maximised and at the same time scoring zero on the factor and objectives that are to be minimised.

4.2.1 Computerised Decision Support System

The DSS so far described is available in form of a soft copy. Printout from the soft copy are attached as appendix III. The soft DSS is as described below:

The DSS has an Access based database that is called Ministry of Planning and National Development Database. The database has a table that consists of the project name, Project number (The primary key), Sources of funds, Total estimated costs and the expenditure schedule. The table also contains the objectives and factors that are considered in the selection process, that are selected from the pools of factors and objectives identified elsewhere in the study.

The database also has an entry form that is quite easy to use. This form will guide the decision making process by assisting in accessing the factors, objectives and project details on the screen. Once deliberations are over, the system generates a result that is based on the Ideal Profile Method approach and displays each factor/objective score and the project's overall score which the users are required to enter in the project overall score field.

A report that shows the summary of the projects and their score is also generated. This report is to be used in further deliberations during the second phase of the selection process.

On accessing the database, an auto execute macro takes you to the switchboard from where you can select what you want to do . The system is window based and where applicable menu driven. Attached is a diskette that has the soft DSS.

The model discussed requires the following set of data per each project:

- Factors that have to be considered and rated so as to assess the ability to successfully achieve the project objectives;
- The Ministry's objective that the project seeks to fulfill in order to assess the criticality and centrality of the project to the Ministry;
- The project objective and the project details, though the latter does not affect the ranking in any way.

The MPND uses the stated investment priority as its prioritisation criterion to rate the projects as either core, high priority or medium priority and it is on this basis that DSS divides the nadir score for a project into three classes each class taking a third of the score. Projects are put in any of the three classes by their overall merit score. Information obtained from this ranking enter the next phase of the ranked projects to establish the final rank. The deliberations are to be carried out in a professional manner avoiding emotional decisions and personal interests in the projects being deliberated on. The DSS cannot be a hundred percent validated against past projects because:

a) Deliberations on the projects were not recorded hampering the accuracy of second phase of the DSS against past projects.
b) The DSS allows subjectivity with the heuristic approach adopted in the project selection phase. Due to passage of time, the environment around the project selection has changed and attempted deliberations on the past projects yield results on which no justified conclusion can be drawn from them.

However, the DSS workability can be demonstrated vividly by using it to rank fifteen ongoing projects drawn from all the ministries. The reason for this deviation is necessitated by of the role the MPND plays in the selection process as it influences the selection in the other ministries as well and also MPND approves, after appraising them, the projects that are to be included in the PIP for submission to Forward Budget and Annual Estimations. The projects are drawn from the three ranks of the proposals during the 1998/99-2000/2001 investment period. It is at this point worth noting that project ranks for purposes of this study are based on a rating that assumes rationality in decision making as it is not possible to have the committee simulate the past and deliberate on earlier rated projects without the influence of changes in the environment surrounding the projects currently. It is also taken that as long as the ranks arrived at are based on rational

deliberations then comparability of the ranks between the current approach and the designed model can be done and conclusive decisions made. Provided here is the ranking by sector of the ongoing projects by their respective ministries:

Economic Sector				
Ministry	Core Projects	High Priority Projects	Medium Priority Projects	**Total**
Agriculture Livestock Development and Marketing	29	54	11	**94**
Land Reclamation Regional and Water Development	26	205	77	**308**
Environment and National Development	11	30	0	**41**
Energy	20	45	37	**102**
Transport and Communication	22	14	0	**36**
Public Works and Housing	80	119	22	**221**
Tourism and Wildlife	24	31	0	**55**
Cooperation Development	4	14	0	**18**
Commerce and Industry	29	17	0	**46**
Research Technology and Technical Training	10	29	8	**47**
Land and Settlement	8	25	0	**33**
Total	**263**	**583**	**155**	**1001**

Source: Public Investment Programme 1998/1999-2000/2001

Social Sector				
Ministry	Core Projects	High Priority Projects	Medium Priority Projects	**Total**
Education	33	34	41	**108**
Health	25	48	79	**152**
Labour and Manpower Dvelopment	2	1	0	**3**
Culture and Social Services	28	9	0	**37**
Total	**88**	**92**	**120**	**300**

Source: Public Investment Programme 1998/1999-2000/2001

Public Administration Sector				
Ministry	Core Projects	High Priority Projects	Medium Priority Projects	**Total**
Office of the President and Directorate of Personnel Management	33	40	67	**140**
Finance	10	9	10	**29**
Office of the Vice President and Ministry of Planning and National Development	19	14	0	**33**
Local Government	19	20	20	**59**
Information and Broadcasting	9	14	0	**23**
Home Affairs and National Heritage	21	31	0	**52**
Foreign Affairs and International Cooperation	14	16	0	**30**
Total	**125**	**144**	**97**	**366**

Source: Public Investment Programme 1998/1999-2000/2001

The ranks per the ministries and sectors were tested for independence using Chi Square. The Chi-square measures whether one categorical variable or qualitative data is related to another. The following hypothesis was tested to establish any relationship between the ministries and the ranks for the various projects:

Ho Project ranking and ministries are independent

Ha Project ranking and Ministries are dependent

The results of the tests are in the following tables:

Economic Sector

Ministry	Core Projects (F_o)	F_e	High Priority Projects (F_o)	F_e	Medium Priority Projects (Fo)	F_e	Total
Agriculture Livestock development and I	29	25	54	55	11	15	**94**
Land Reclamation Regional and Water I	26	81	205	179	77	48	**308**
Environment and NaturalResources	11	11	30	24	0	6	**41**
Energy	20	27	45	59	37	16	**102**
Transport and Communication	22	9	14	21	0	6	**36**
Public Works and Housing	80	58	119	129	22	34	**221**
Tourism and Wildlife	24	14	31	32	0	9	**55**
Cooperative Development	4	5	14	10	0	3	**18**
Commerce and Industry	29	12	17	27	0	7	**46**
Research Technology and Techinical Tr	10	12	29	27	8	7	**47**
Land and Settlement	8	9	25	19	0	5	**33**
Total	**263**		**583**		**155**		**1001**

Degrees of freedom (r-1)(c-1)	20
Calculated chi-square statistic	204.2
Critical value at .01 significance level	37.566
Critical value at .05 significance level	31.41

F_o	F_e	F_o-F_e	$(F_o-F_e)^2$	$(F_o-F_e)^2/F_e$
29	25	4	16	0.65
26	81	-55	3025	37.38
11	11	0	0	0.00
20	27	-7	49	1.83
22	9	13	169	17.87
80	58	22	484	8.34
24	14	10	100	6.92
4	5	-1	1	0.21
29	12	17	289	23.91
10	12	-2	4	0.32
8	9	-1	1	0.12
54	55	-1	1	0.02
205	179	26	676	3.77
30	24	6	36	1.51
45	59	-14	196	3.30
14	21	-7	49	2.34
119	129	-10	100	0.78
31	32	-1	1	0.03
14	10	4	16	1.53
17	27	-10	100	3.73
29	27	2	4	0.15
25	19	6	36	1.87
11	15	-4	16	1.10
77	48	29	841	17.63
0	6	-6	36	5.67
37	16	21	441	27.92
0	6	-6	36	6.46
22	34	-12	144	4.21
0	9	-9	81	9.51
0	3	-3	9	3.23
0	7	-7	49	6.88
8	7	1	1	0.14
0	5	-5	25	4.89
				204.20

Social Sector

Ministry	Core Projects (F_o)	F_e	High Priority Projects (F_o)	F_e	Medium Priority Projects (Fo)	F_e	Total
Education	33	32	34	33	41	43	**108**
Health	25	45	48	47	79	61	**152**
Labour and Manpower Dvelopment	2	1	1	1	0	1	**3**
Culture and Social Services	28	11	9	11	0	15	**37**
Total	**88**		**92**		**120**		**300**

Degrees of freedom (r-1)(c-1)	6
Calculated chi-square statistic	58.01
Critical value at .01 significance level	16.812
Critical value at .05 significance level	12.592

F_o	F_e	F_o-F_e	$(F_o-F_e)^2$	$(F_o-F_e)^2/ F_e$
33	32	1	1	0.03
25	45	-20	400	8.89
2	1	1	1	1.00
28	11	17	289	26.27
34	33	1	1	0.03
48	47	1	1	0.02
1	1	0	0	0.00
9	11	-2	4	0.36
41	43	-2	4	0.09
79	61	18	324	5.31
0	1	-1	1	1.00
0	15	-15	225	15.00
				58.01

Public Administration Sector

Ministry	Core Projects (F_o)	F_e	High Priority Projects (F_o)	F_e	Medium Priority Projects (Fo)	F_e	Total
Office of President and Directorate of Personnel Management	33	48	40	55	67	37	**140**
Finance	10	11	9	13	14	9	**33**
Office of Vice President and Planning and National Development	19	11	14	13	0	9	**33**
Local Government	19	19	20	22	17	15	**56**
Information and Broadcasting	9	8	14	9	0	6	**23**
Home Affairs and National Heritage	21	18	31	20	0	14	**52**
Foreign Affairs and International Cooperation	14	10	16	12	0	8	**30**
Total	**125**		**144**		**98**		**367**

Degrees of freedom (r-1)(c-1)	12
Calculated chi-square statistic	91.55
Critical value at .01 significance level	26.217
Critical value at .05 significance level	21.026

F_o	F_e	F_o-F_e	$(F_o-F_e)^2$	$(F_o-F_e)^2/F_e$
33	48	-15	225	4.69
10	10	0	0	0.00
19	11	8	64	5.82
19	19	0	0	0.00
9	8	1	1	0.13
21	18	3	9	0.50
14	10	4	16	1.60
40	56	-16	256	4.57
9	12	-3	9	0.75
14	13	1	1	0.08
20	22	-2	4	0.18
14	9	5	25	2.78
31	21	10	100	4.76
16	12	4	16	1.33
67	37	30	900	24.32
14	9	5	25	2.78
0	9	-9	81	9.00
17	15	2	4	0.27
0	6	-6	36	6.00
0	14	-14	196	14.00
0	8	-8	64	8.00
				91.55

All the sectors

Sector	Core Projects (F_o)	F_e	High Priority Projects (F_o)	F_e	Medium Priority Projects (Fo)	F_e	Total
Economic	263	286	583	492	155	223	**1001**
Social Services	88	86	92	147	120	67	**300**
Public Administration	125	105	144	180	97	82	**366**
Total	**476**		**819**		**372**		**1667**

Degrees of freedom (r-1)(c-1)	4
Calculated chi-square statistic	115.72
Critical value at .01 significance level	13.277
Critical value at .05 significance level	9.488

F_o	F_e	F_o-F_e	$(F_o-F_e)^2$	$(F_o-F_e)^2/F_e$
263	286	-23	529	1.85
88	86	2	4	0.05
125	105	20	400	3.81
583	492	91	8281	16.83
92	147	-55	3025	20.58
144	180	-36	1296	7.20
155	223	-68	4624	20.74
120	67	53	2809	41.93
97	82	15	225	2.74
				115.72

The test results are summarised in the following table:

Sectors	Degrees of Freedom	Calculated Chi-Square	Critical value at 99% Confidence level	Critical value at 95% Confidence Level	Accept / Reject null hypothesis
Economic	20	204.2	37.566	31.41	Reject at both levels of Confidence.
Social	6	58.01	16.812	12.592	Reject at both levels of Confidence.
Public Administration	12	91.55	26.217	21.026	Reject at both levels of Confidence.
All	4	115.72	13.277	9.488	Reject at both levels of Confidence.

The results indicate that rating of projects and the ministries are not independent. The implication here is that ratings by the ministries are not objectively done but there is tendency to favour certain ministries more than others.

A sample of fifteen ongoing projects was selected to assess the workability of the designed model. The projects were judgmentally selected to ensure that all the three ranks as per the ministries were captured. Out of the fifteen projects, selection details of five have been provided, and a tabular summary of the ranks of all the projects is also provided. For detailed workings on the computation of the overall score per each of the five projects, see appendix III which is a printout from the soft copy of the DSS.

Project Name: Second Generation Identity Cards

Project Number 647

Source of Funds Government of Kenya

Factors Considered

Initial Investment costs

Full operating and maintenance costs

Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget, user charges or self-financing

Internal Rate of Return for projects with an initial cost of more than Kshs. 100m

Phasing of expenditure

Centrality and criticality of the project towards carrying out the Ministry's function

Sustainability of the project after inauguration

Available level of human skills

Gender issues focusing on the respective roles of women and men within the context of national socio-economic development

Objectives Considered

Formulate, prepare and monitor the implementation of national development plans, including mid-plan revisions and sessional papers on development prospects, strategies and policies;

Coordinate and manage all sectoral planning related to economic and basic infrastructure, trade and industry policy issues;

Provide well integrated and effective economic policies through continuous monitoring evaluation and review;

Promote rural development through appropriate policies, programmes and projects that enhance capacity for growth;

Maintain and manage a databank arising out of the resources surveys and remote sensing for purposes of providing the appropriate signals with regard to resource monitoring.

