AD-DSS Program User's Manual

Introduction:

The program of the Architectural Design Decision Support System (AD-DSS) has been developed to assist stakeholders in building projects to evaluate architectural design alternatives in terms of life-cycle performance, and to make it easier for users to perform evaluation process. In the AD-DSS, four main criteria have been defined to evaluate design alternatives: (1) space functionality; (2) construction performance; (3) operational performance; and (4) aesthetics. These criteria have been divided into eight sub-criteria. Space functionality is divided into accessibility, relation, and size; construction performance is divided into time and cost; and operational performance into energy and maintenance. The aesthetics criterion has no sub-criteria. This program was developed using C sharp programing language and has three main functions as shown in Figure 1 (user's interface).

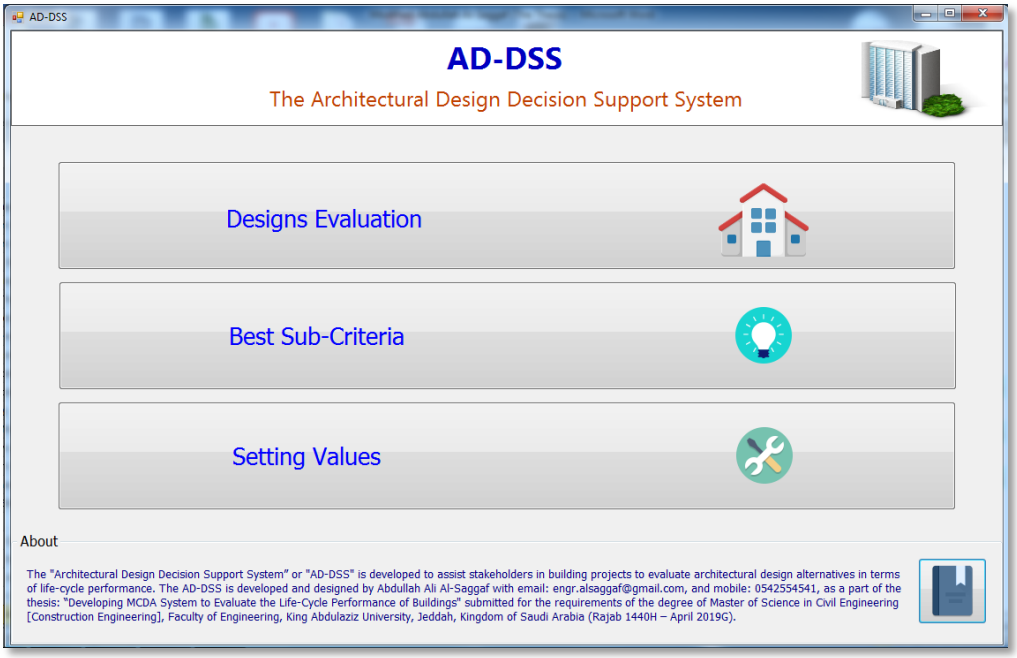

Figure 1: AD-DSS Program User's Interface

The first function of this program is “Designs Evaluation”, the second one is “Best Sub-Criteria”, and the third one is “Setting Values”. The user’s interface also includes a user’s manual which guides the user how to perform step by step each of the program functions (Figure 2).

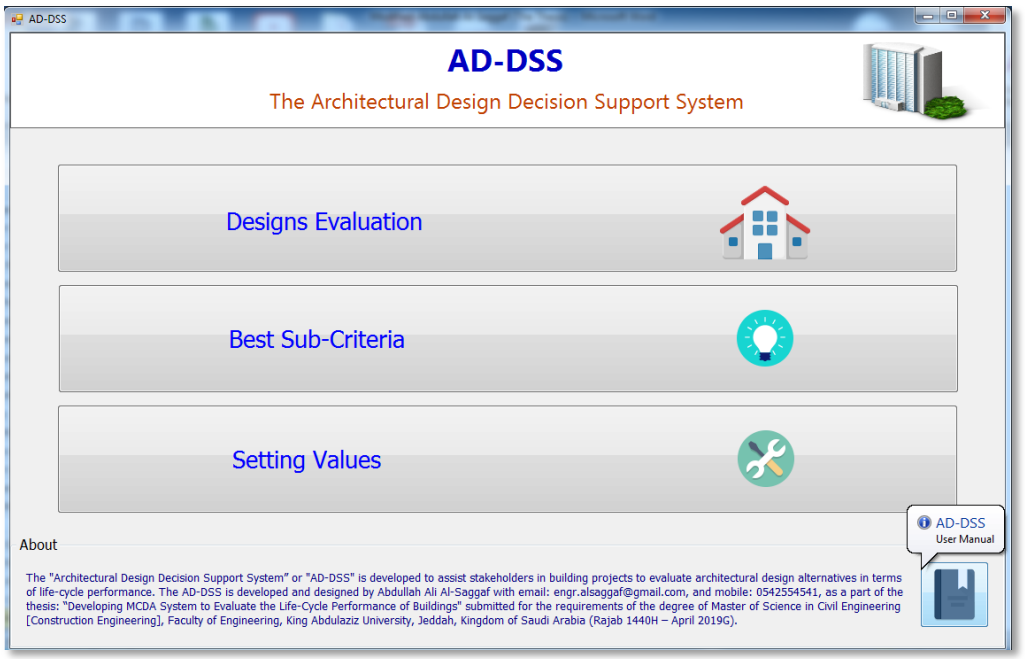

Figure 2: AD-DSS Program User’s Manual Icon

1. Designs Evaluation:

On the main user’s interface, the user can press the button of the “Designs Evaluation” as shown in Figure 3 to open the first function window. In this function, there are three main windows: (1) design selection and overall evaluation scoring (Options Windows), (2) design evaluation and analysis based on the criteria/sub-criteria (Results Window); and (3) Overall analysis and results (Dashboard Window).

