CHAPTER IV

SYSTEM DESIGN

4.1 System Design

In the system design process, there are several steps to be performed, as follows:

1. Data Flow Diagram (DFD)
2. Algorithm and Flowchart
3. User Interface

4.2 Data Flow Diagram (DFD)

According to Visual Paradigm (2012), *A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects.* Some diagram notations used in this research can be identified in figure 4.1:

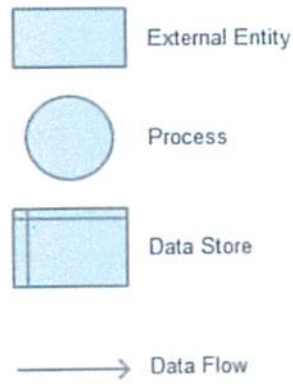

Figure 4.1 DFD Diagram Notations

1. *External Entity*

   An external entity can represent a human, system or subsystem. It is where certain data comes from or goes to. It is external to the system we study, in terms of the business process. For this reason, people use to draw external entities on the edge of a diagram.

2. *Process*

   A process is a business activity or function where the manipulation and transformation of data takes place. A process can be decomposed to finer level of details, for representing how data is being processed within the process.

3. *Data Store*

   A data store represents the storage of persistent data required and/or produced by the process.

4. *Data Flow*

   A data flow represents the flow of information, with its direction represented by an arrow head that shows at the end(s) of flow connector.

4.2.1 Context Level DFD (Level 0)

Context level DFD, also known as level 0 DFD, sees the whole system as a single process and emphasis the interaction between the system and external entities. The context diagram shows the entire system as a single process, and gives no clues as to its internal organization.

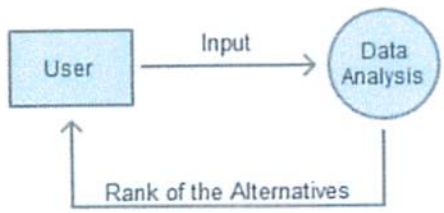

Figure 4.2 Context Level DFD

4.2.2 Level 1 DFD

The context-level DFD above is next "exploded", to produce a Level 1 DFD that shows some of the detail of the system being modeled. The Level 1 DFD shows how the system is divided into sub-systems (processes), each of which deals with one or more of the data flows to or from an external agent, and which together provide all of the functionality of the system as a whole. It also identifies internal data stores that must be present in order for the system to do its job, and shows the flow of data between the various parts of the system.

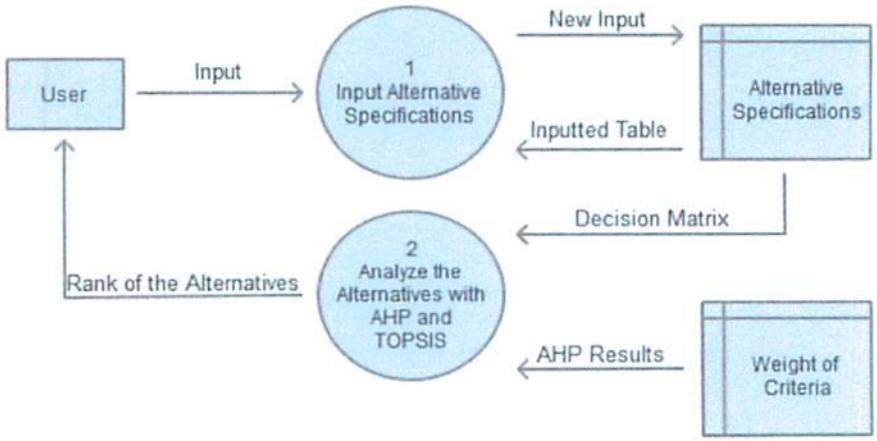

Figure 4.3 Level 1 DFD

4.2.3 Level 2 DFD

A Level 2 DFD focuses more on a single process from the Level 1 DFD above.

