



**CDSID Standard Excel Spreadsheet
Documentation for Data Import and Export
(12/08/2016)**

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1 Input Documentation

To enter the input data into the FU-TIENO-CF3, the Excel spreadsheet used must have the FITradeoff default formatting, which is presented in Table 1. The spreadsheet must be filled up with the criteria, their corresponding classification, weights, type of function and parameters, the alternatives and the consequences matrix.

Table 1: FITradeoff default formatting for Excel spreadsheets.

Excel Cell	A	B	C	D	E
1	Criteria:	Criterion 1	Criterion 2	Criterion 3	Criterion 4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:				
3	Weights:				
4	Type:				
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				

1.1 Criteria

Row 1 must be filled up, from the column B, with the name of the problem's criteria. In Table 2 we show an example in which there are four criteria named 'C1', 'C2', 'C3' and 'C4'.

The number of columns will change according to the number of criteria considered in the problem. In Table 3 we added two criteria to our previous example: 'C5' and 'C6'. In Table 4 we removed 'C4' from the set of criteria, remaining 'C1', 'C2' and 'C3'.

Table 2: Filling the criteria (default).

Excel Cell	A	B	C	D	E
1	Criteria:	C1	C2	C3	C4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:				
3	Weights:				
4	Type:				
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				

Table 3: Filling the criteria (add criteria).

Excel Cell	A	B	C	D	E	F	G
1	Criteria:	C1	C2	C3	C4	C5	C6
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:						
3	Weights:						
4	Type:						
5	a:						
6	b:						
7	c:						
8	Alternatives:	Consequences Matrix:					
9	Alternative 1						
10	Alternative 2						
11	Alternative 3						
12	Alternative 4						

Table 4: Filling the criteria (remove criteria).

Excel Cell	A	B	C	D	E
1	Criteria:	C1	C2	C3	
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:				
3	Weights:				
4	Type:				
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				

1.2 Type of Criteria (Classification)

There are four types of criteria that can be assigned to the problem's criteria: Cont Min, Cont Max, Disc Min and Disc Max. Following we explain the meaning of each of them:

- Cont Min/ Disc Min – It means that the value function for the criterion in question is monotonically decreasing against the natural scale, i. e., the lower the value in the criterion, most preferred, and the higher, least preferred.
- Cont Max/ Disc Max – It means that the value function for the criterion in question is monotonically increasing against the natural scale, i. e., the higher the value in the criterion, most preferred, and the lower, least preferred.

The user must fill up row 2 according to the problematic and adopted model. For the Additive Model, which is used in FU-T1ENO-CF3, it should be informed if the criterion can assume a range of values (continuous criterion) or if the criterion can just take discrete values (discrete criterion):

- Continuous Criterion (Cont) – It means that we are dealing with a continuous criterion, i.e., any value within the range limited by the minimum and maximum values of performance in the criterion[MinV,MaxV] can be assumed.

- Discrete Criterion (Disc) – It means that we are dealing with a discrete criterion, and only values in a scale of points will be assumed. This scale is defined according to the user's input (row 7, parameter 'c') and is explained in section 1.4.1.

The combination of criteria features forms a pattern that should be used to fill the row 2: 0 (Cont Min), 1 (Cont Max), 2 (Disc Min) or 3 (Disc Max) (Tables 5).

Table5: Codes for criteria classification.

0	Cont Min
1	Cont Max
2	Disc Min
3	Disc Max

Table6 shows an example of criteria classification, in which each criterion has distinct features:

Table 6: Filling the type of criteria (classification of criteria).

Excel Cell	A	B	C	D	E
1	Criteria:	C1	C2	C3	C4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:	3	0	1	2
3	Weights:				
4	Type:				
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				

1.3 Weights

The input of criteria weights is not mandatory. For this version of the software row 3 of the Excel spreadsheet must not be filled up.

1.4 Types of Function and Parameters

Row 4 must be filled up with the type of function that each criterion will assume during the intra-criterion evaluation. The type of function is different depending on the utilized model. **This version of the software works only with linear value functions.** If you want to use the version with non-linear value functions, please contact FITradeoff support (contact@fitradeoff.org) asking for version FU-TXENO-CTx.

For this version of the software the type of function for each criteria must be linear. Table 7 shows the code and equation for the linear equation used in FU-T1ENO-CFx.

Table 7: Code and Equation for linear function.