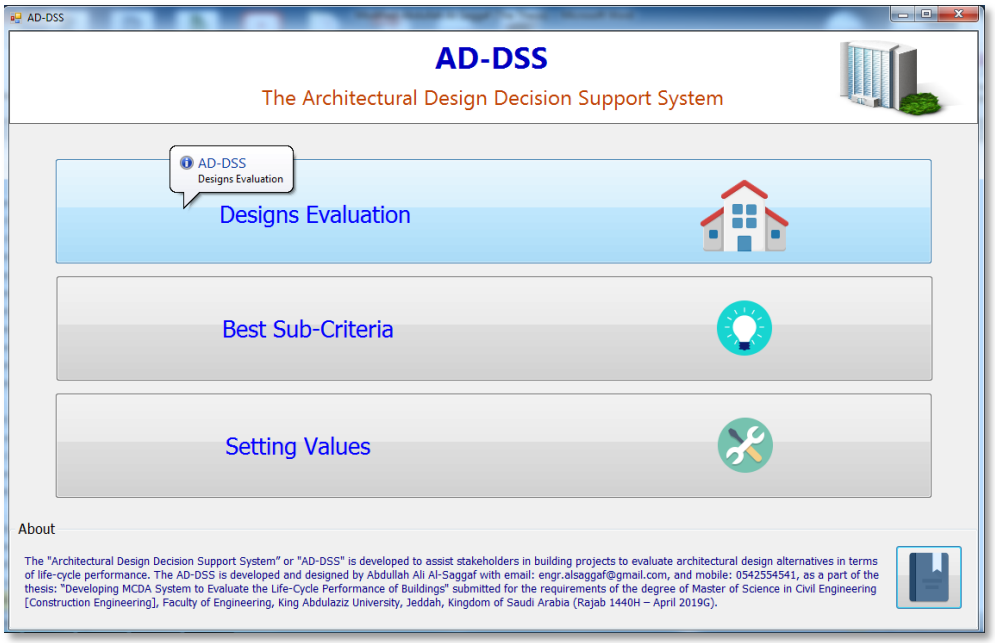

Figure 3: Designs Evaluations Function

As shown in Figure 4, the user must first add the number of design alternatives to be evaluated (10 is the maximum) by pressing "Adding Button", and then the program will automatically create the evaluation table for these alternatives. Afterwards, the user must select 14 parameters out of 40 design options for each design alternative.

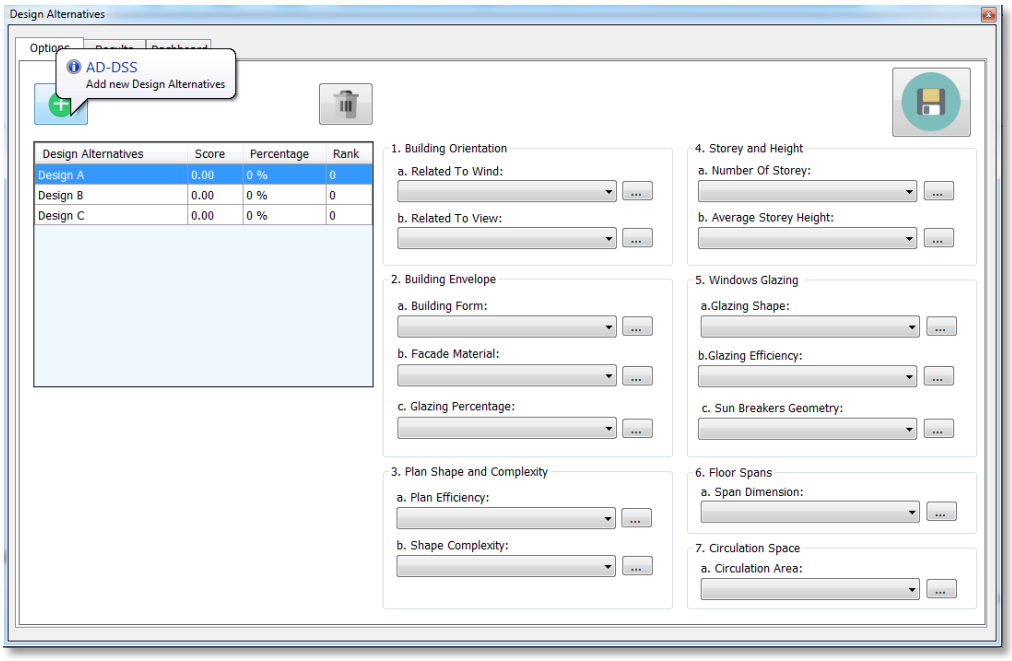

Figure 4: Designs Selection and Evaluation Scoring Window

In through this process, the user can add or delete any design alternative by using “Adding Button” or “Deleting Button”. In this example, three design alternatives (A, B and C) have been selected in the AD-DSS program user’s manual for an illustration.

The user can select the alternative parameters by using two methods. The first method allows the user to select these parameters using drop-down menu located under each of the system 7 Architectural Design Variables (ADVs) and their 14 sub-categories, which contains multiple design options as shown in Figure 5.