Project's Overall merit Score: **238**

Ideal Project's Score: **0**

Nadir Project Score: **400**

Comment

The project score fall within the fourth tenth of the selection scale.

Project Name: Population and Development Studies

Project Number 103

Source of Funds UNFPA

Factors Considered

Full operating and maintenance costs

Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget, user charges or self-financing

Phasing of expenditure

Centrality and criticality of the project towards carrying out the Ministry's function

Available level of human skills

Gender issues focusing on the respective roles of women and men within the context of national socio-economic development

Sources of fund (Internal or External)

Objectives Considered

Develop appropriate economic models for analysing and assessing economic trends in order to facilitate development;

Formulate, prepare and monitor the implementation of national development plans, including mid-plan revisions and sessional papers on development prospects, strategies and policies;

Coordinate and manage all sectoral planning related to economic and basic infrastructure, trade and industry policy issues;

Coordinate and manage all issues related to human resource development and planning;

Provide an inventory of the country's physical and natural resources through surveys and remote sensing hence facilitate proper management and resource utilisation.

Research on population trends and formulation of policies and programmes designed to reduce fertility and generally improve quality of life and ensure desired population growth rate.

Undertake macro and micro economic and public policy research and analysis.

Project's Overall merit Score: 316

Ideal Project's Score: 0

Nadir Project Score: 540

Comment

The project is placed in the sixth tenth on the selection scale.

Project Name: District Development Planning

Project Number 031

Source of Funds Government of Kenya

Factors Considered

Initial Investment costs

Full operating and maintenance costs

Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget, user charges or self-financing

Phasing of expenditure

Centrality and criticality of the project towards carrying out the Ministry's function

Provisions of national and sectrol policies defined in Government Development Plan

Sessional Papers and Other similar documents

Sustainability of the project after inauguration

Available level of human skills

Technology level required to support the project

Staff motivation and the working environment.

Objectives Considered

Develop appropriate economic models for analysing and assessing economic trends in order to facilitate development

Improving the effectiveness and efficiency of Government public investment programme and the management of its implementation

Coordinate and manage all sectoral planning related to economic and basic infrastructure, trade and industry policy issues

Promote rural development through appropriate policies, programmes and projects that enhance capacity for growth

Research on population trends and formulation of policies and programmes designed to reduce fertility and generally improve quality of life and ensure desired population growth rate.

Project's Overall merit Score: **246**

Ideal Project's Score: **0**

Nadir Project Score: **520**

Comment

The project score fall in the fifth tenth of the selection scale.

Project Name: Kenya Institute for Public Policy Research and Analysis

Project Number 049

Source of Funds Government of Kenya

Factors Considered

Initial Investment costs

Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget, user charges or self-financing

Phasing of expenditure

Centrality and criticality of the project towards carrying out the Ministry's function

Provisions of the prior year Finance Bill

Provisions of national and sectoral policies defined in Government Development Plan

Sessional Papers and Other similar documents

Available level of human skills

Technology level required to support the project

Staff motivation and the working environment.

Objectives Considered

Develop appropriate economic models for analysing and assessing economic trends in order to facilitate development;

Improving the effectiveness and efficiency of Government public investment programme and the management of its implementation;

Promote regional economic growth through integration and cooperation;

Provide well integrated and effective economic policies through continuous monitoring evaluation and review;

Coordinate and manage all issues related to human resource development and planning;

Promote rural development through appropriate policies, programmes and projects that enhance capacity for growth;

Provide an inventory of the country's physical and natural resources through surveys and remote sensing hence facilitate proper management and resource utilisation.

Undertake macro and micro economic and public policy research and analysis.

Project's Overall merit Score: **363**

Ideal Project's Score: **0**

Nadir Project Score: **690**

Comment

The project score fall in the second third of the selection scale. Although this is at relatively strong position, it can be ranked as a high priority project.

Project Name: District Aerial Surveys

Project Number 47

Source of Funds Government of Kenya

Factors Considered

Full operating and maintenance costs

Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget, user charges or self-financing

Phasing of expenditure

Centrality and criticality of the project towards carrying out the Ministry's function

Sustainability of the project after inauguration

Contracts entered into and their legal implications

Technology level required to support the project

Infrastructure (Transport and Communication facilities)

Availability of utilities such as water and electricity

Provisions of national and sectrol policies defined in Government Development Plan Sessional Papers and other similar documents

Objectives Considered

Advice the government on economic issues relating to consultative group meetings stand-by arrangements and external finance resources;

Promote regional economic growth through integration and cooperation;

Coordinate and manage all issues related to human resource development and planning;

Promote rural development through appropriate policies, programmes and projects that enhance capacity for growth;

Provide an inventory of the country's physical and natural resources through surveys and remote sensing hence facilitate proper management and resource utilisation.

Promote rural development through appropriate policies, programmes and projects that enhance capacity for growth.

Project's Overall merit Score: **447**

Ideal Project's Score: **0**

Nadir Project Score: **550**

Comment

The project score comes under the ninth tenth of the selection scale.

The selection committee can now based on the appraisal results, continue with the selection process and use the committee's judgment and other influences to arrive at the final rank of the projects.

The following table shows the summary of the fifteen projects ranked:

Project Name	Rank by Ministry	Ministry Rank using the ten – scale ranking	Project Overall Score	Nadir Score	DSS First Phase Rank	Overall Rank after Deliberations
Second Generation Identity Cards	1	1	238	400	5	6
Population Development Studies	1	1	316	540	6	6
Kenya Institute for Public Policy Research and Analysis	1	1	363	690	5	7
District Development Planning	1	1	246	520	5	4
Nyayo National Stadium (Renovation)	1	1	447	550	9	8
Construction of Perimeter Fence-Treasury Estate	1	1	200	266	9	8
Busia Sugar Project	3	7	185	734	3	2
Policy Analysis	3	7	203	583	4	4
Nyeri Municipal Council sewerage	3	7	150	400	3	3
Consultancy Fees	1	1	213	280	8	8
Nairobi-Mombasa Road Rehabilitation Project	1	1	69	715	1	1
Promotion of Mineral Resources PHII	2	4	217	248	9	9
Export Promotion and Marketing	1	1	143	526	3	2
Construction of Labs.-JKUAT	3	7	169	424	4	4
Catchment Rehabilitation	3	7	112	470	3	3

Source: Primary data

The ranking of the projects has been analysed using a Spearman Rank Correlation coefficient to assist in determining any significant difference between the current selection process and the selection by the designed model. The details are as stipulated:

Spearman Rank Correlation

Project	Rank Current Selection Method (Ro)	Rank per the Model (Ri)	Ro-Ri	$(Ro-Ri)^2$
Second Generation Identity cards	4	6	-2	4
Population Development Studies	1	6	-5	25
Kenya Institute for Public Policy Research and Analysis	1	7	-6	36
District Development Planning	1	4	-3	9
Nyayo national Stadium (Renovation)	1	8	-7	49
Construction of Perimeter Fence- Treasury Estate	1	8	-7	49
Busia Sugar Project	7	2	5	25
Policy Analysis	7	4	3	9
Nyeri Municipal Council sewerage	7	3	4	16
Consultancy Fees	1	8	-7	49
Nairobi-Mombasa Road Rehabilitation Project	1	1	0	0
Promotion of Mineral Resources PHII	4	9	-5	25
Export Promotion and Marketing	1	2	-1	1
Construction of Labs.- JKUAT	7	4	3	9
Catchment Rehabilitation	7	3	4	16
				322

Spearman rank coefficient	0.425
Degrees of freedom (n-2)	28
Calculated t-statistic	1.693
t-critical value at .01 level of significance	2.467
t-critical value at .05 level of significance	1.701

The Spearman's rank correlation coefficient is 0.425. This shows a weak relationship between the two models rating of the projects. The t-test also indicate that there is no relationship existing between the two models when independently used to rate the projects. The hypothesis tested using the t-test was:

Ho The models do not yield similar projects

Ha The models yield similar projects

The calculated t-statistics was 1.693 whereas the critical value was 2.650 at 99% confidence level and 1.771 at 95% confidence level. This leads to the acceptance of the null hypothesis that the models do not yield similar projects. The results indicate that the DSS yield different projects if used to select projects. The results were submitted to some of the selection committee members seeking their comments on them and they felt that project rating was more objective and faster and that it yielded a more superior portfolio. The members however added that the results could have been affected by the change in environment, the feeling that nothing was at stake and that the superority could fully be justified if the projects were novel and implementation done successfully. The DSS set of projects is of better quality as it is based on each project's factors and objectives and these are measured against what an ideal project is able to achieve.

5 CONCLUSION

5.1 Summary

The aim of this study was to analyse the investment project selection process of the Ministry of Planning and National Development and design a Decision Support System (DSS) that can assist in the selection process. The state of art review focused on the areas of selection, being what the study was analysing, and of decision support system, the tool that was to be used in the selection process.

Looking at the existing selection process the study found that the selection process starts in the field and passes through four stages before a project can be included in the Public Investment Programme for funding. During the four stages project reviews and justifications are done but this study was limited to the fourth stage, which is the selection process at the ministry's level.

The MNPD has a prioritisation criteria based on the objectives that are deemed necessary in selecting the investment portfolio. For purposes of this study an understanding of the key issues that is the factors, objectives and the prioritisation criteria was needed so as to appreciate the problems the Selection Committee faces in processing the information and to facilitate in the design of the system.

The study also established that MPND used the investment prioritisation criteria to rank the projects which are justified on the basis of social and economic benefits. Ranking for PIP purposes is however, based primarily on the ability to have the project fully funded and completed within the set time frame and also within the Development budget expenditure ceilings for both government and external sources of finance. The actual rating of the projects remains gray with little attention being paid to the much desired audit trail that shows the costs and benefits accruing to the society from the project. With only

the investment priorities as the guiding rule much has been left on the hands of the selection committee who in absence of a terse rating procedure have found themselves unable to wrestle with their duties with ease. The projects are hardly justified on every single factor and objective that they purport to pursue at this level. This is however the stage with the required resources that assist on critical evaluation and appraisal of the project proposal and a failure to utilise these resources in the correct manner is a major drawback in the entire project selection process. Looking at the percentage level of government funding to the various ministry four out of the twenty-two ministries take sixty-four percent of the government funding although they account for only thirty-two percent of the total cost and forty-seven percent of the total number of projects. This can probably be attributed to lobbying for funds with the ministries that exert most pressure of leaping from their powerful muscle. Besides the percentage level of funding the hypothesis that project ranking and ministries are independent was tested and at 99% and 95% levels of certainty it showed that the project rank and the ministry are dependent. This further supports lack of independence in the rating of the projects and the lobbying that actually goes on in the selection process. Lobbying for funding of certain projects can gravelly affect the objectivity required in the selection process as the persons lobbying will have undue influence on the selection committee especially when they have interest in certain projects. The Spearman's correlation shows a strong agreement between the ratings per the current process and of the DSS, a phenomenon that would encourage the use of the DSS. The DSS however instills objectivity with the desired level of flexibility in the selection process. Being computerised, it provides automatically a data bank or a registry of the projects with the factors and other issues that were considered in the selection process. It also cuts on the time needed to select projects as the process of ranking is more defined. In the current ranking process only three ranks are used. This can be

attributed to the difficulties that would be encountered in trying to prioritise projects in more than the three ranks. With the designed DSS, the projects are ranked in a selection scale of ten ranks with much ease. This yields projects that are better differentiated than with the current three ranks selection approach and give room for paying attention to even very minor differences between the projects.

5.2 Recommendation

Based on the foregoing discussion, the current project selection is found lacking in the desired clarity on how the rating of projects is done. This study recommends a system approach to this problem. This system approach entails amongst other things assessing the projects from a "wholistic thinking" point of view and installing a system that will be used to assist in the selection process and also remove the ambiguity that is prevalent in the current system. The approach to selection of projects has been revisited and there is need to put together all the factors and objectives that are necessary for the successful implementation of the selected projects right in the selection process as this will yield better results. This can be achieved by adopting a system approach to the selection process. The recommended system approach can be achieved by installing and running the designed Decision Support System that uses a multi-criteria approach in the selection process. The requirements of the DSS both before and after implementation are:

5.2.1 Personnel Training

The implementation of the decision support system can bear fruits if the users are effectively trained on its use. This will enable them to appreciate the intended support that the DSS offers them, its requirements and also facilitate in the collection of the correct information needed in the selection process. Multi-disciplinary training in the areas of

Information Technology and Project Management is required for the staff so that the Selection Committee can be able to handle both the usage and maintenance of the DSS with ease. This will not only motivate the committee to use it but will also enable it to redesign the DSS as time passes and changes to the system are required.