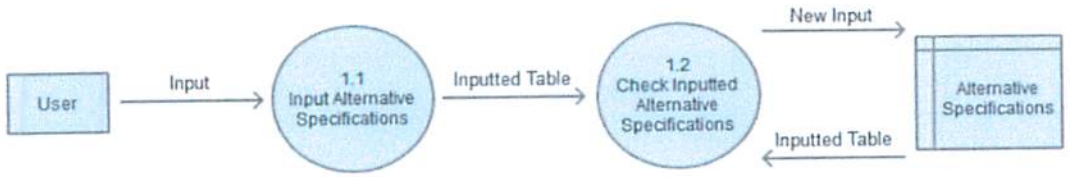

Figure 4.4 Process 1: Input Alternative Specifications

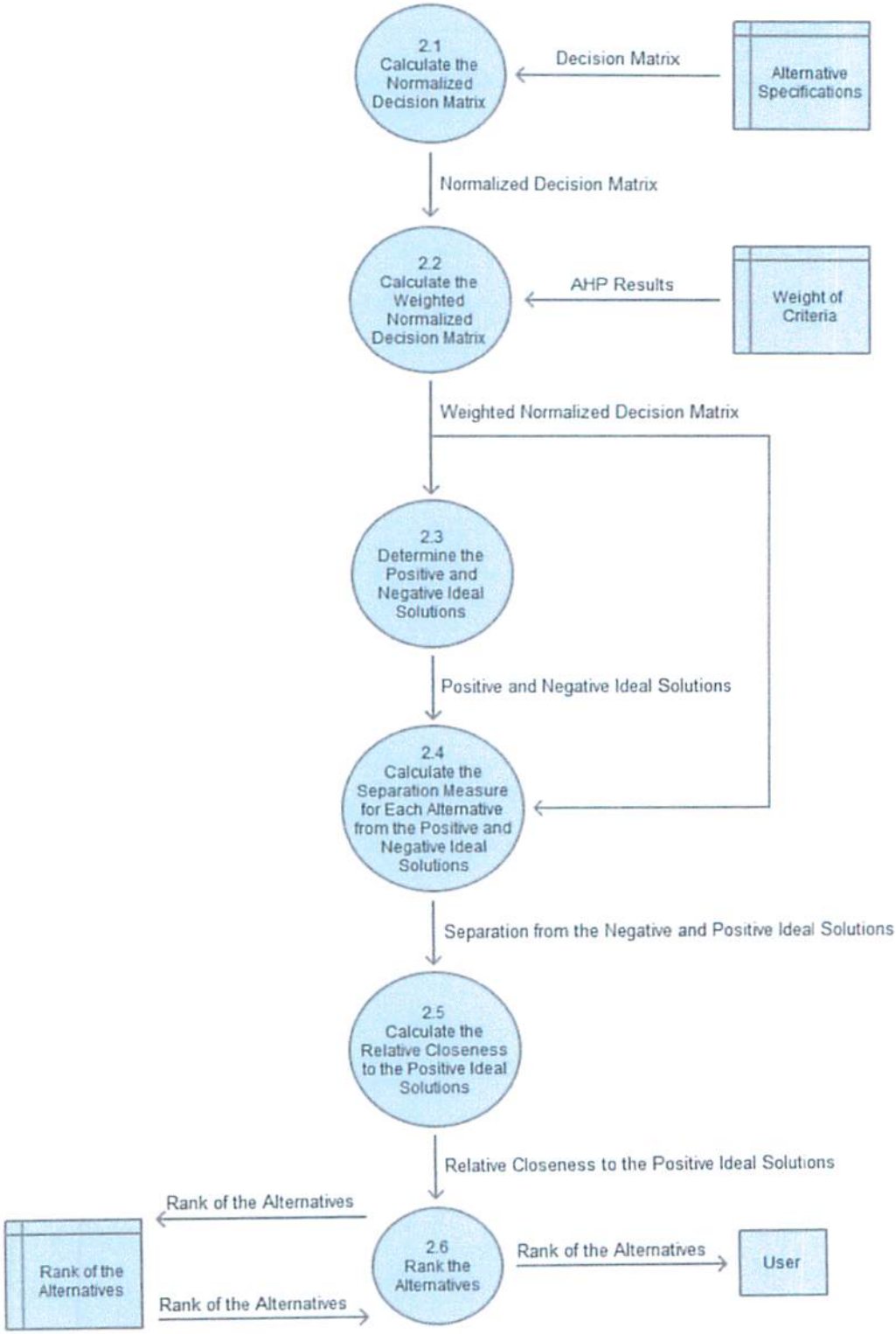

Figure 4.5 Process 2: Analyze the Alternatives with AHP and TOPSIS

4.3 Algorithm and Flowchart

According to RFF Electronics (1996), *an algorithm is a step-by-step procedure for calculations while a flowchart is a type of diagram that represents an algorithm, work flow or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows.* Some flowchart shapes used in this research can be identified in figure 4.6:

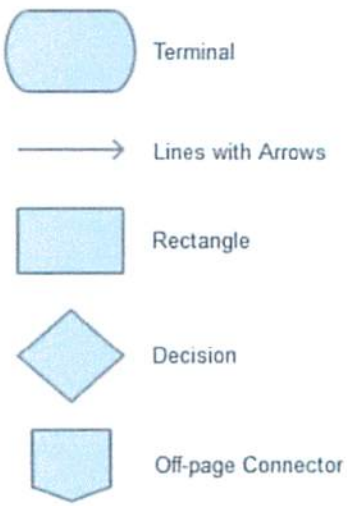

Figure 4.6 Flowchart Shapes

1. *Terminal or Terminator Shape*
   This shape tells you where the flowchart begins and ends. It shows the entry point of your flowchart and the exit point.
2. *Lines with Arrows*
   You read a flowchart by following the lines with arrows from shape to shape. The lines with arrows determine the flow through the chart.
3. *Rectangle*
   In most flowcharts, the rectangle is the most common shape. It is used to show a process, task, action, or operation. It shows something that has to be done or an action that has to be taken.
4. *Decision*
   A decision asks a question. The answer to the question determines which arrow you follow out of the decision shape.

5. *Off-Page Connector*

   This shape means the flow continues on another page. A letter or page number in the shape tells you where to go.

Method flowcharts can be observed in figures below:

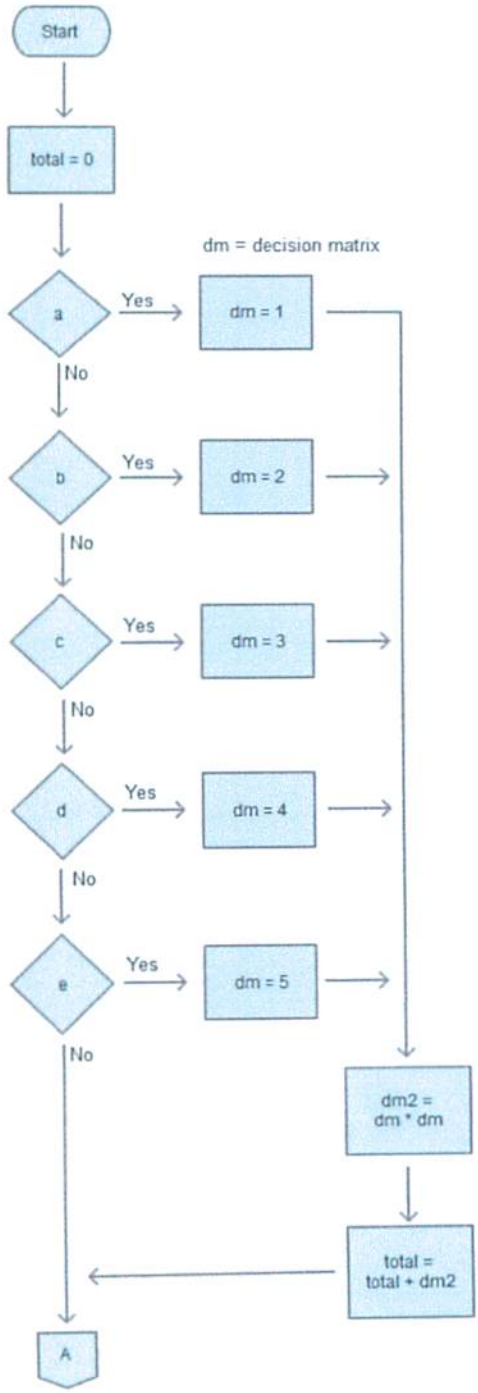

Figure 4.7 Decision Matrix Flowchart

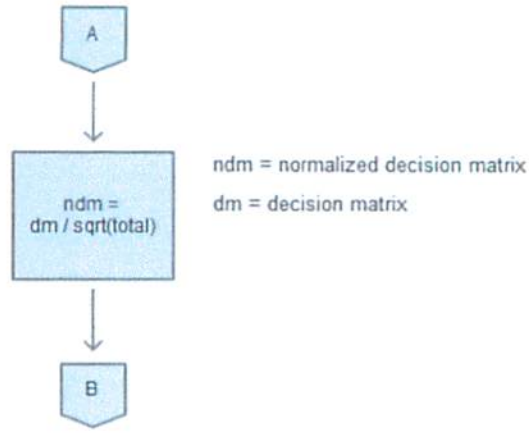

Figure 4.8 Normalized Decision Matrix Flowchart

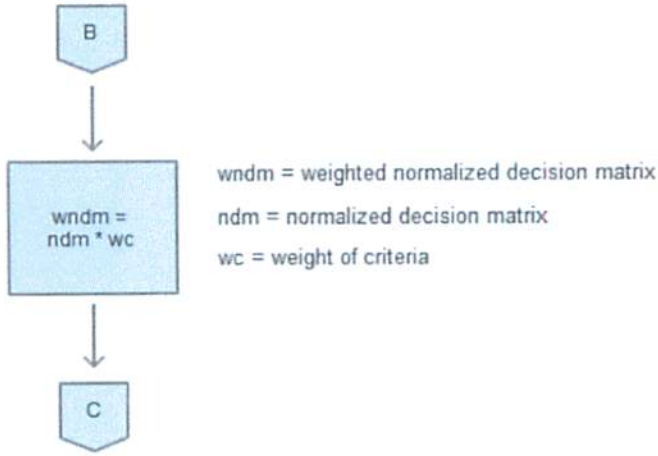

Figure 4.9 Weighted Normalized Decision Matrix Flowchart

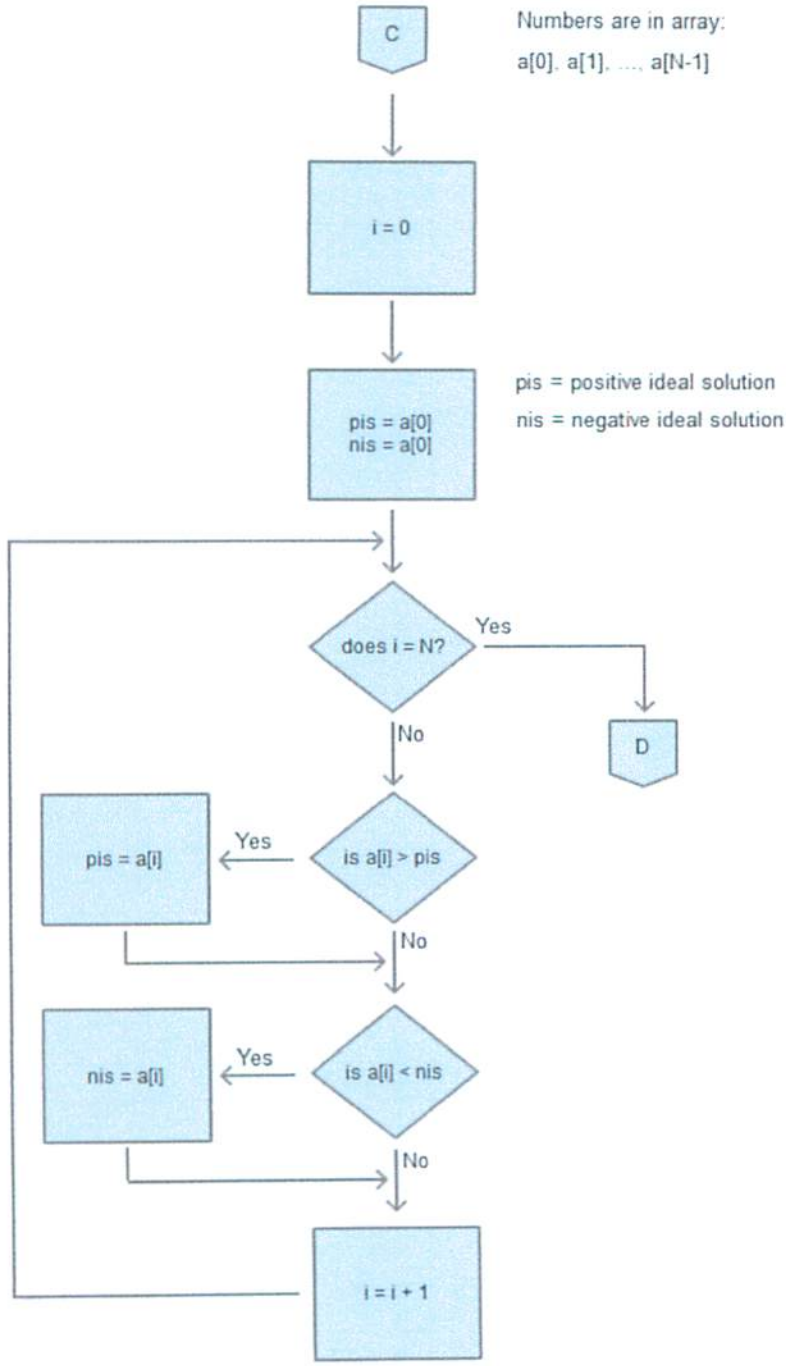

Figure 4.10 Positive and Negative Ideal Solution Flowchart

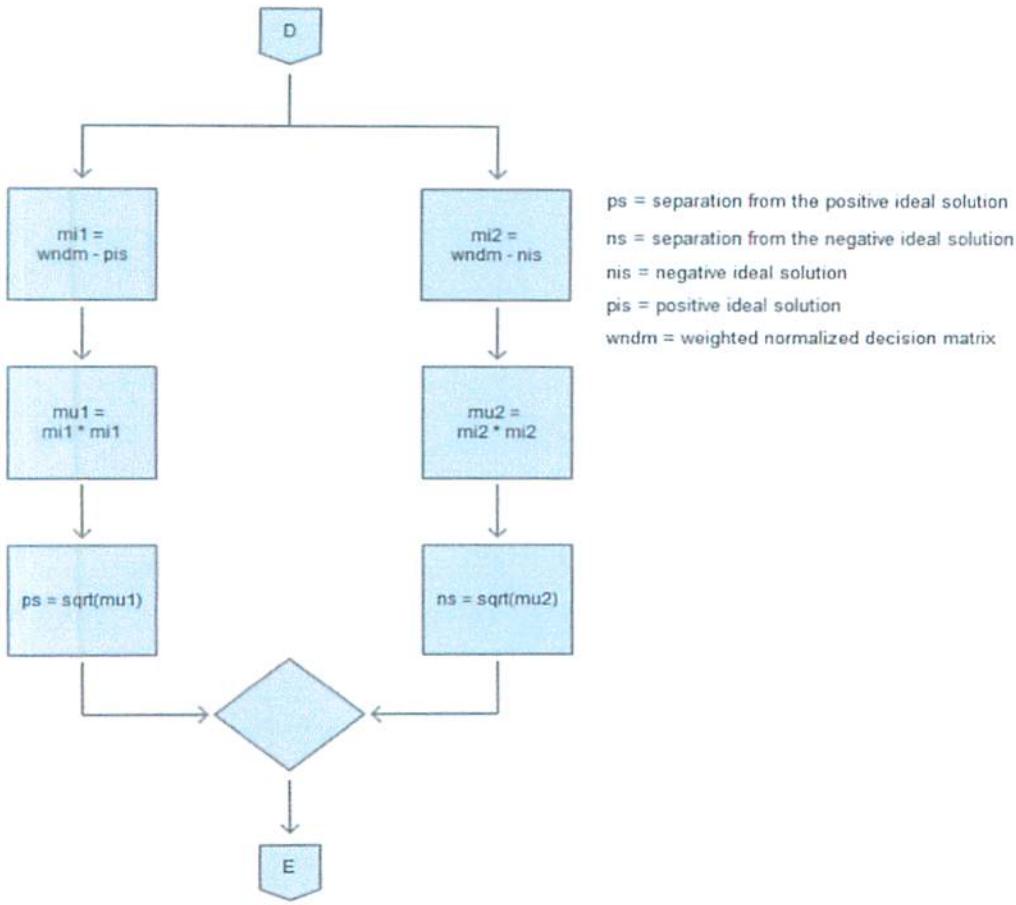

Figure 4.11 Positive and Negative Separation Measure Flowchart