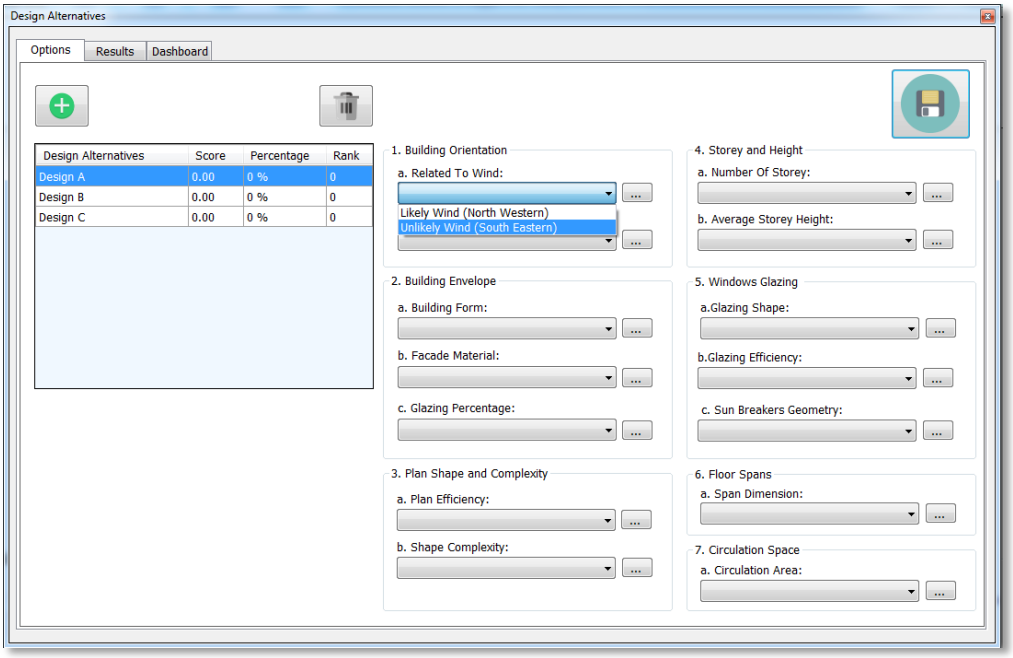

Figure 5: Design Parameters Selection by Drop-Down Menu

The second method of selection allows the user to select each alternative’s parameters by the options 3-D models window as shown in Figure 6. Accordingly, to perform this method, the user can click the button beside the drop-down menu and preview the options models and descriptions before making the selection. After completion of the selection process of the first alternative’s parameters, the user should click the save button located in the main selection window as shown in Figure 7. In this figure, the 14 parameters data of Design A has

been completely selected and saved. This step must be reaped for all the design alternatives after their complete parameters have been selected. In addition to the possibility to add or delete the alternative, the user can edit any created alternative data by selecting the alternative, making the required changing, and then resaving the new data again.