5.2.2 Redefining the Investment Priorities

Investment priorities for the ministry are expected to assist in identifying the projects that will improve on the effective and efficient functioning of the ministry and in the meeting of the ministry's objectives. The Ministry lays emphasis on those projects and activities that facilitate formulation and continuous monitoring, assessment and appraisal of government policies and strategies and enabling successful completion of all donor assisted projects. This emphasis needs to be expanded to include some of the other core functions of the Ministry. An example of a core factor not explicitly addressed in the priority and which needs to be addressed is the coordination and guidance on national planning process including assessing availability, projections and allocation of resources.

5.2.3 Hardware and Software

The ministry is currently in the process of computerising the Project Management Department. The process will provide the department with the necessary hardware and software. This study recommends that the DSS be implemented on a networked environment to allow multiple users especially when the Selection Committee is deliberating on the projects. The DSS requires Access 97application software and Windows 95/98 operating system. The two are members of the Microsoft products hence the need to install the Microsoft office suite and the operating system. Varied versions of the same are available in the market with the latest release of Office suite being Office 2000 but care should be exercised when selecting both hardware and software. Microsoft Access is a relational database management application and it was used for purposes of this study, to develop the decision support system and also to design a data bank for all the projects, factors and objectives that are used in the selection process.

5.3 Limitations of the Study

The interpretations of the findings for this study are subject to certain limitations. Being a case study the entire research work was based on the selection process at the MPND but this is only the final step in the project selection process. This makes it difficult to generalise the conclusions on the entire selection process.

The study had to be completed within a strict time frame within which the computerisation process in the ministry was not ended. This made it difficult to demonstrate the improvement in the selection process the DSS yields.

5.4 Suggestion for further Research

In line with this research project, further research studies can be done base on:

The entire project selection process from the field to the ministry or

- A different stage of the project life cycle.

The study can also be replicated with other governmental and non-governmental bodies.

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APPENDIX I

INTERVIEW GUIDELINE

1. On average how many projects does the government invest in any one year?

2. Do you categorize the projects?
   Yes / No

3. If yes, how
   a) By costs
   b) By gestation period
   c) By revenues
   d) Others (specify)

4. Before embarking on the selection process, do you conduct feasibility studies?

   Yes/No

5. If yes, how are these feasibility studies conducted?
   (a) By our staff only
   (b) By our staff assisted by external consultants
   (c) By external consultants assisted by our staff
   (d) By external consultants only
   (e) Others (specify)

6. Who are involved in Investment Project Selection?

7. How often are the Investment Projects selected?

8. Do you have rules and regulations governing the selection process?

   Yes/No

9. Which are the rules and regulations?

10. Do you follow any procedures in the selection process?
    Yes/No

11. Which are the procedures?

12. Do you use computer,based programs in the selection process?
    Yes/No

13. If yes, which are the programs?

14. Who developed these programs?

15. Do you have user manuals for these programs?

16. Is your software year 2000 (Y2K) compliant?
Yes/ No

17. If no, what measures are in place in case of a failure?

18. Is your hardware year 2000 (Y2K) compliant?
Yes/No

19. If no what measures have you put in place in case of a failure?

20. Have you experienced any major difficulties while using these programs?
Yes/No

21. Which are the difficulties?

22. Do you have models in your selection process?
Yes/No

23. If yes, which qualitative and quantitative models do you use?
Qualitative
Quantitative

24. Rate the following software in terms of frequency of use in the investment projects selection:

	Very high	high	Moderate	low	very low
Microsoft Excel					
Lotus 123					
SuperCalc					
Simphony					
Micro Manager					
SPSS					
Microsoft Access					
Dbase					
Word Perfect					
Visual BASIC					
Others (specify)					
1.					
2.					
3.					

4.
5.

25. Which factors do you consider while selecting your investment Project?

a) Economic Factors

(i) Initial investment cost
(ii) Investment Management costs
(iii) Short-term profitability
(iv) Long term profitability
(v) Previous expenditure on the project to be written-off if the project is to be halted.
(vi) General state of the economy
(vii) Feasibility study costs
(viii) Ability of the project to maintain a consistent revenue stream
(ix) Direct cash flows generated for the Fund

b) Legal and Political Factors

(x) The political stability of the country
(xi) Enacted laws
(xii) Provisions of the Prior year Finance Bill
(xiii) Management of contracts (if any)

c) Resources related factors

(xiv) Available skills to man the project
(xv) Technology level within the government
(xvi) Availability of raw materials
(xvii) Proximity to the raw materials
(xviii) Availability of set-up skills
(xix) Growth prospects (ability to expand the project in future)
(xx) Contribution to staff development and training
(xxi) General staff morale and job satisfaction both existing and what the project may generate.
(xxii) Utilization level of the resources.

d) Other factors

(xxiii) Technology level in the economy
(xxiv) Project location in the country
(xxv) Communication Network
(xxvi) Transport infrastructure
(xxvii) Availability of utilities such as water and electricity
(xxviii) Security of the location where the project is situated

(xxix) Other parties interested in the same project (e.g NGOs)
(xxx) Importance of the project to the public
(xxxi) Contribution to the national objectives
(xxxii) Improvements in public health and safety
(xxxiii) Effects of the project on natural environment
(xxxiv) Whether the investment project is local or international.

26. Which other factors do you consider necessary while selecting an investment project?

27. Which objectives does the Ministry seek to achieve in selecting the projects:

(i) Maximize the long term returns
(ii) Ensure the Government's liquidity
(iii) Minimize risks
(iv) Alleviate poverty
(v) Create employment
(vi) Promote unionism
(vii) Provide housing
(viii) Minimize the management costs
(ix) Minimize initial investment costs
(x) Minimizing Public investment project team's time on selecting the projects
(xi) Others (specify)

28. Do you have control measures in your selection process?
Yes/No

29. If yes, which are the control measures?

(a) Input Controls
- Transaction codes
- Forms Design
- Verification
- Control and cash totals
- Check digits
- Data file labeling
- Others (specify)

(b) Programming Controls
- Limit or Reasonableness check
- Arithmetic Proof
- Identification
- Sequence Check
- Error Log
- Transaction Log
- Others (specify)

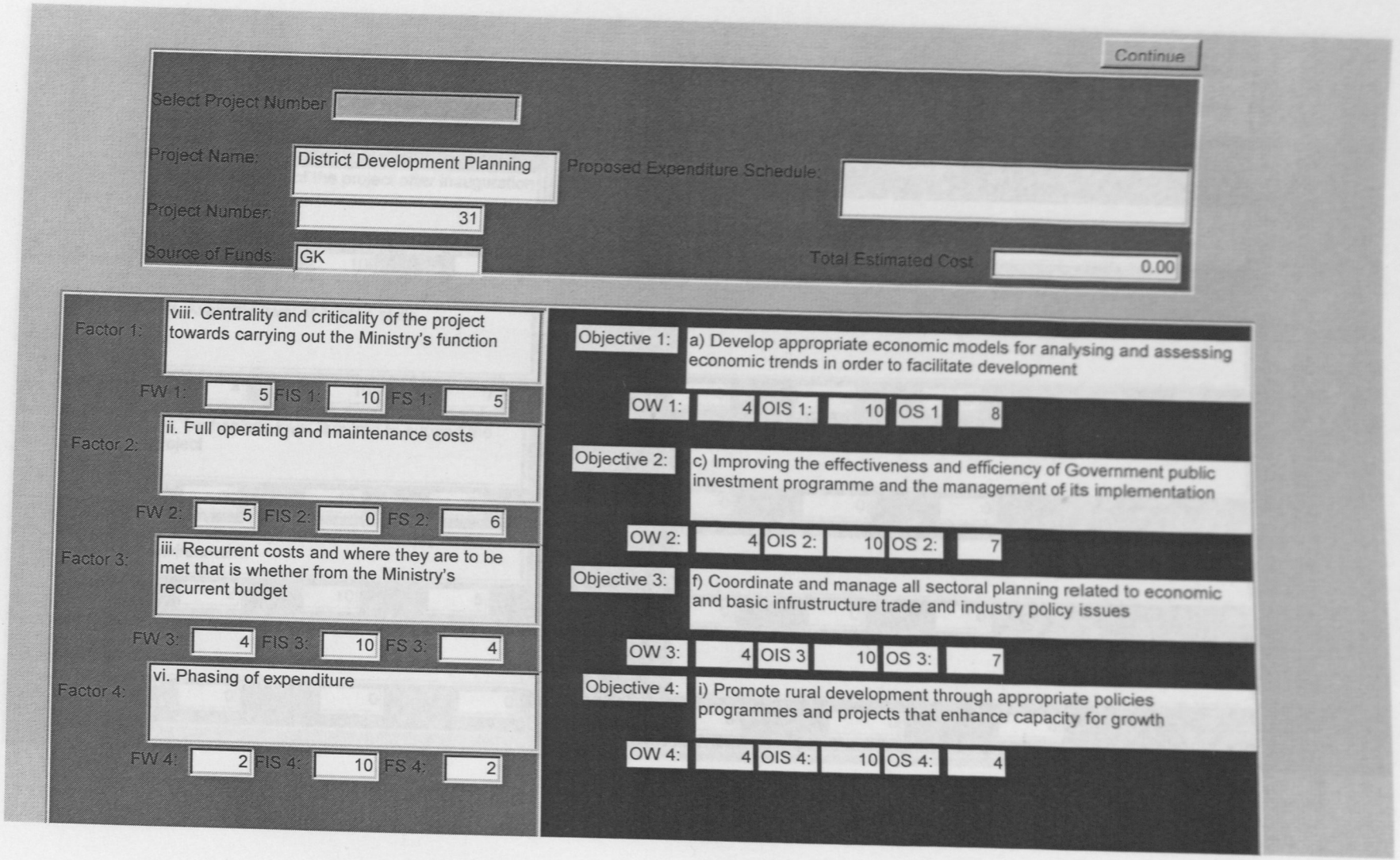
(c) Data Base Controls
- Physical controls

- Procedural Controls
- Others (specify)

(d) Output Controls
- Screening to detect obvious errors
- Distribution to authorized persons only
- Prenumbering of documents.
- Others (specify)

(e) Documentation Controls
- General systems documentation
- Program documentation
- Procedures documentation
- Others (specify)