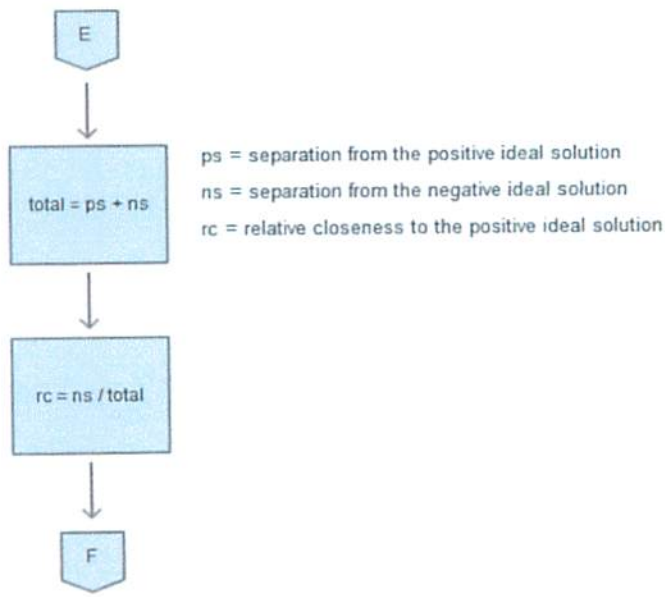

Figure 4.12 Relative Closeness Flowchart

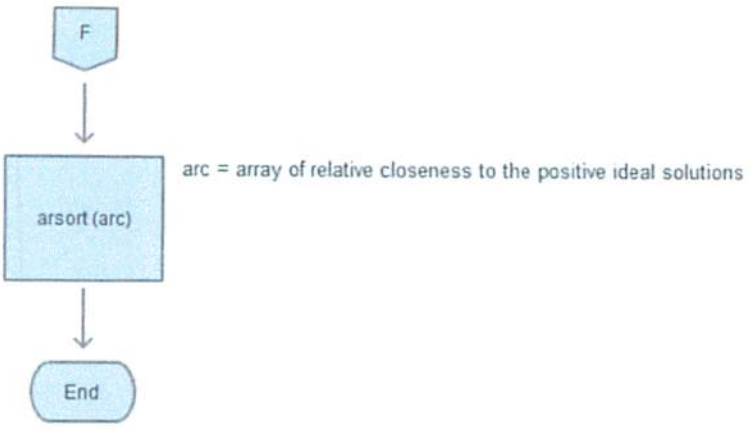

Figure 4.13 Ranking Flowchart

4.4 User Interface

According to TechTerms.com (2009), *a user interface, also called a "UI" or simply an "interface," is the means in which a person controls a software application or hardware device. A good user interface provides a "user-friendly" experience, allowing the user to interact with the software or hardware in a natural and intuitive way.*