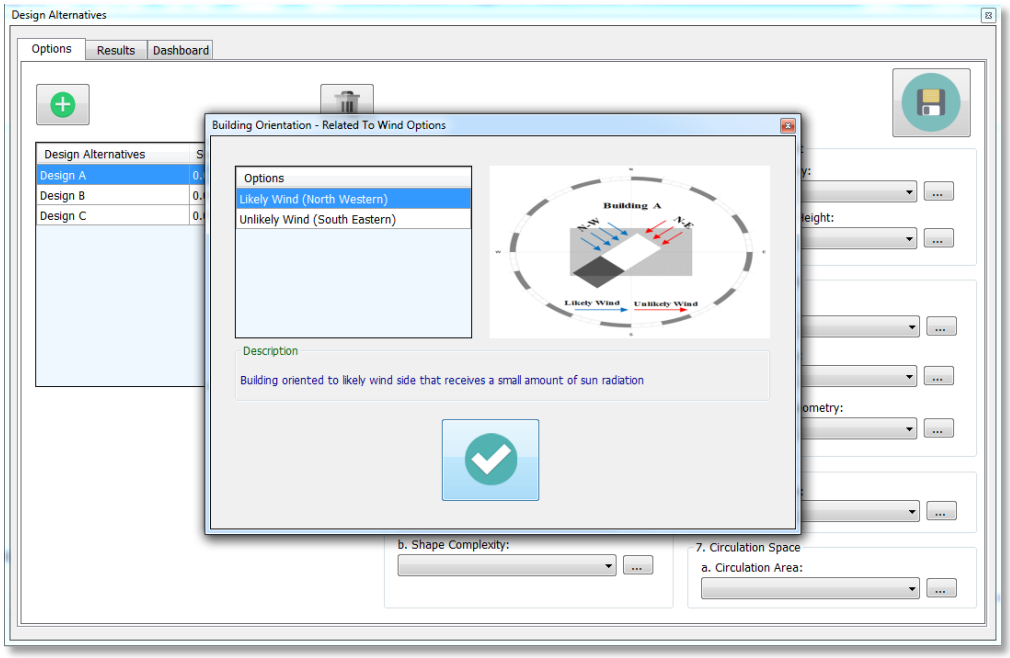

Figure 6: Design Parameters Selection by the 3-D Models

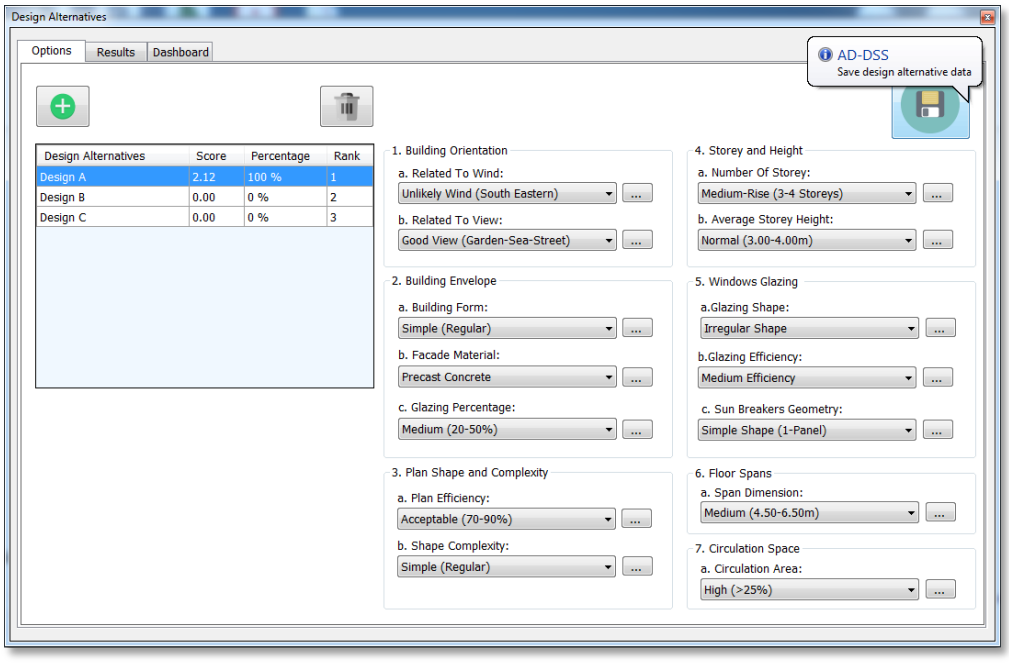

Figure 7: Design Alternative A Parameters Saving Process

Upon completing the design alternatives selecting (user inputs), the system will automatically evaluate each design by generating its score. Then, the system will rank the alternatives and show the best design in terms of the overall life-cycle performance as shown in Figure 8 (program outputs).

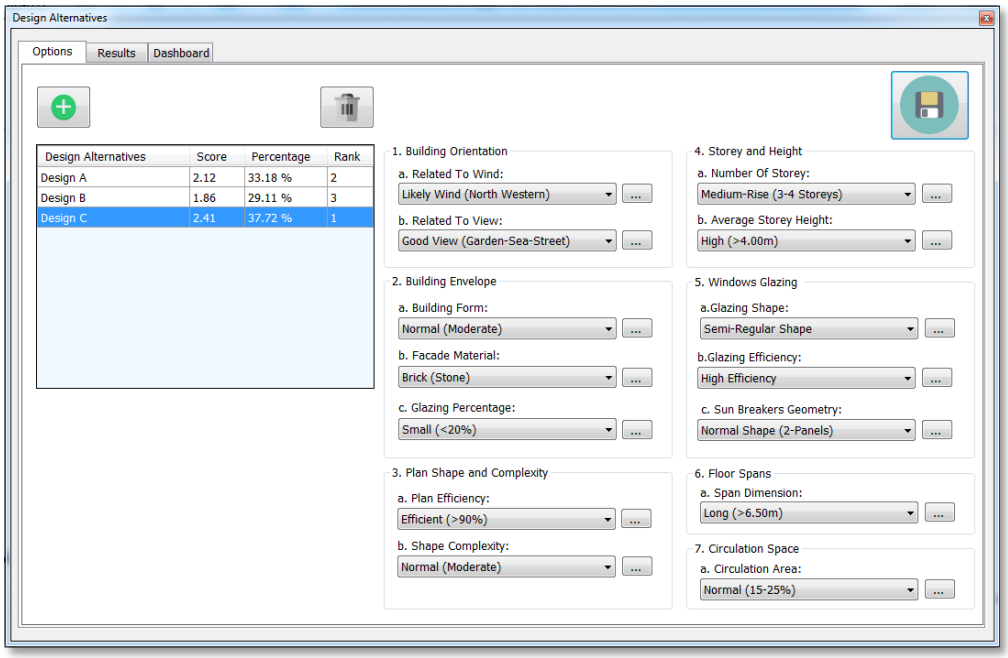

Figure 8: Design Alternatives Evaluation Scores

In addition to the previous outputs, the system has the ability to analyse and select the design alternative which is best in any specific of the 4 criteria or the 8 sub-criteria. This feature allows the user to optimize and achieve owner objectives. To perform this step, the user can transfer to the second windows in the "Design Evaluation" function which called "Results". In this window, the program enables the user to select between the 4 criteria as shown in Figure 9. Then, the system will show the best design and its score and relative index based on the selected criterion. At the same time, the system will generate the design and its score which is the best in the sub-criteria of the selected criterion. For example, in Figure 8, for the criteria "Space Functionality", the best alternatives is Design C with a score of 16.60 and relative index of 38.79%. In the same figure, the based design of the sub-criterion

"Accessibility" is Design B with a score of 6.00 and relative index of 35.71%, and so on. Figure 10 illustrates another example of the criteria "Construction Performance" to show how the user can transfer between the criteria and their sub-criteria.