(f) Security Controls
- Malfunctions
- Fraud and unauthorized access
- Power and Communication failures
- Fires
- Sabotage and riot
- Natural disasters
- General hazards
- Others (specify)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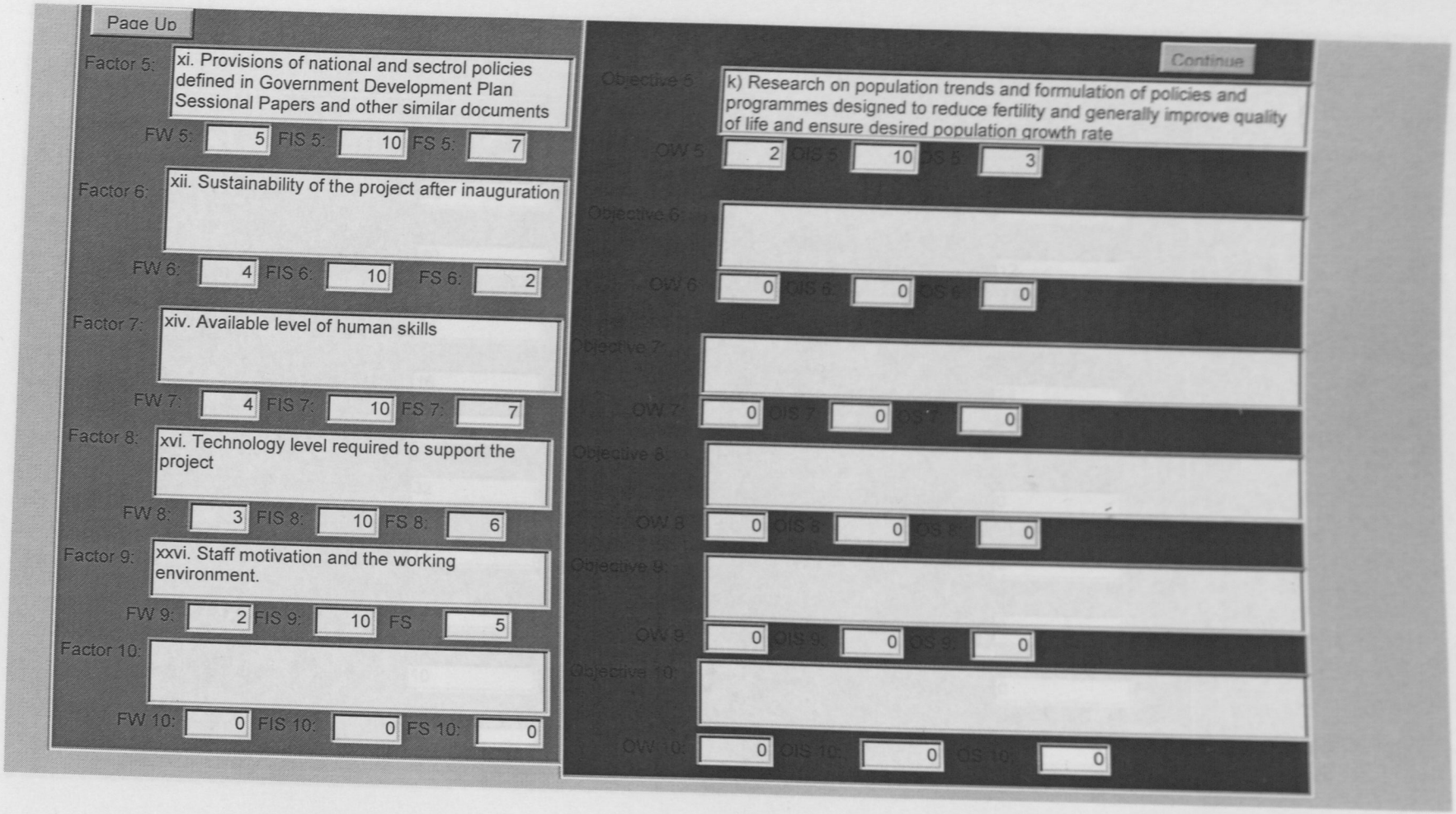
Select Project Number:
Project Name: District Development Planning
Proposed Expenditure Schedule:
Project Number: 31
Source of Funds: GK
Total Estimated Cost: 0.00
Factor 1: viii. Centrality and criticality of the project towards carrying out the Ministry's function
FW 1: 5 FIS 1: 10 FS 1: 5
Factor 2: ii. Full operating and maintenance costs
FW 2: 5 FIS 2: 0 FS 2: 6
Factor 3: iii. Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget
FW 3: 4 FIS 3: 10 FS 3: 4
Factor 4: vi. Phasing of expenditure
FW 4: 2 FIS 4: 10 FS 4: 2
Objective 1: a) Develop appropriate economic models for analysing and assessing economic trends in order to facilitate development
OW 1: 4 OIS 1: 10 OS 1 8
Objective 2: c) Improving the effectiveness and efficiency of Government public investment programme and the management of its implementation
OW 2: 4 OIS 2: 10 OS 2: 7
Objective 3: f) Coordinate and manage all sectoral planning related to economic and basic infrustructure trade and industry policy issues
OW 3: 4 OIS 3 10 OS 3: 7
Objective 4: i) Promote rural development through appropriate policies programmes and projects that enhance capacity for growth
OW 4: 4 OIS 4: 10 OS 4: 4


Page Up
Factor 5:
xi. Provisions of national and sectrol policies defined in Government Development Plan Sessional Papers and other similar documents
FW 5: 5 FIS 5: 10 FS 5: 7
Factor 6:
xii. Sustainability of the project after inauguration
FW 6: 4 FIS 6: 10 FS 6: 2
Factor 7:
xiv. Available level of human skills
FW 7: 4 FIS 7: 10 FS 7: 7
Factor 8:
xvi. Technology level required to support the project
FW 8: 3 FIS 8: 10 FS 8: 6
Factor 9:
xxvi. Staff motivation and the working environment.
FW 9: 2 FIS 9: 10 FS 5
Factor 10:
FW 10: 0 FIS 10: 0 FS 10: 0
Continue
Objective 5:
k) Research on population trends and formulation of policies and programmes designed to reduce fertility and generally improve quality of life and ensure desired population growth rate
OW 5: 2 OIS 5: 10 OS 5: 3
Objective 6:
OW 6: 0 OIS 6: 0 OS 6: 0
Objective 7:
OW 7: 0 OIS 7: 0 OS 7: 0
Objective 8:
OW 8: 0 OIS 8: 0 OS 8: 0
Objective 9:
OW 9: 0 OIS 9: 0 OS 9: 0
Objective 10:
OW 10: 0 OIS 10: 0 OS 10: 0

Previous

Results

Factor 1 Weighted Score	25	Objective 1 Weighted Score	8
Factor 2 Weighted Score	30	Objective 2 Weighted Score	12
Factor 3 Weighted Score	24	Objective 3 weighted Score	12
Factor 4 Weighted Score	16	Objective 4 Weighted Score	24
Factor 5 Weighted Score	15	Objective 5 Weighted Score	14
Factor 6 Weighted Score	32	Objective 6 Weighted Score	0
Factor 7 Weighted Score	12	Objective 7 Weighted Score	0
Factor 8 Weighted Score	12	Objective 8 Weighted Score	0
Factor 9 Weighted Score	10	Objective 9 Weighted Score	0
Factor 10 Weighted Score	0	Objective 10 Weighted Score	0

Previous page

Factor's Overall Score	176	Objective's Overall Score	70
Factor Overall score + Objective Overall Score	246		
Project Overall Merit Score:	246 (Enter the Score)		

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Continue

Select Project Number:

Project Name: District Aerial Surveys

Project Number: 47

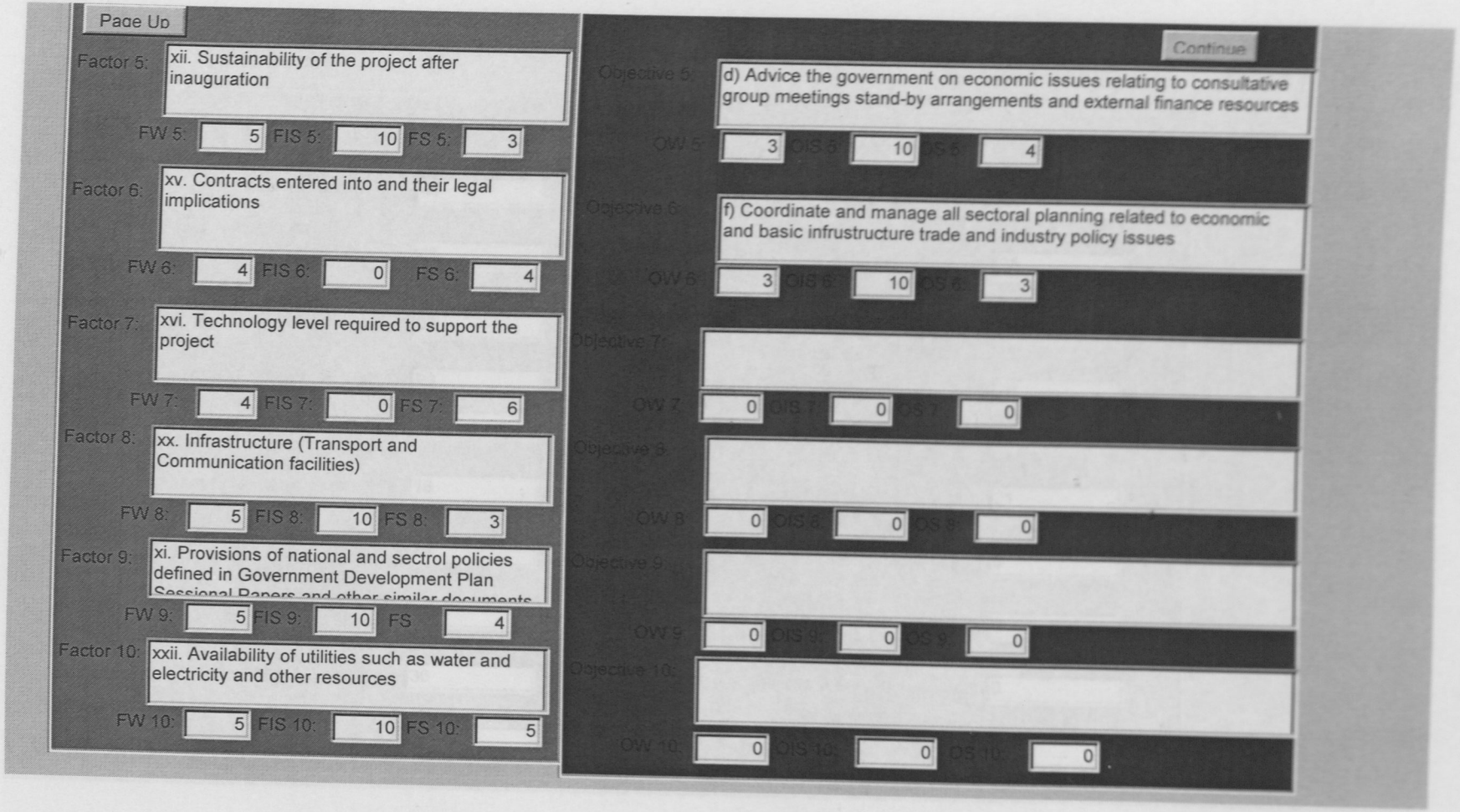
Source of Funds: GK

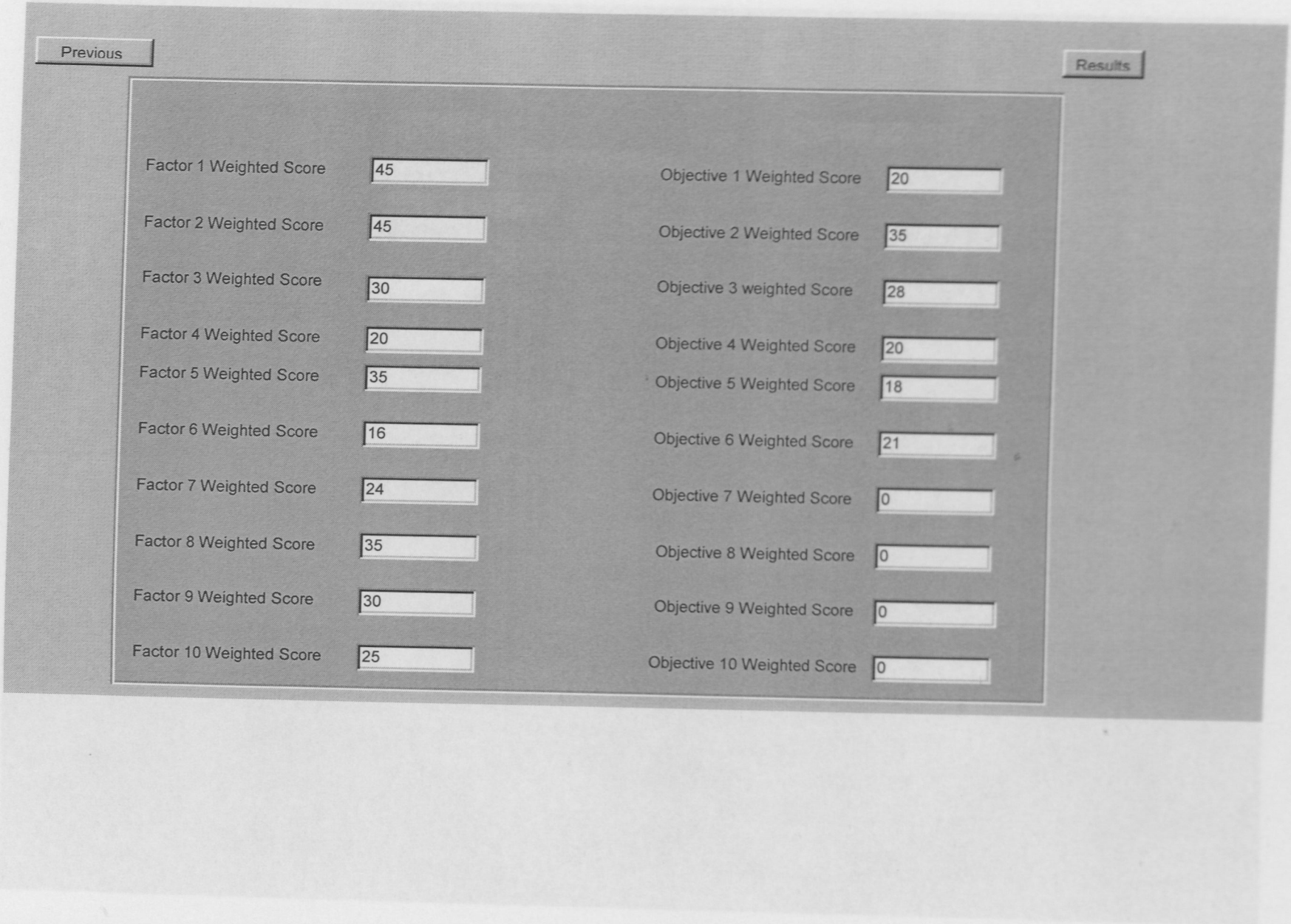
Proposed Expenditure Schedule:

Total Estimated Cost: 0.00

Factor 1:	ii. Full operating and maintenance costs	FW 1: 5	FIS 1: 0	FS 1: 9	
Factor 2:	iii. Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget	FW 2: 5	FIS 2: 0	FS 2: 9	
Factor 3:	vi. Phasing of expenditure	FW 3: 5	FIS 3: 10	FS 3: 4	
Factor 4:	viii. Centrality and criticality of the project towards carrying out the Ministry's function	FW 4: 5	FIS 4: 10	FS 4: 6	

Objective 1:	i) Promote rural development through appropriate policies programmes and projects that enhance capacity for growth	OW 1: 5	OIS 1: 10	OS 1 6
Objective 2:	h) Coordinate and mange all issues related to human resource development and planning	OW 2: 5	OIS 2: 10	OS 2: 3
Objective 3:	e) Promote regional economic growth through integration and cooperation	OW 3: 4	OIS 3 10	OS 3: 3
Objective 4:	k) Research on population trends and formulation of policies and programmes designed to reduce fertility and generally improve quality of life and ensure desired population growth rate	OW 4: 4	OIS 4: 10	OS 4: 5


Page Up
Factor 5:
xii. Sustainability of the project after inauguration
FW 5: 5 FIS 5: 10 FS 5: 3
Factor 6:
xv. Contracts entered into and their legal implications
FW 6: 4 FIS 6: 0 FS 6: 4
Factor 7:
xvi. Technology level required to support the project
FW 7: 4 FIS 7: 0 FS 7: 6
Factor 8:
xx. Infrastructure (Transport and Communication facilities)
FW 8: 5 FIS 8: 10 FS 8: 3
Factor 9:
xi. Provisions of national and sectrol policies defined in Government Development Plan
FW 9: 5 FIS 9: 10 FS 4
Factor 10:
xxii. Availability of utilities such as water and electricity and other resources
FW 10: 5 FIS 10: 10 FS 10: 5
Continue
Objective 5:
d) Advice the government on economic issues relating to consultative group meetings stand-by arrangements and external finance resources
OW 5: 3 OIS 5: 10 OS 5: 4
Objective 6:
f) Coordinate and manage all sectoral planning related to economic and basic infrustructure trade and industry policy issues
OW 6: 3 OIS 6: 10 OS 6: 3
Objective 7:
OW 7: 0 OIS 7: 0 OS 7: 0
Objective 8:
OW 8: 0 OIS 8: 0 OS 8: 0
Objective 9:
OW 9: 0 OIS 9: 0 OS 9: 0
Objective 10:
OW 10: 0 OIS 10: 0 OS 10: 0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Factor 5 Weighted Score
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Factor 8 Weighted Score
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Factor 9 Weighted Score
30
Factor 10 Weighted Score
25
Objective 1 Weighted Score
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Objective 2 Weighted Score
35
Objective 3 weighted Score
28
Objective 4 Weighted Score
20
Objective 5 Weighted Score
18
Objective 6 Weighted Score
21
Objective 7 Weighted Score
0
Objective 8 Weighted Score
0
Objective 9 Weighted Score
0
Objective 10 Weighted Score
0

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Factor's Overall Score	305	Objective's Overall Score	142
Factor Overall score + Objective Overall Score	447		
Project Overall Merit Score:	447	(Enter the Score)	

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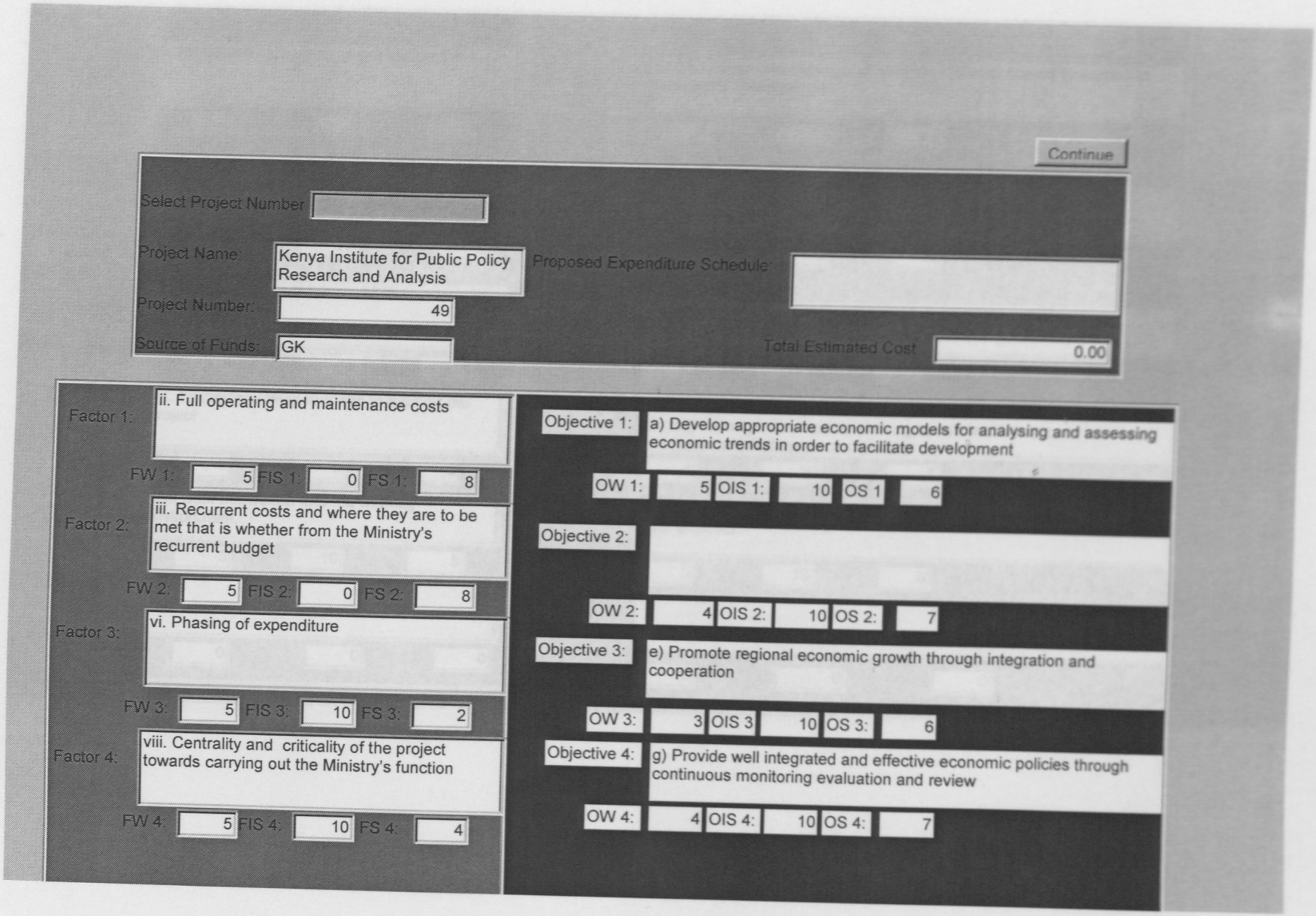
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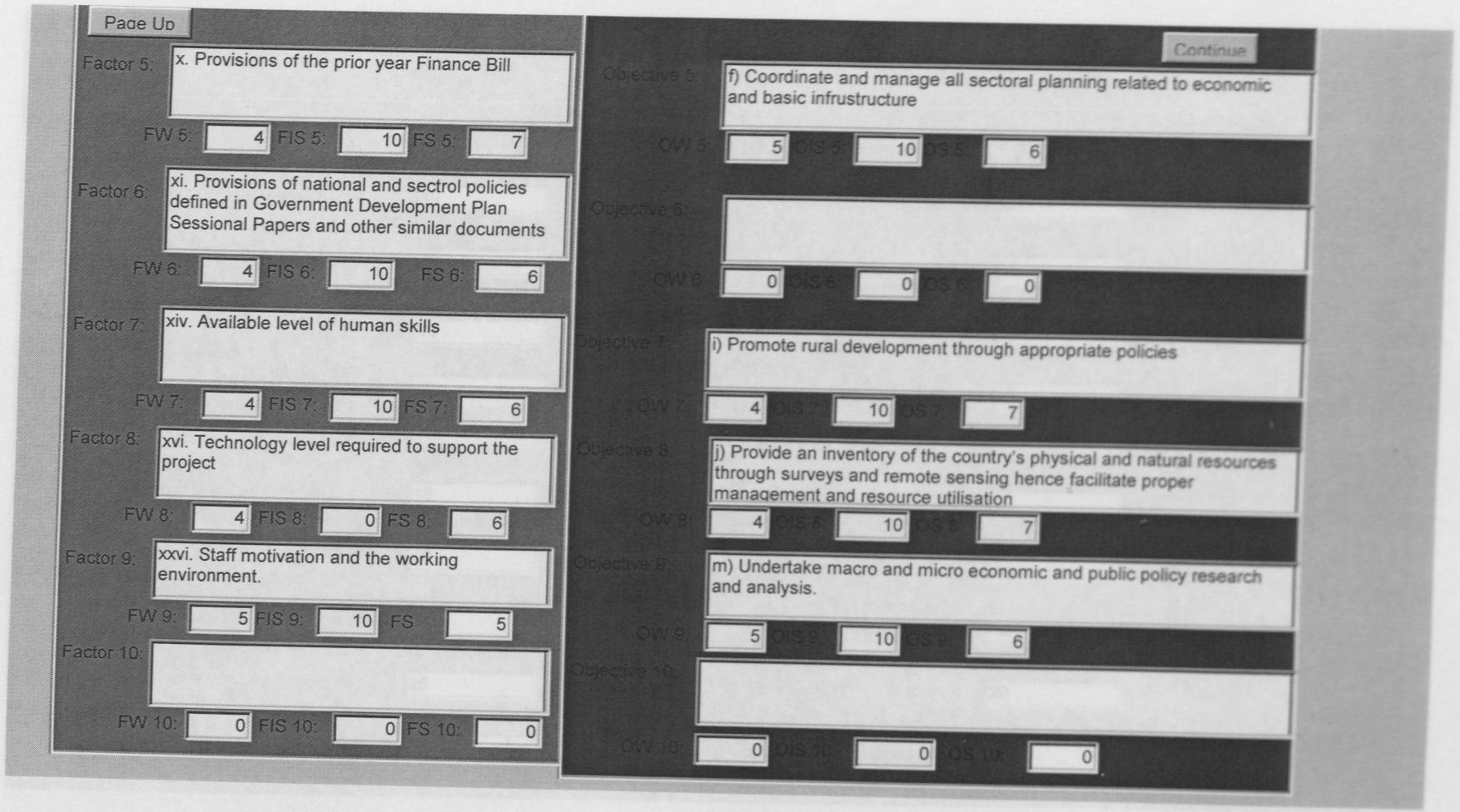
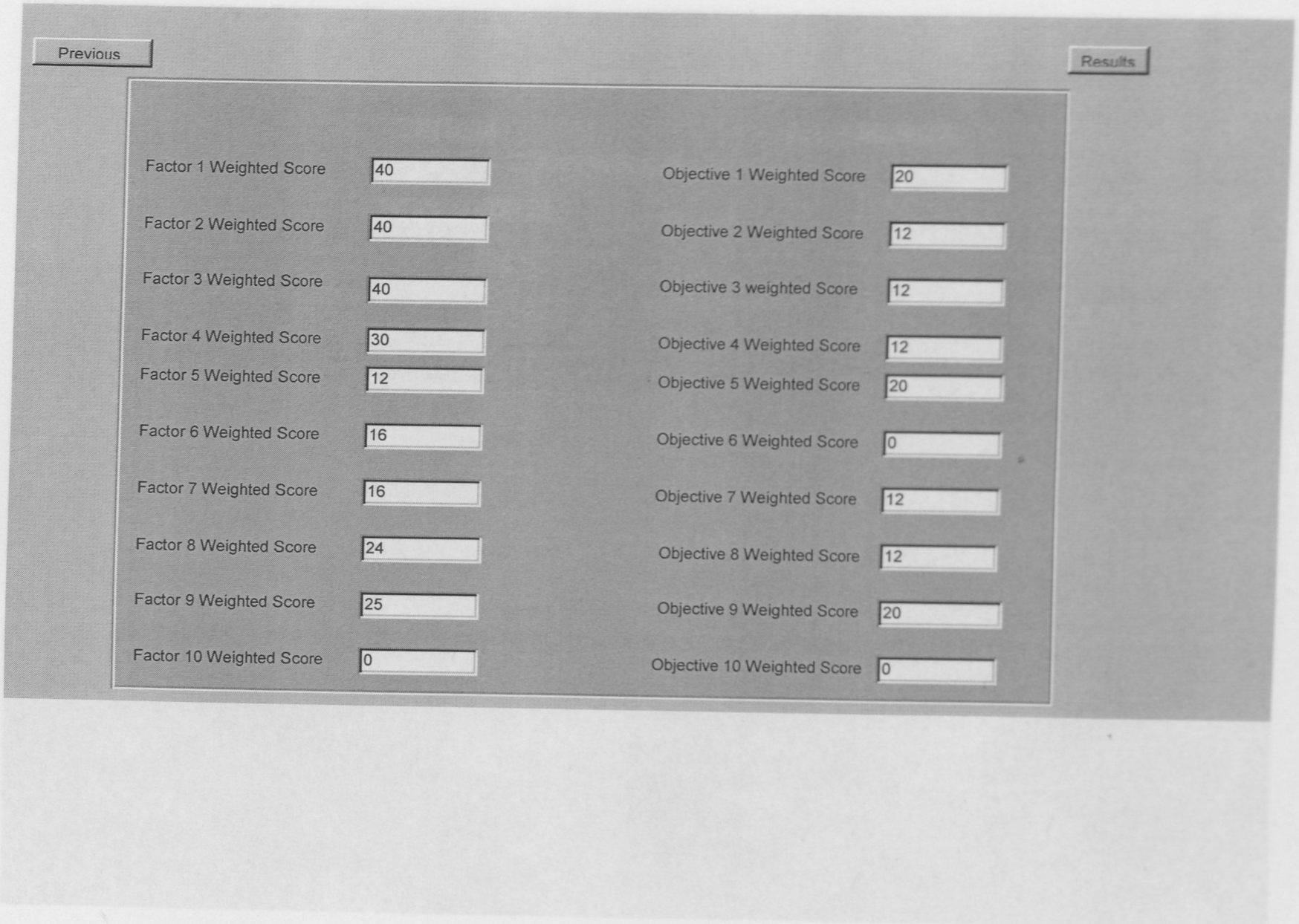
Project Name:
Kenya Institute for Public Policy Research and Analysis
Proposed Expenditure Schedule:
Project Number:
49
Source of Funds:
GK
Total Estimated Cost
0.00
Factor 1:
ii. Full operating and maintenance costs
FW 1: 5 FIS 1: 0 FS 1: 8
Factor 2:
iii. Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget
FW 2: 5 FIS 2: 0 FS 2: 8
Factor 3:
vi. Phasing of expenditure
FW 3: 5 FIS 3: 10 FS 3: 2
Factor 4:
viii. Centrality and criticality of the project towards carrying out the Ministry's function
FW 4: 5 FIS 4: 10 FS 4: 4
Objective 1:
a) Develop appropriate economic models for analysing and assessing economic trends in order to facilitate development
OW 1: 5 OIS 1: 10 OS 1 6
Objective 2:
OW 2: 4 OIS 2: 10 OS 2: 7
Objective 3:
e) Promote regional economic growth through integration and cooperation
OW 3: 3 OIS 3 10 OS 3: 6
Objective 4:
g) Provide well integrated and effective economic policies through continuous monitoring evaluation and review
OW 4: 4 OIS 4: 10 OS 4: 7