User interface design of data analysis software can be observed in the figures below:

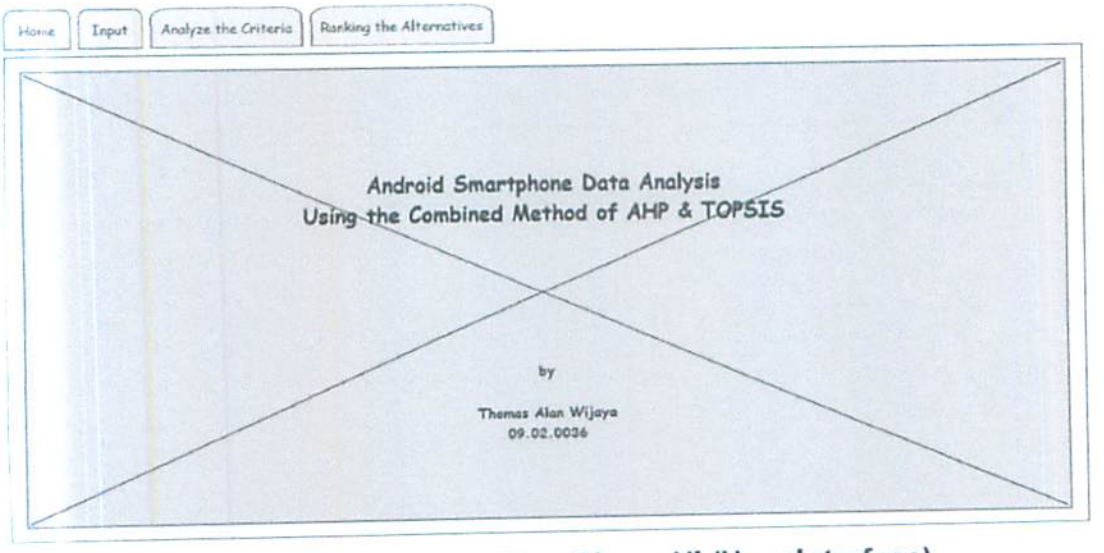

Figure 4.14 Starting Page/Home UI (User Interface)