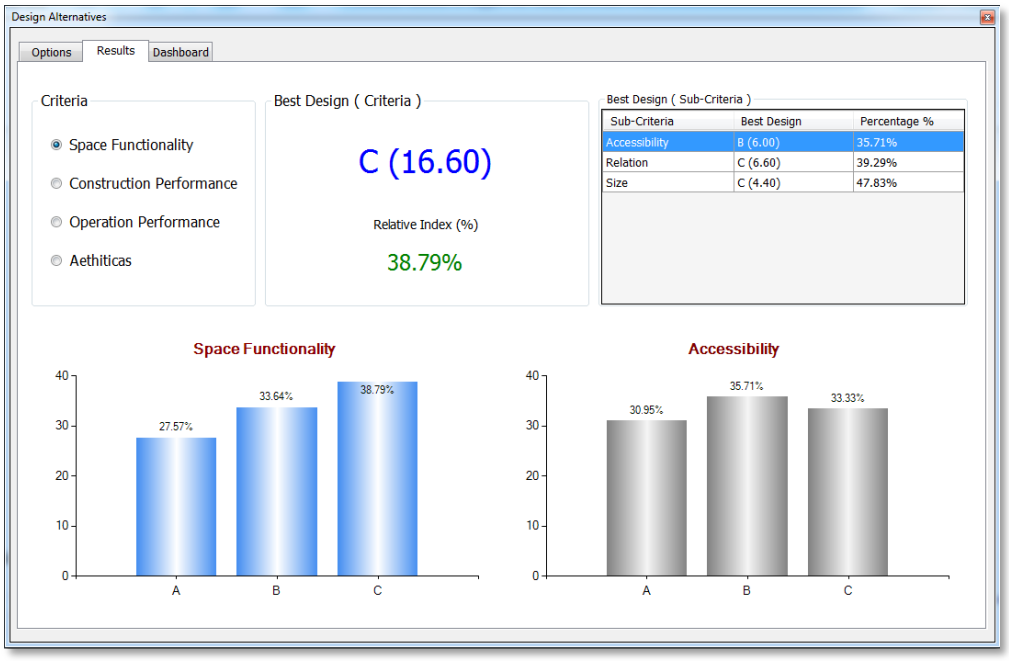

Figure 9: Design Alternatives Evaluation Based on "Space Functionality"

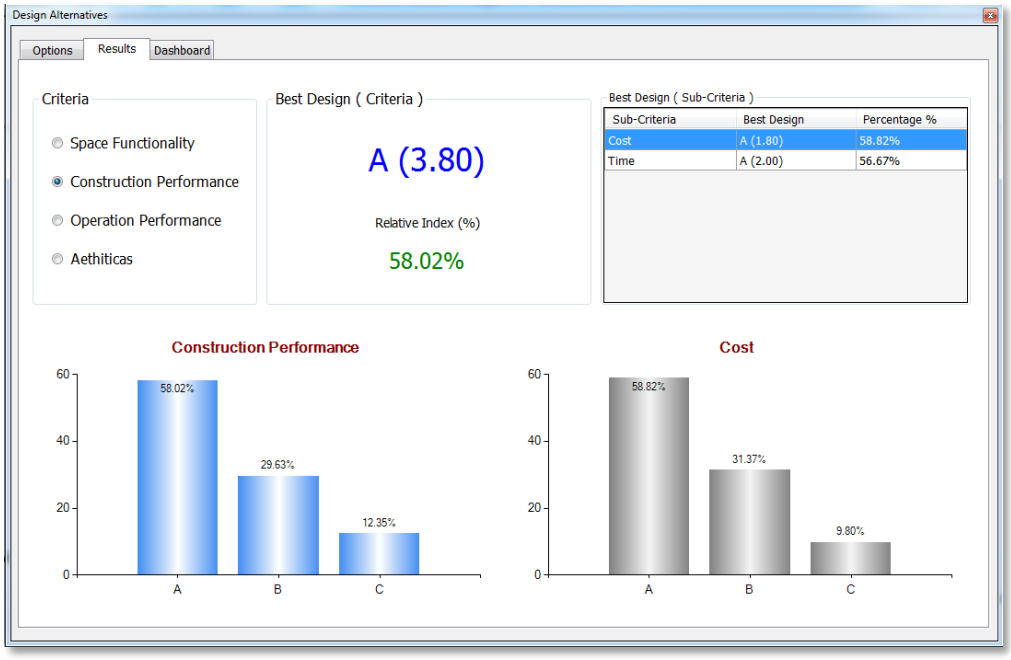

Figure 10: Design Alternatives Evaluation Based on "Construction Performance"

Moreover, in this window, as shown in Figures 9 and 10, the program automatically create schemes (chart bars) for the criteria and its selected sub-criteria, showing each design alternative relative index. In the "Dashboard" window of the "Design Evaluation" Function (Figure 11), the program will illustrate all the complete evaluation process and results as a summary report to help the user to analyse the outputs before he/she take the decision.