Page Up
Factor 5:
x. Provisions of the prior year Finance Bill
FW 5: 4 FIS 5: 10 FS 5: 7
Factor 6:
xi. Provisions of national and sectrol policies defined in Government Development Plan Sessional Papers and other similar documents
FW 6: 4 FIS 6: 10 FS 6: 6
Factor 7:
xiv. Available level of human skills
FW 7: 4 FIS 7: 10 FS 7: 6
Factor 8:
xvi. Technology level required to support the project
FW 8: 4 FIS 8: 0 FS 8: 6
Factor 9:
xxvi. Staff motivation and the working environment.
FW 9: 5 FIS 9: 10 FS 5
Factor 10:
FW 10: 0 FIS 10: 0 FS 10: 0
Continue
Objective 5:
f) Coordinate and manage all sectoral planning related to economic and basic infrustructure
OW 5: 5 OIS 5: 10 OS 5: 6
Objective 6:
OW 6: 0 OIS 6: 0 OS 6: 0
Objective 7:
i) Promote rural development through appropriate policies
OW 7: 4 OIS 7: 10 OS 7: 7
Objective 8:
j) Provide an inventory of the country's physical and natural resources through surveys and remote sensing hence facilitate proper management and resource utilisation
OW 8: 4 OIS 8: 10 OS 8: 7
Objective 9:
m) Undertake macro and micro economic and public policy research and analysis.
OW 9: 5 OIS 9: 10 OS 9: 6
Objective 10:
OW 10: 0 OIS 10: 0 OS 10: 0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Factor 2 Weighted Score
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Factor 3 Weighted Score
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Factor 4 Weighted Score
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Factor 5 Weighted Score
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Factor 9 Weighted Score
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Factor 10 Weighted Score
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Objective 1 Weighted Score
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Objective 2 Weighted Score
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Objective 3 weighted Score
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Objective 4 Weighted Score
12
Objective 5 Weighted Score
20
Objective 6 Weighted Score
0
Objective 7 Weighted Score
12
Objective 8 Weighted Score
12
Objective 9 Weighted Score
20
Objective 10 Weighted Score
0

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Factor's Overall Score	243	Objective's Overall Score	120
Factor Overall score + Objective Overall Score	363		
Project Overall Merit Score:	363 (Enter the Score)		

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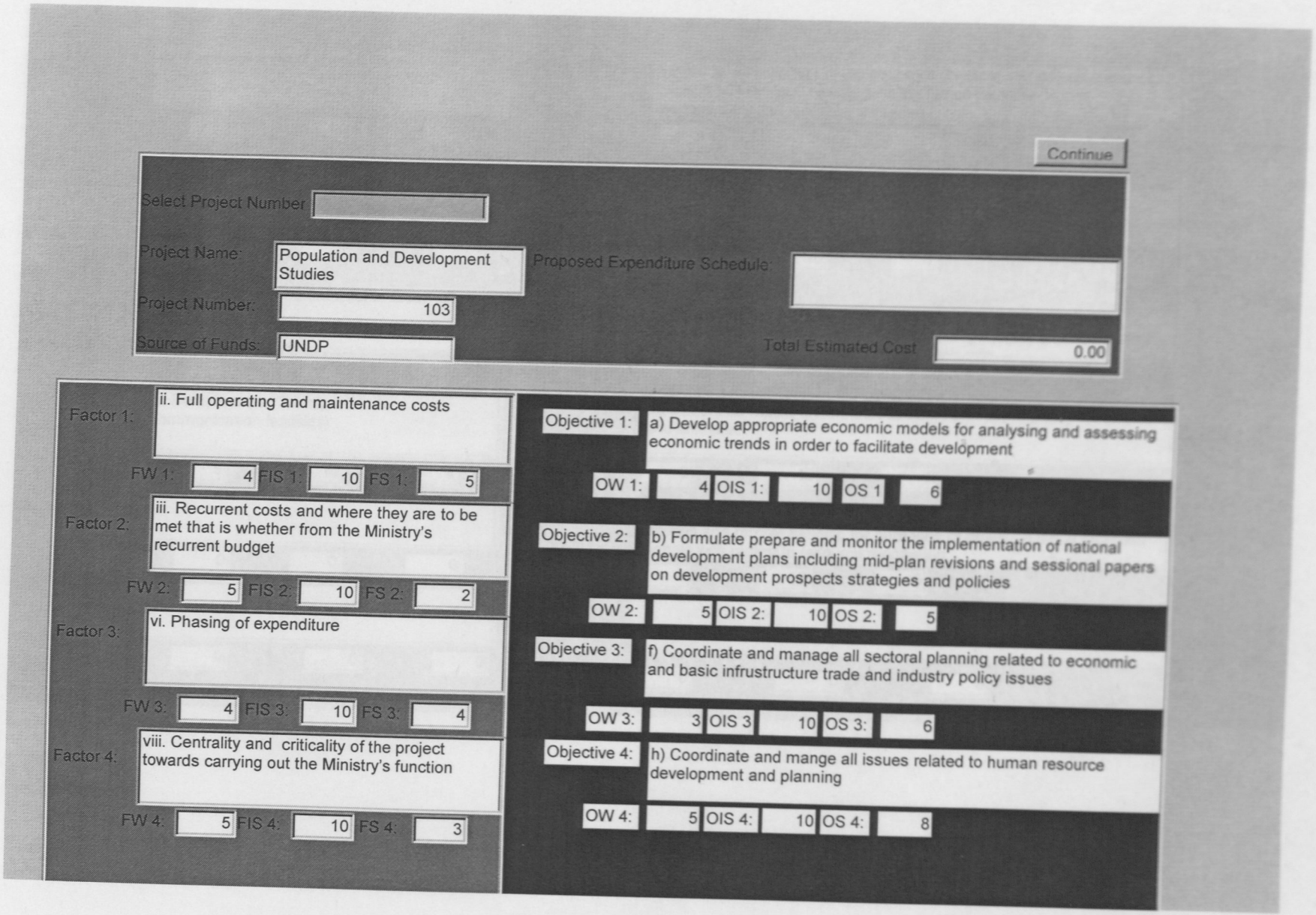
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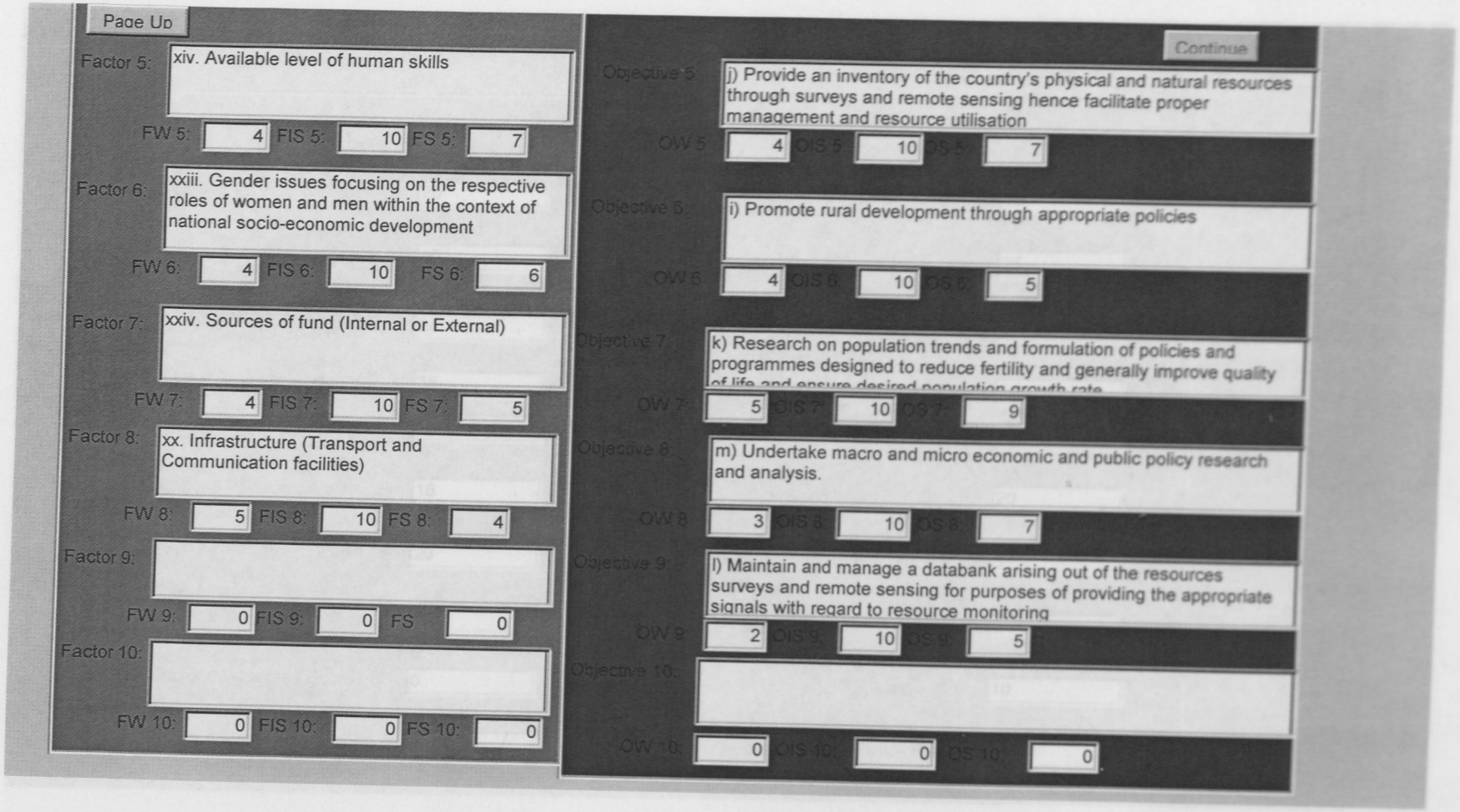
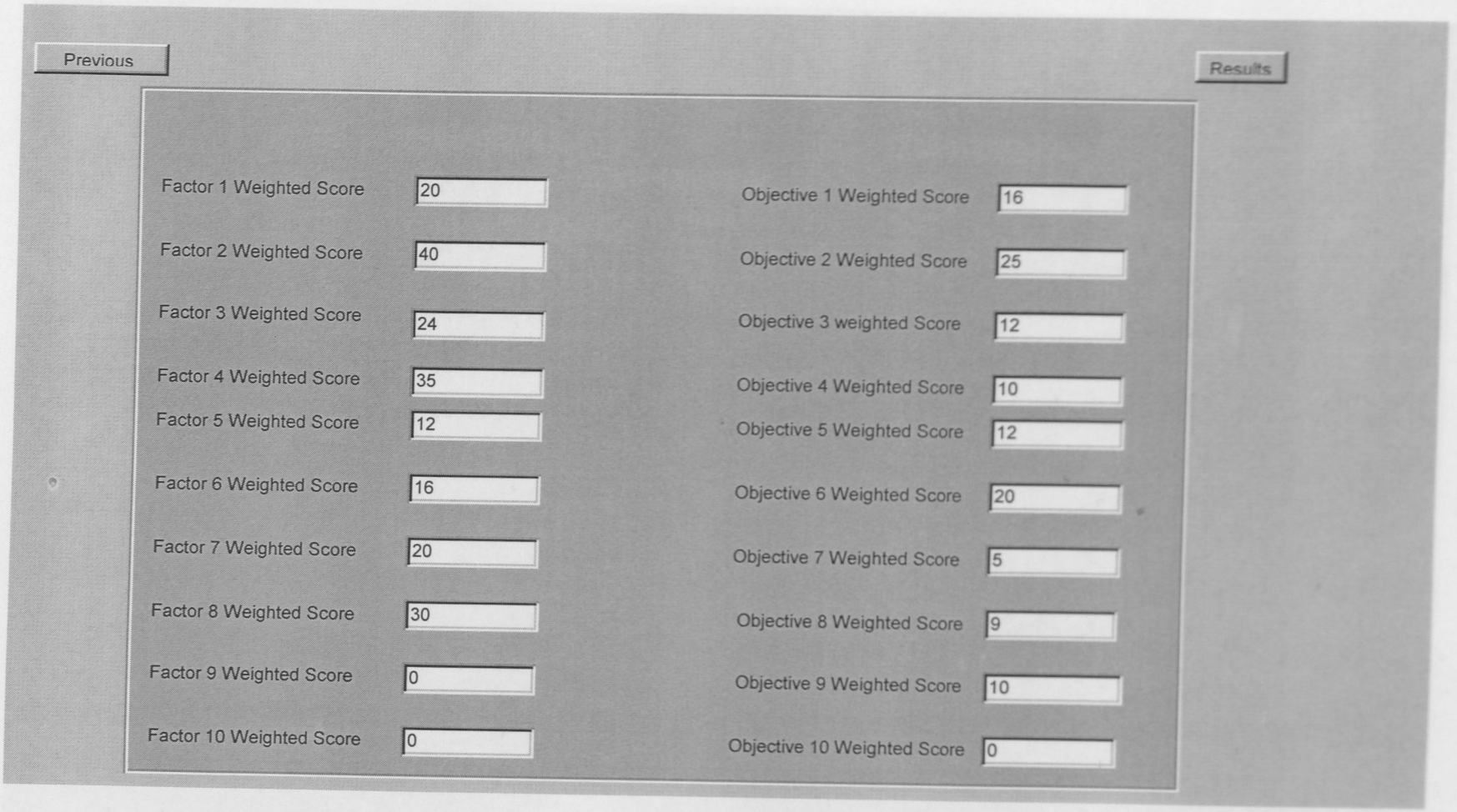
Select Project Number
Project Name:
Population and Development Studies
Proposed Expenditure Schedule:
Project Number:
103
Source of Funds:
UNDP
Total Estimated Cost
0.00
Factor 1:
ii. Full operating and maintenance costs
FW 1: 4 FIS 1: 10 FS 1: 5
Factor 2:
iii. Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget
FW 2: 5 FIS 2: 10 FS 2: 2
Factor 3:
vi. Phasing of expenditure
FW 3: 4 FIS 3: 10 FS 3: 4
Factor 4:
viii. Centrality and criticality of the project towards carrying out the Ministry's function
FW 4: 5 FIS 4: 10 FS 4: 3
Objective 1:
a) Develop appropriate economic models for analysing and assessing economic trends in order to facilitate development
OW 1: 4 OIS 1: 10 OS 1 6
Objective 2:
b) Formulate prepare and monitor the implementation of national development plans including mid-plan revisions and sessional papers on development prospects strategies and policies
OW 2: 5 OIS 2: 10 OS 2: 5
Objective 3:
f) Coordinate and manage all sectoral planning related to economic and basic infrustructure trade and industry policy issues
OW 3: 3 OIS 3 10 OS 3: 6
Objective 4:
h) Coordinate and mange all issues related to human resource development and planning
OW 4: 5 OIS 4: 10 OS 4: 8