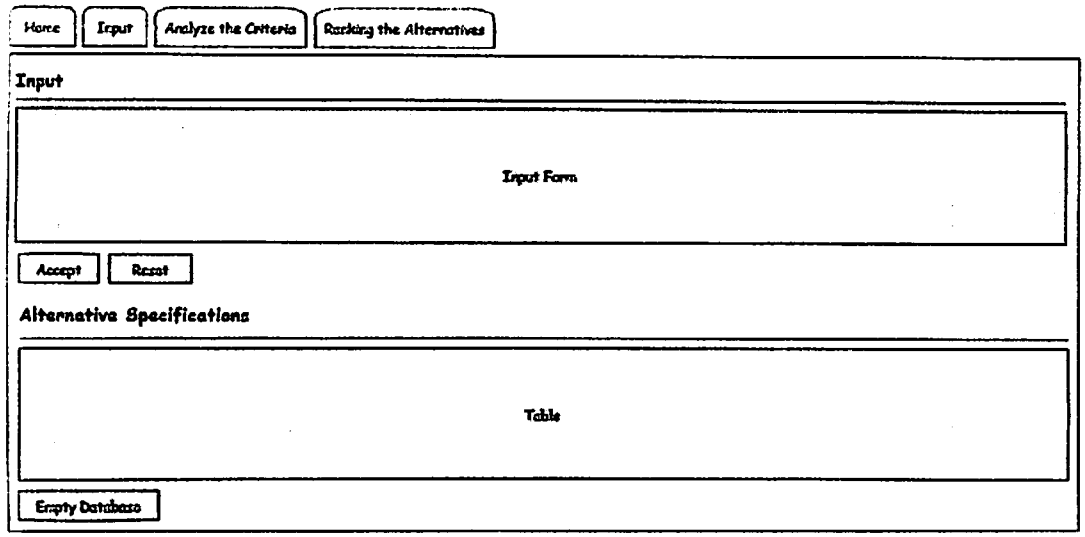

Figure 4.15 Input UI

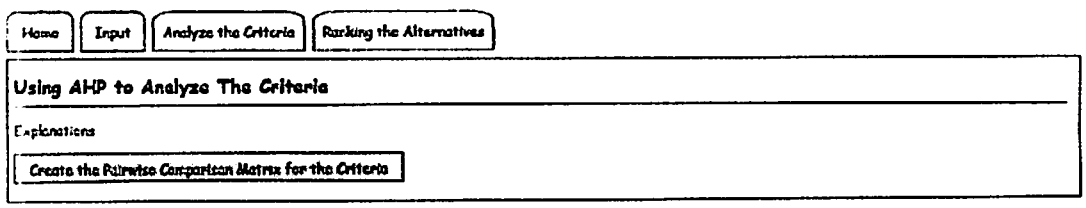

Figure 4.16 AHP 1 UI

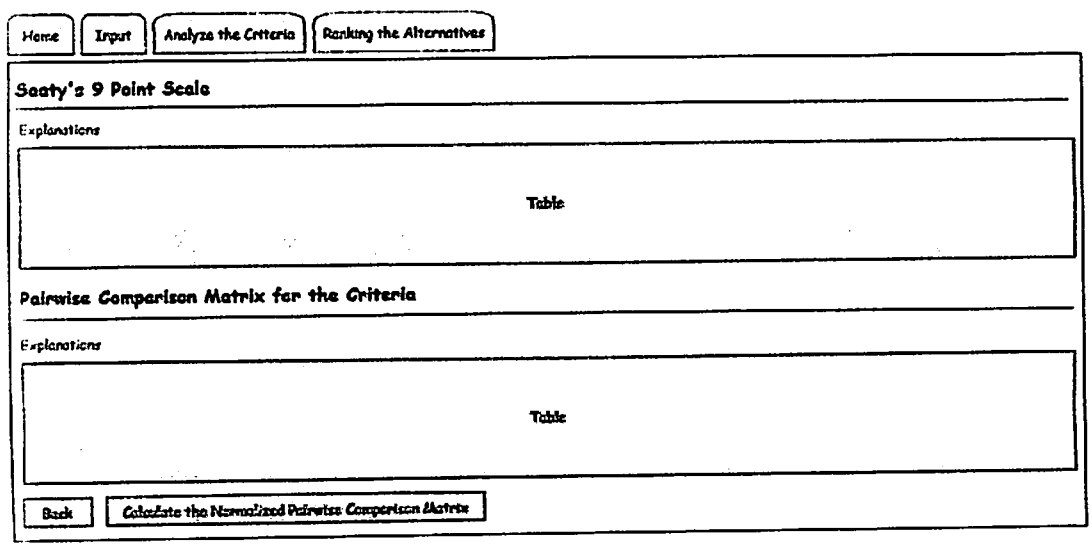

Figure 4.17 AHP 2 UI

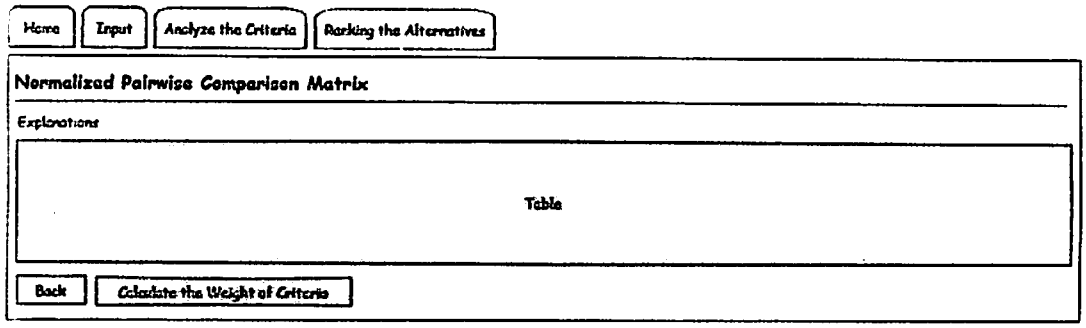

Figure 4.18 AHP 3 UI

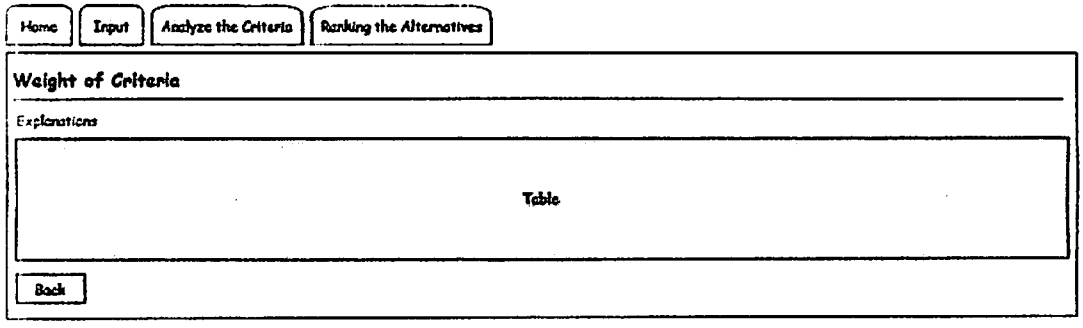