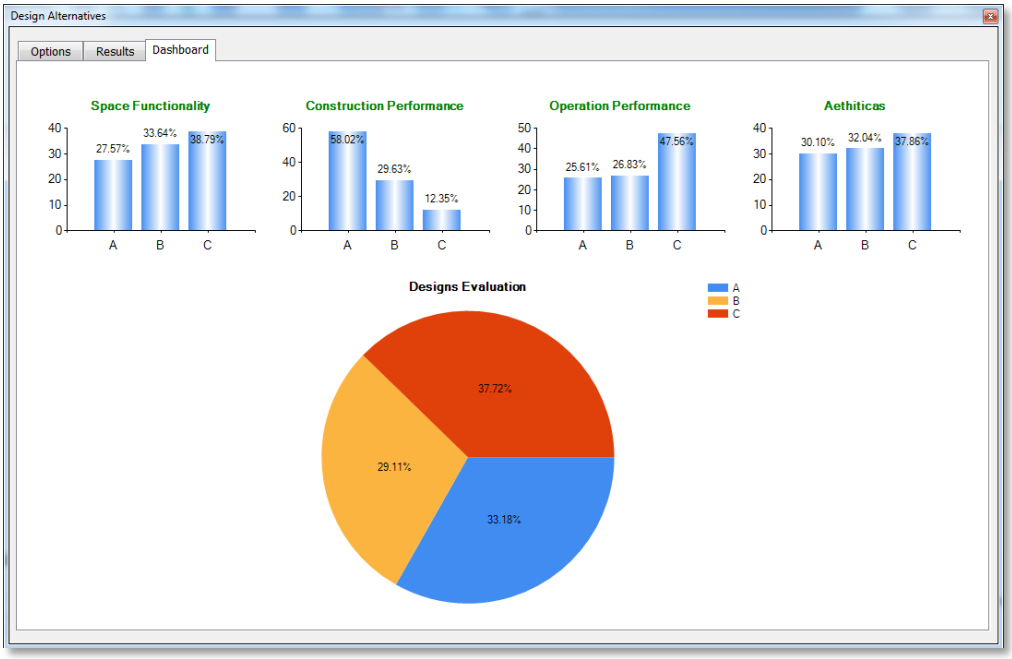

Figure 11: Summary of Overall Design Alternatives Evaluation Results

2. Best Sub-Criteria:

Another significant feature of the ADD-DSS program (second function), that it helps the user to optimize the owner objectives by directly generates the optimum design features based on the one or more sub-criteria. This will work as an interactive design selection hint which helps the user to try to achieve the owner objectives. To perform this step, from the main "User's Interface", the user can select "Best Sub-Criteria" button (Figure 12) and then "Best Sub-Criteria Selection Window" will appear as shown in Figure 13.

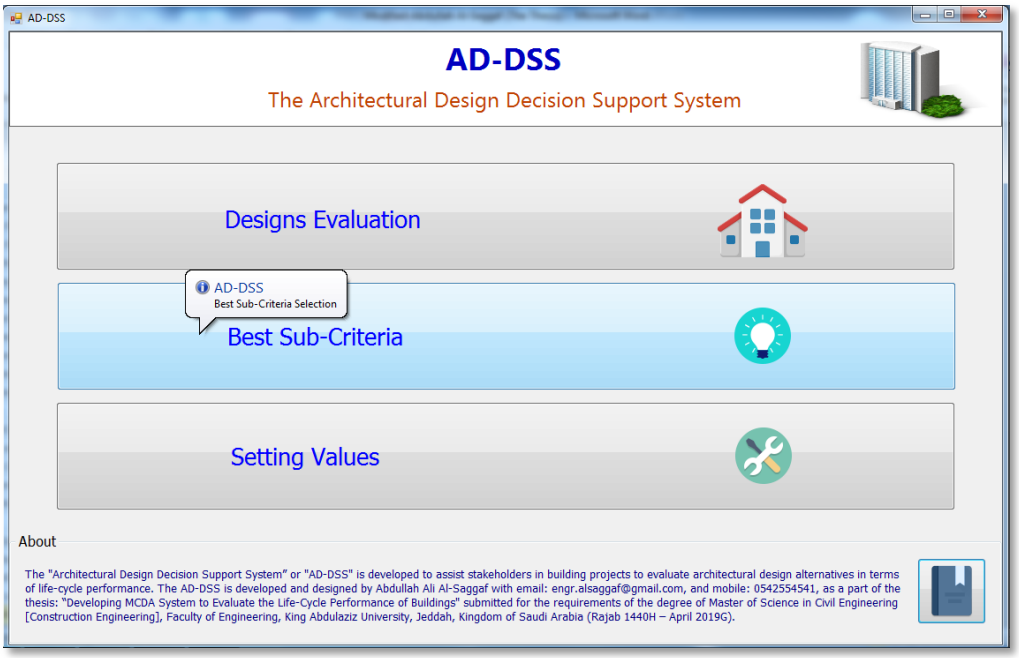

Figure 12: Best Sub-Criteria Selection Function

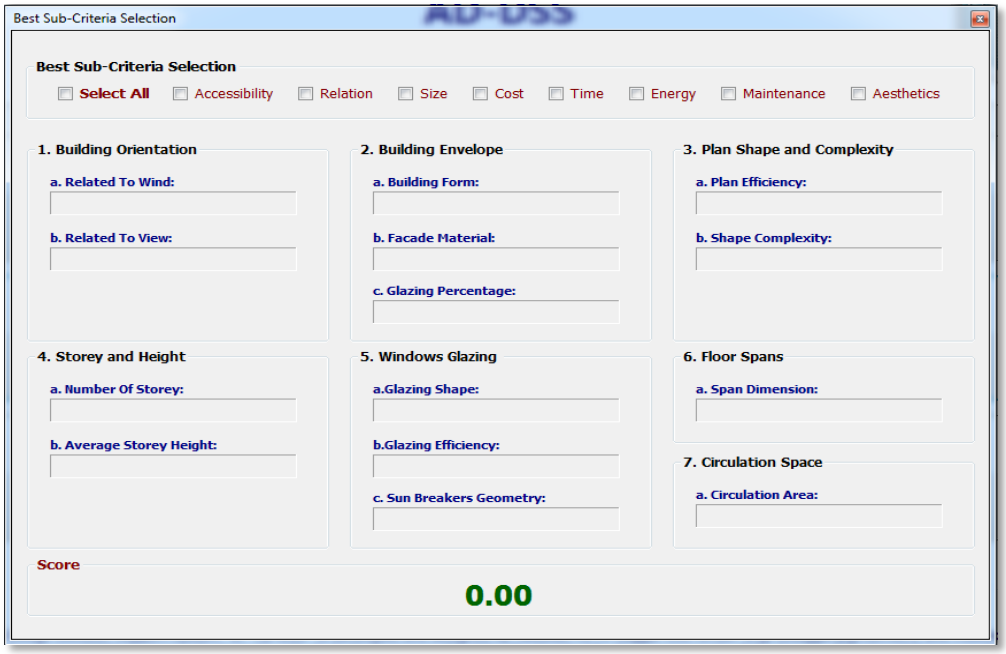

Figure 13: Best Sub-Criteria Selection Window

After that, the user can select from the top of this window one or more sub-criteria aspects by clicking on the box(s). For example, Figure 15 shows the optimum parameters if the owner objective is to obtain building with least cost and at the same time is consuming less energy