Page Up
Factor 5:
xiv. Available level of human skills
FW 5: 4 FIS 5: 10 FS 5: 7
Factor 6:
xxiii. Gender issues focusing on the respective roles of women and men within the context of national socio-economic development
FW 6: 4 FIS 6: 10 FS 6: 6
Factor 7:
xxiv. Sources of fund (Internal or External)
FW 7: 4 FIS 7: 10 FS 7: 5
Factor 8:
xx. Infrastructure (Transport and Communication facilities)
FW 8: 5 FIS 8: 10 FS 8: 4
Factor 9:
FW 9: 0 FIS 9: 0 FS 0
Factor 10:
FW 10: 0 FIS 10: 0 FS 10: 0
Continue
Objective 5:
j) Provide an inventory of the country's physical and natural resources through surveys and remote sensing hence facilitate proper management and resource utilisation
OW 5: 4 OIS 5: 10 OS 5: 7
Objective 6:
i) Promote rural development through appropriate policies
OW 6: 4 OIS 6: 10 OS 6: 5
Objective 7:
k) Research on population trends and formulation of policies and programmes designed to reduce fertility and generally improve quality of life and ensure desired population growth rate
OW 7: 5 OIS 7: 10 OS 7: 9
Objective 8:
m) Undertake macro and micro economic and public policy research and analysis.
OW 8: 3 OIS 8: 10 OS 8: 7
Objective 9:
l) Maintain and manage a databank arising out of the resources surveys and remote sensing for purposes of providing the appropriate signals with regard to resource monitoring
OW 9: 2 OIS 9: 10 OS 9: 5
Objective 10:
OW 10: 0 OIS 10: 0 OS 10: 0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Objective 5 Weighted Score
12
Objective 6 Weighted Score
20
Objective 7 Weighted Score
5
Objective 8 Weighted Score
9
Objective 9 Weighted Score
10
Objective 10 Weighted Score
0

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Factor's Overall Score	197	Objective's Overall Score	119
Factor Overall score + Objective Overall Score	316		
Project Overall Merit Score:	316 (Enter the Score)		