Figure 4.19 AHP 4 UI

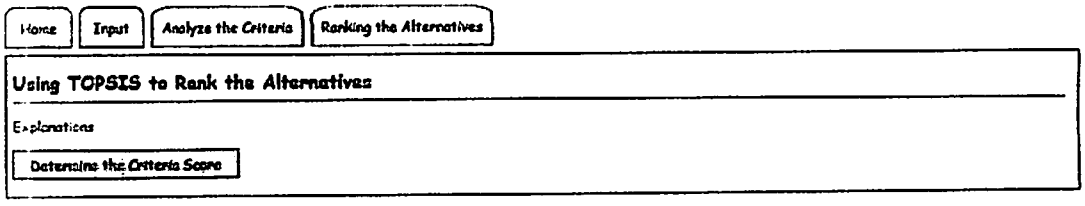

Figure 4.20 TOPSIS 1 UI

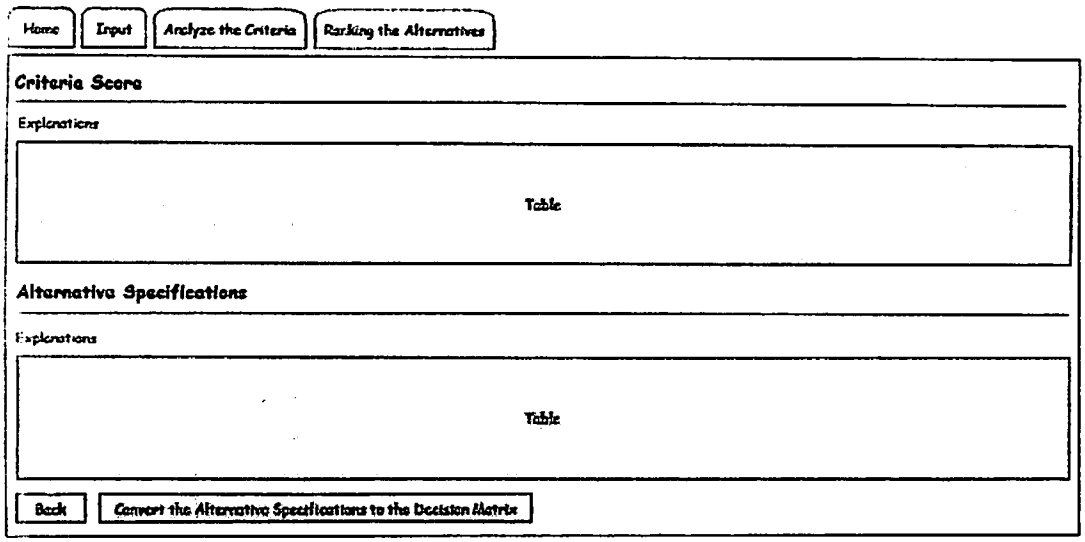

Figure 4.21 TOPSIS 2 UI

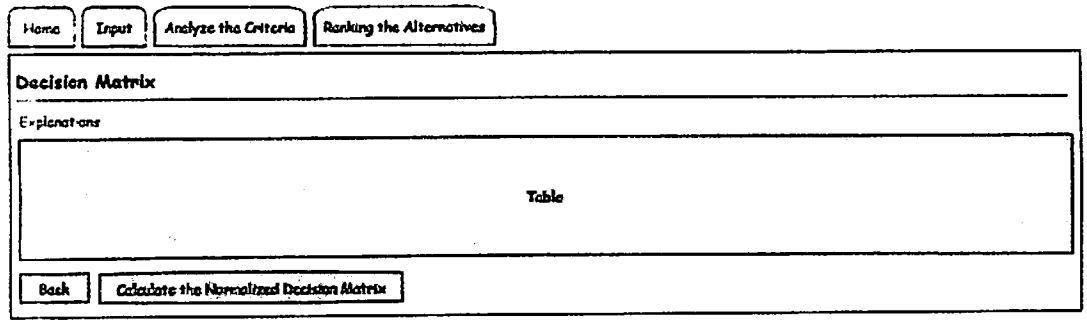

Figure 4.22 TOPSIS 3 UI

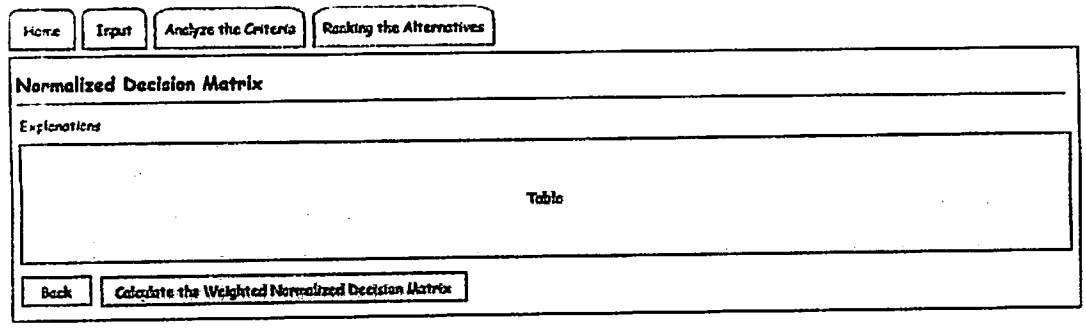

Figure 4.23 TOPSIS 4 UI

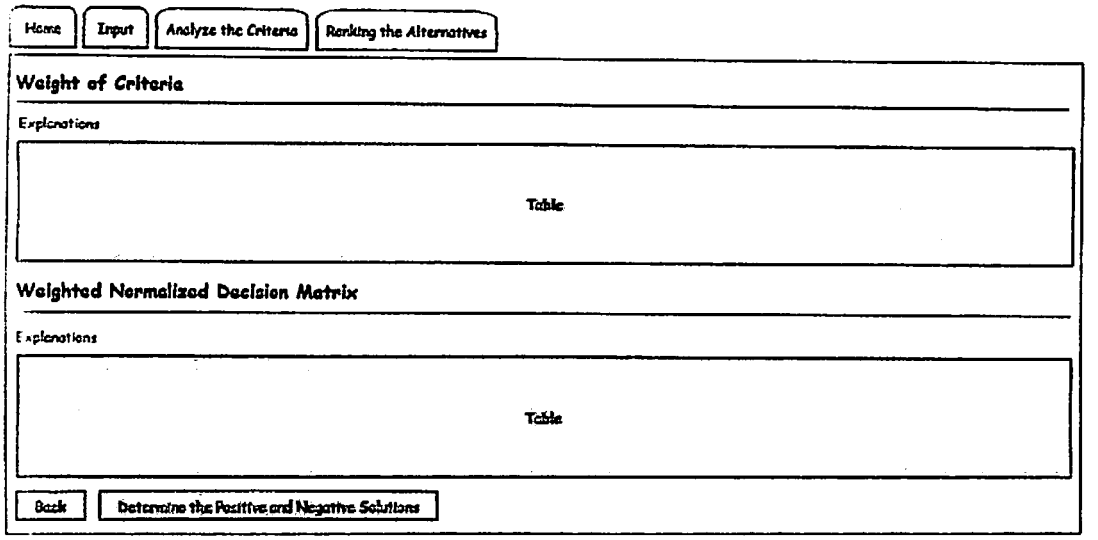