to operate, while Figure 14 shows the optimum design parameters when the user select all sub-criteria.

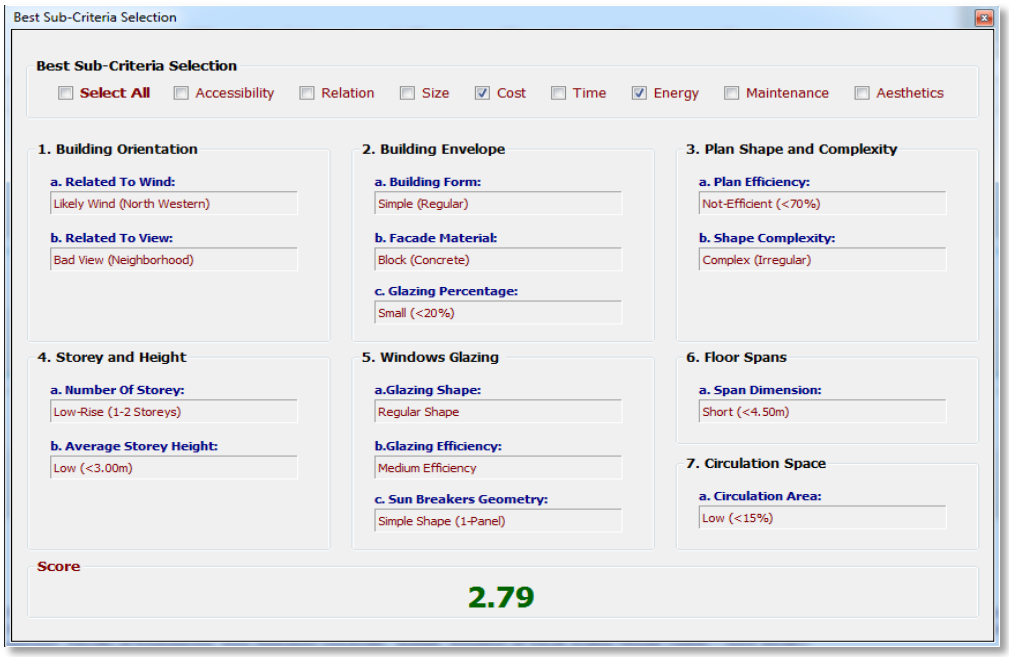

Figure 14: Optimum Design Parameters for Cost and Energy

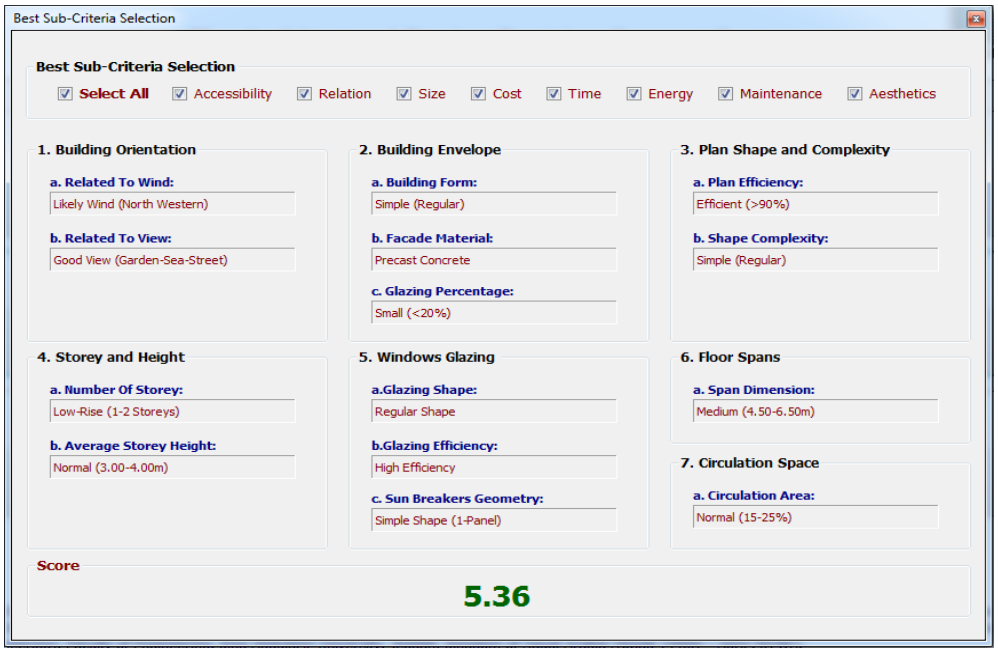

Figure 15: Optimum Design Parameters for Overall Sub-Criteria

3. Sitting Values:

The third function of the developed program is “Sitting Values” and contains only one window. The user can enter this window by press the button as show in Figure 16.