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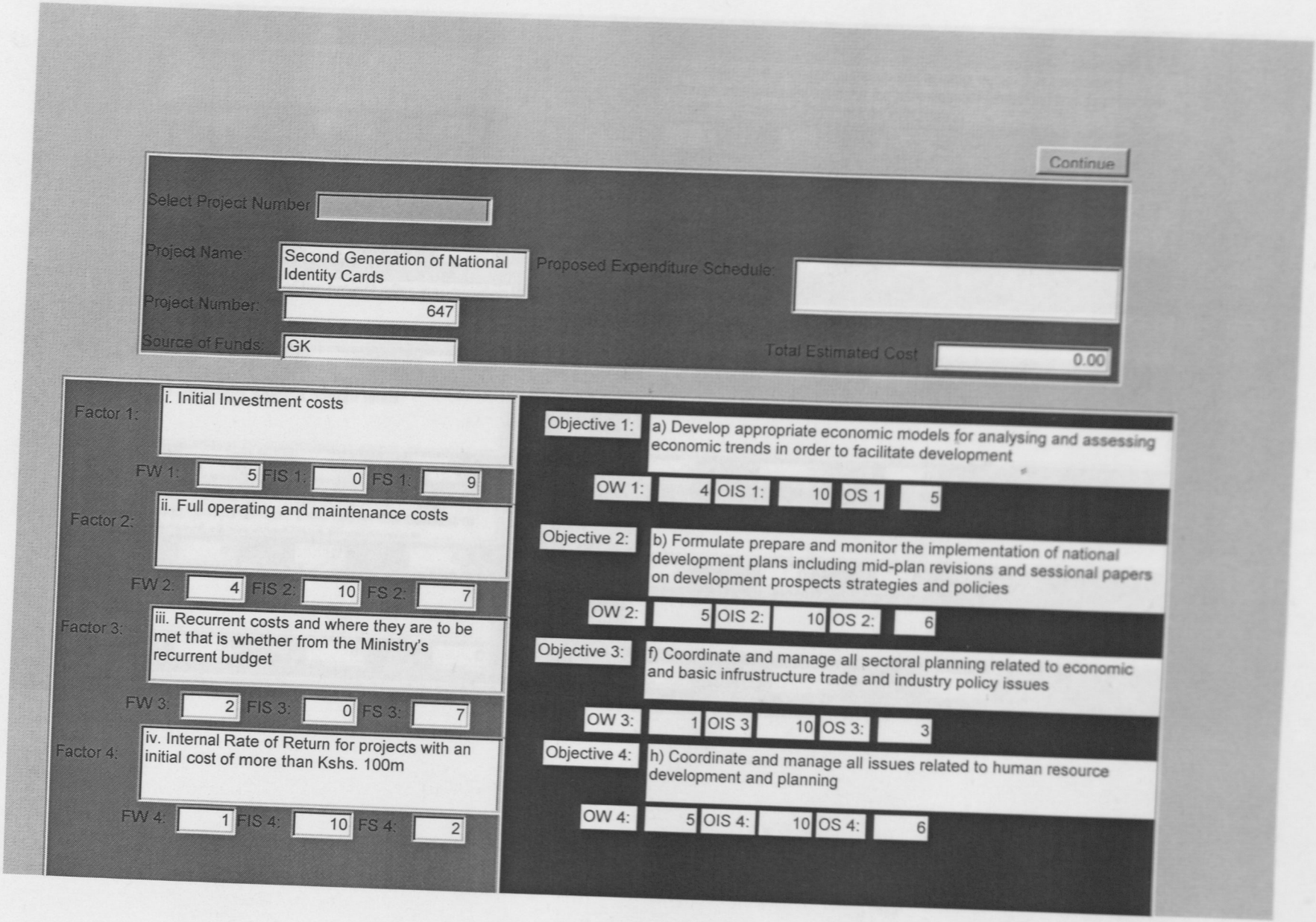
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Select Project Number
Project Name:
Second Generation of National Identity Cards
Proposed Expenditure Schedule:
Project Number:
647
Source of Funds:
GK
Total Estimated Cost
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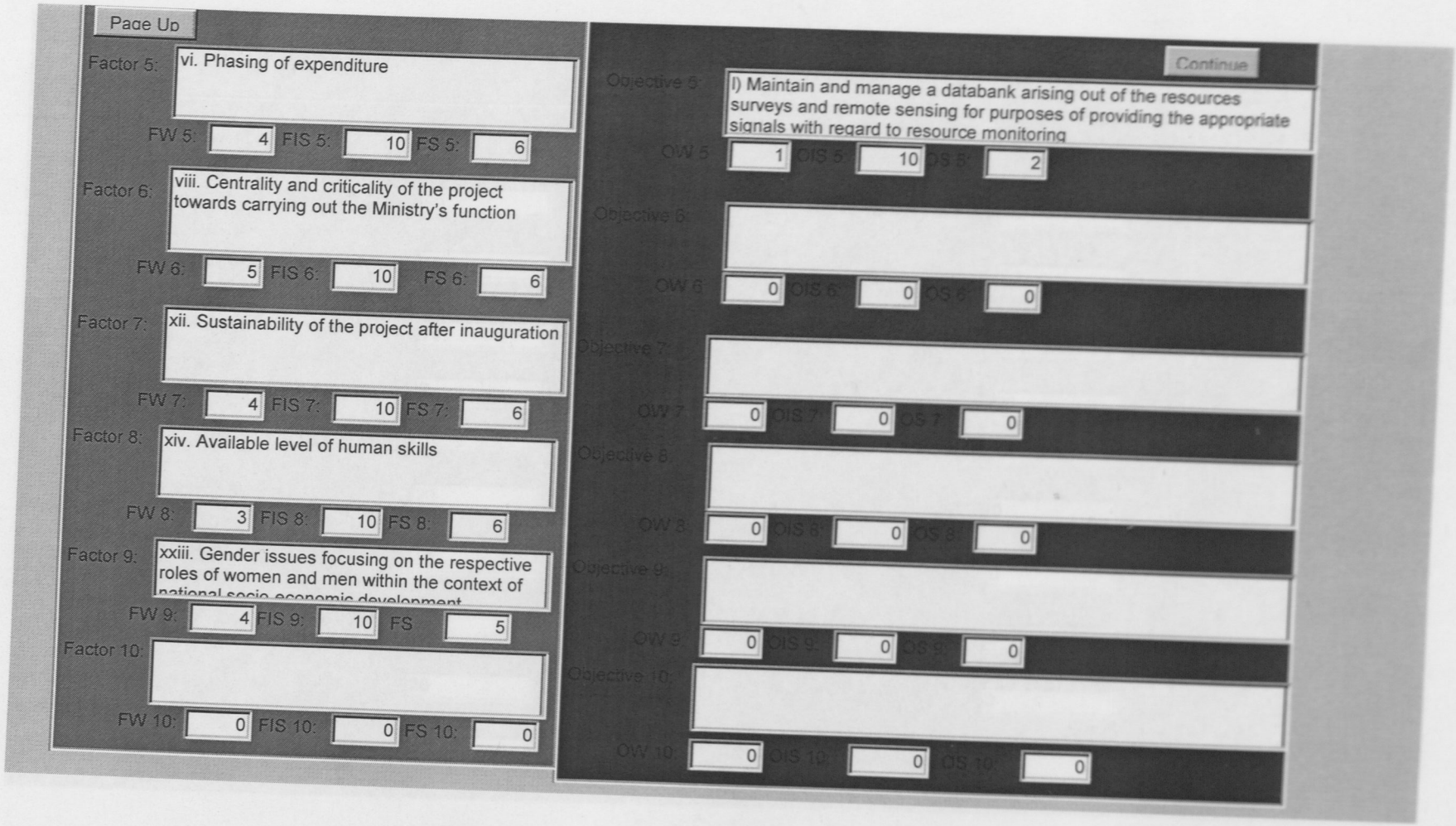
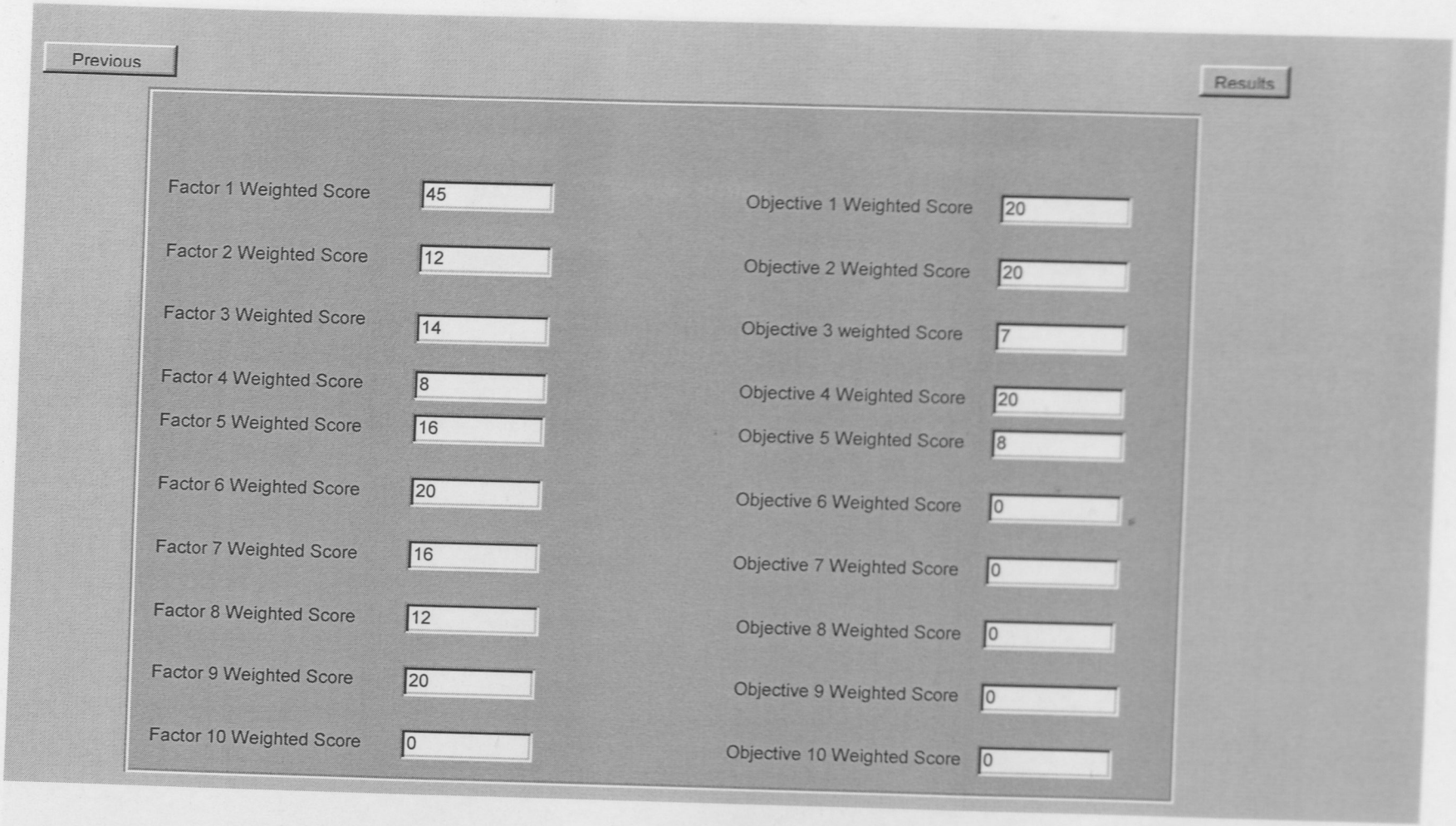
Factor 1:
i. Initial Investment costs
FW 1: 5 FIS 1: 0 FS 1: 9
Factor 2:
ii. Full operating and maintenance costs
FW 2: 4 FIS 2: 10 FS 2: 7
Factor 3:
iii. Recurrent costs and where they are to be met that is whether from the Ministry's recurrent budget
FW 3: 2 FIS 3: 0 FS 3: 7
Factor 4:
iv. Internal Rate of Return for projects with an initial cost of more than Kshs. 100m
FW 4: 1 FIS 4: 10 FS 4: 2
Objective 1:
a) Develop appropriate economic models for analysing and assessing economic trends in order to facilitate development
OW 1: 4 OIS 1: 10 OS 1 5
Objective 2:
b) Formulate prepare and monitor the implementation of national development plans including mid-plan revisions and sessional papers on development prospects strategies and policies
OW 2: 5 OIS 2: 10 OS 2: 6
Objective 3:
f) Coordinate and manage all sectoral planning related to economic and basic infrustructure trade and industry policy issues
OW 3: 1 OIS 3 10 OS 3: 3
Objective 4:
h) Coordinate and manage all issues related to human resource development and planning
OW 4: 5 OIS 4: 10 OS 4: 6


Page Up
Factor 5:
vi. Phasing of expenditure
FW 5: 4 FIS 5: 10 FS 5: 6
Factor 6:
viii. Centrality and criticality of the project towards carrying out the Ministry's function
FW 6: 5 FIS 6: 10 FS 6: 6
Factor 7:
xii. Sustainability of the project after inauguration
FW 7: 4 FIS 7: 10 FS 7: 6
Factor 8:
xiv. Available level of human skills
FW 8: 3 FIS 8: 10 FS 8: 6
Factor 9:
xxiii. Gender issues focusing on the respective roles of women and men within the context of
FW 9: 4 FIS 9: 10 FS 5
Factor 10:
FW 10: 0 FIS 10: 0 FS 10: 0
Continue
Objective 5:
I) Maintain and manage a databank arising out of the resources surveys and remote sensing for purposes of providing the appropriate signals with regard to resource monitoring
OW 5 1 OIS 5 10 OS 5 2
Objective 6:
OW 6 0 OIS 6 0 OS 6 0
Objective 7:
OW 7 0 OIS 7 0 OS 7 0
Objective 8:
OW 8 0 OIS 8 0 OS 8 0
Objective 9:
OW 9 0 OIS 9 0 OS 9 0
Objective 10:
OW 10 0 OIS 10 0 OS 10 0


Previous
Results
Factor 1 Weighted Score
45
Factor 2 Weighted Score
12
Factor 3 Weighted Score
14
Factor 4 Weighted Score
8
Factor 5 Weighted Score
16
Factor 6 Weighted Score
20
Factor 7 Weighted Score
16
Factor 8 Weighted Score
12
Factor 9 Weighted Score
20
Factor 10 Weighted Score
0
Objective 1 Weighted Score
20
Objective 2 Weighted Score
20
Objective 3 weighted Score
7
Objective 4 Weighted Score
20
Objective 5 Weighted Score
8
Objective 6 Weighted Score
0
Objective 7 Weighted Score
0
Objective 8 Weighted Score
0
Objective 9 Weighted Score
0
Objective 10 Weighted Score
0

Previous page

Factor's Overall Score	163	Objective's Overall Score	75
Factor Overall score + Objective Overall Score	238		
Project Overall Merit Score:	238 (Enter the Score)		

Ngunjiri J K MBA Project

Select better projects for a heathy economy and a better Kenya

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Appendix III

	Total Number of Projects	Total Estimated cost	GoK funded	External Funding	Average cost per project	Percentage of Ministry's project cost to Overall cost	Percentage of Ministry's government funded project cost to Overall government funding
Economic Sector							
Agriculture Livestock development and Marketing	44	445,445.00	46,457.00	398,988.00	**10,123.75**	1.91	0.84
Land Reclamation Regional and Water Development	272	2,278,134.00	983,973.00	1,294,161.00	**8,375.49**	9.76	17.73
Environment and NaturalResources	34	334,698.00	50,272.00	284,426.00	**9,844.06**	1.43	0.91
Energy	93	10,269,248.00	469,648.00	9,799,600.00	**110,422.02**	43.98	8.46
Transport and Communication	25	474,364.00	429,964.00	44,400.00	**18,974.56**	2.03	7.75
Public Works and Housing	138	1,958,321.00	613,698.00	1,344,623.00	**14,190.73**	8.39	11.06
Tourism and Wildlife	34	334,698.00	50,272.00	284,426.00	**9,844.06**	1.43	0.91
Cooperative Development	10	195,090.00	3,994.00	191,096.00	**19,509.00**	0.84	0.07
Commerce and Industry	22	268,481.00	111,073.00	157,408.00	**12,203.68**	1.15	2.00
Research Technology and Techinical Training	45	433,030.00	92,288.00	340,742.00	**9,622.89**	1.85	1.66
Land and Settlement	10	179,049.00	70,803.00	108,246.00	**17,904.90**	0.77	1.28
Social Sector							
Education	87	1,391,855.00	643,921.00	747,935.00	**15,998.33**	5.96	11.60
Health	152	826,214.00	122,857.00	703,357.00	**5,435.62**	3.54	2.21
Labour and Manpower Dvelopment	2	67.00	67.00	0.00	**33.50**	0.00	0.00
Culture and Social Services	22	49,321.00	25,076.00	24,245.00	**2,241.86**	0.21	0.45
Public Administration Sector							
Office of President and Directorate of Personnel Management	75	1,815,546.00	1,293,172.00	522,374.00	**24,207.28**	7.78	23.30
Finance	26	411,804.00	353,353.00	58,450.00	**15,838.62**	1.76	6.37
Office of Vice President and Planning and National Development	29	282,787.00	24,699.00	258,088.00	**9,751.28**	1.21	0.45
Local Government	43	1,207,703.00	31,476.00	1,176,227.00	**28,086.12**	5.17	0.57
Information and Broadcasting	14	20,537.00	14,389.00	6,148.00	**1,466.93**	0.09	0.26
Home Affairs and National Heritage	38	133,943.00	77,101.00	56,842.00	**3,524.82**	0.57	1.39
Foreign Affairs and International Cooperation	11	40,678.00	40,678.00	0.00	**3,698.00**	0.17	0.73
	1226	**23,351,013.00**	**5,549,231.00**	**17,801,782.00**	**19,046.50**		