Figure 4.24 TOPSIS 5 UI

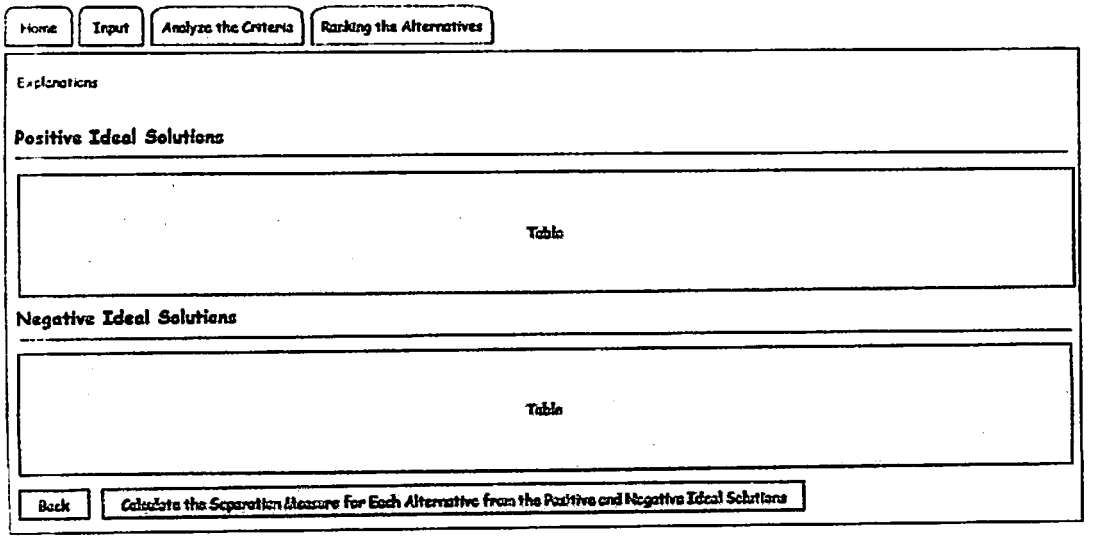

Figure 4.25 TOPSIS 6 UI

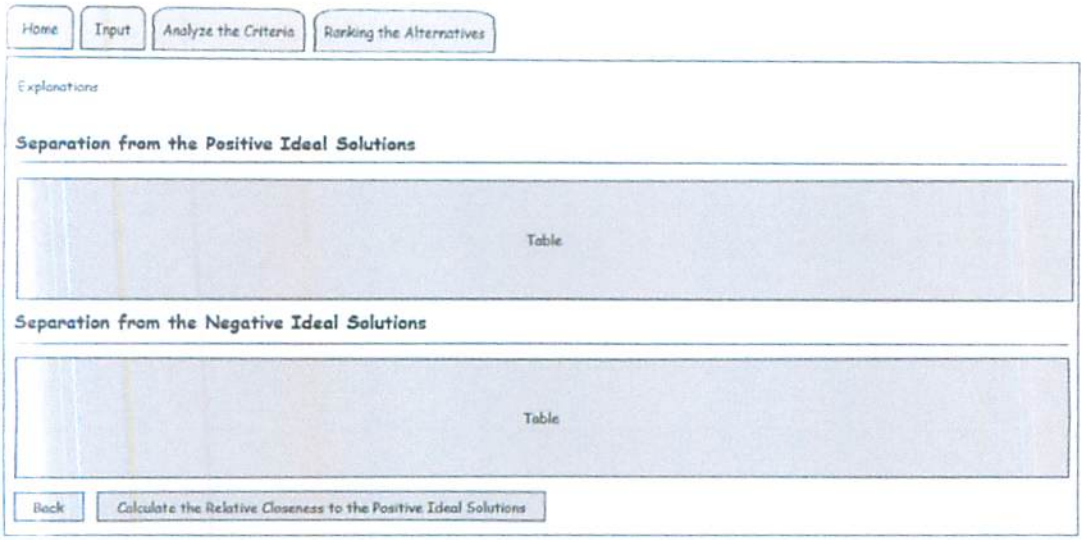

Figure 4.26 TOPSIS 7 UI

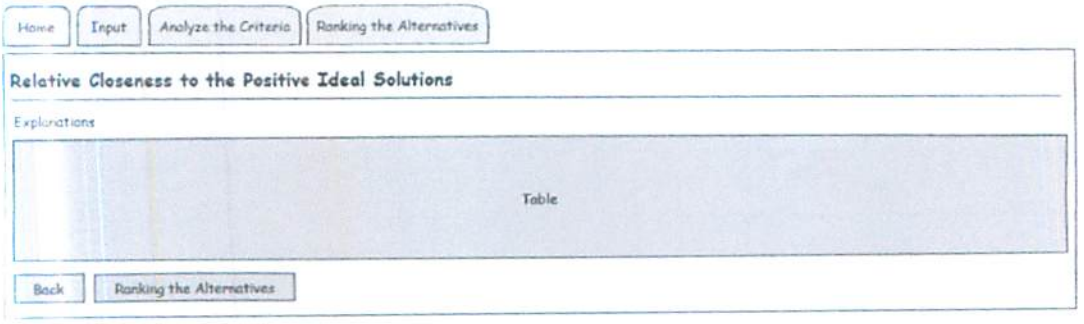

Figure 4.27 TOPSIS 8 UI

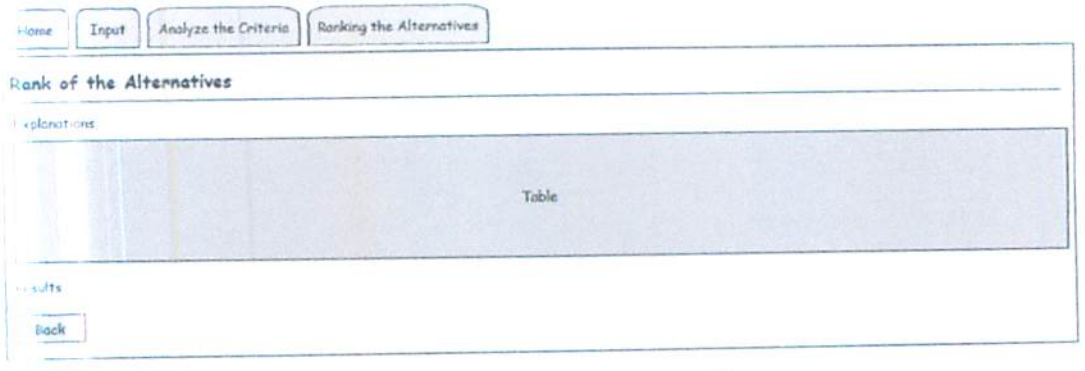

Figure 4.28 TOPSIS 9 UI