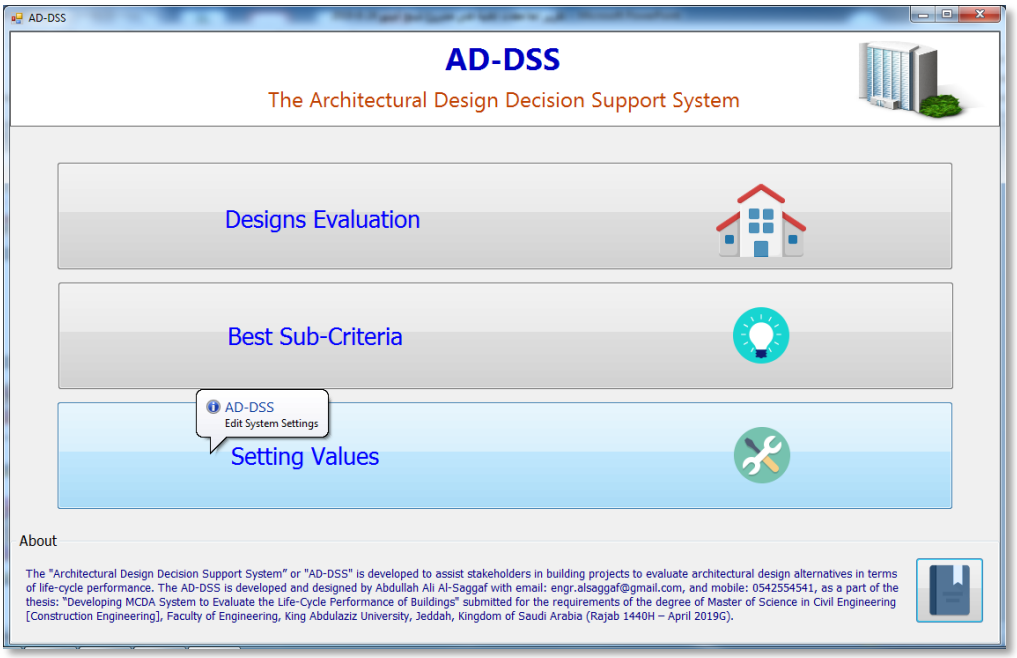

Figure 16: Setting Values Function

In this function, a total of positive and negative 320 assessments on the impact of each ADVs options on the design-quality sub-criteria were entered as the default values in this programs (40 design options x 8 sub-criteria). These values were assessed by the experts based on the hot climates characteristics and suitable for three types of building :(1) residential buildings (ex. apartment block, block of flats, duplex, townhouse, villa, and tower), (2) commercial buildings (ex. office, hotel, shopping mall, and restaurant), and (3) educational buildings (ex. college, school, library).

Figure 17 shows three main boxes of the ADVs, their sub-categories, and their design options. The user can easily select the ADV and then its sub-categories will appear. By selecting any category, its design options will appear as too as shown in Figure 17. Also, each

sub-category and design option discretion will be shown once the user makes the selection. As well, the 8 values of each design option can be edited by the user on each values box, and then the user can save these changes by pressing on the saving button. The user can reset the default data by pressing the green button of the reset. The new sum of these values will be automatically generated if any change has been made. This function makes this program fixable for other types of climates and buildings.

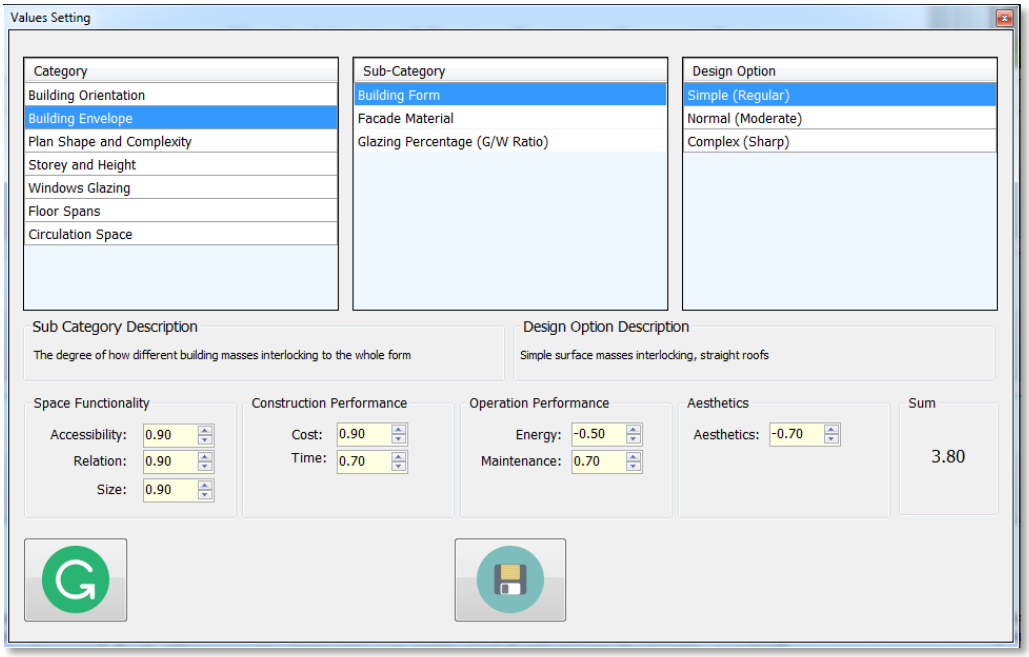

Figure 17: Assessment Values of the ADVs Options in Design Sub-Criteria