Code	Function	Equation
1	Linear	$y = \frac{X - X_{min}}{X_{max} - X_{min}}$

As can be observed in Table 7, the linear function depends only on the minimum (X_{min}) and maximum (X_{max}) values assumed by the analyzed criterion. The resulting values of y will be in the $[0, 1]$ interval. Table 8 shows how row 4 must be filled up.

Parameters ‘a’ and ‘b’ (rows 5 and 6) must not be filled up in this version of the software, and the parameter ‘c’ (row 7) should be filled up in the Excel spreadsheet only if there are discrete criteria – see section 1.4.1).

Table 8: Filling the types of function.

Excel Cell	A	B	C	D	E
1	Criteria:	C1	C2	C3	C4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:	3	0	1	2
3	Weights:				
4	Type:	1	1	1	1
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				

1.4.1 Filling Row 7 for Discrete Criteria

When the model has discrete criteria it is necessary to inform the number of scale levels to be considered. This information must be filled in row 7 (parameter 'c') and must contain numbers between 2 and 7 (see Tables 9 e 10).

Table 9: Number of levels and levels of scale for discrete criteria.

Number of Levels	Levels of Scale (Discretization)
2	Min, Max
3	Min, 50%, Max
4	Min, 33.33%, 66.66%, Max
5	Min, 25%, 50%, 75%, Max
6	Min, 20%, 40%, 60%, 80%, Max
7	Min, 16.67%, 33.33%, 50%, 66.67%, 83.33%, Max

Table 10: Filling the number of levels of scale for discrete criteria.

Excel Cell	A	B	C	D	E
1	Criteria:	C1	C2	C3	C4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:	3	2	3	2
3	Weights:				
4	Type:	1	1	1	1
5	a:				
6	b:				
7	c:	3	2	2	5
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				

1.5 Alternatives

1.5.1 Column A: Alternatives

From the row 9, the column A of the Excel spreadsheet represents the name of the problem's alternatives. Table 11 shows the spreadsheet with four alternatives: 'Alternative 1', 'Alternative 2', 'Alternative 3' and 'Alternative 4'.

The number of rows will change according to the number of alternatives considered in the problem. In Table 12 we added six alternatives to our previous example, and in Table 13 we removed 'Alternative 4' from the set of alternatives, remaining 'Alternative 1', 'Alternative 2' and 'Alternative 3'.

Table 11: Filling the alternatives (default).

Excel Cell	A	B	C	D	E
1	Criteria:	Criterion 1	Criterion 2	Criterion 3	Criterion 4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:				
3	Weights:				
4	Type:				
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				

Table 12: Filling the alternatives (add alternatives).

Excel Cell	A	B	C	D	E
1	Criteria:	Criterion 1	Criterion 2	Criterion 3	Criterion 4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:				
3	Weights:				
4	Type:				
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				
13	Alternative 5				
14	Alternative 6				
15	Alternative 7				
16	Alternative 8				
17	Alternative 9				
18	Alternative 10				

Table 13: Filling the alternatives (remove alternatives).

Excel Cell	A	B	C	D	E
1	Criteria:	Criterion 1	Criterion 2	Criterion 3	Criterion 4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:				
3	Weights:				
4	Type:				
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12					

1.5.2 Consequences Matrix

The user must also fill the Consequences Matrix at the Excel spreadsheet. The values should be inserted into the space shown in Table 14.

Table 14: Filling the consequences matrix.

Excel Cell	A	B	C	D	E
1	Criteria:	Criterion 1	Criterion 2	Criterion 3	Criterion 4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:				
3	Weights:				
4	Type:				
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1				
10	Alternative 2				
11	Alternative 3				
12	Alternative 4				

Table 15 shows an example with values for the consequences matrix. Each cell in the consequences matrix represents the performance of an alternative in a criterion. For example, cell C10 represents performance of Alternative 2 in the criterion C2.

Table 15: Consequences matrix.

Excel Cell	A	B	C	D	E
1	Criteria:	C1	C2	C3	C4
2	0-Cont Min; 1-Cont Max; 2-Disc Min; 3-Disc Max:	3	0	1	2
3	Weights:				
4	Type:	1	1	1	1
5	a:				
6	b:				
7	c:				
8	Alternatives:	Consequences Matrix:			
9	Alternative 1	2	150	800	3
10	Alternative 2	3	200	750	4
11	Alternative 3	5	100	600	1
12	Alternative 4	1	175	675	2

2 Output Documentation

The Excel exporting document (Output) must contain at least two worksheets (tabs): Input and Output. Generally the Input tab should contain the same information as the data import spreadsheet (Table 1), as described in Section 1 of this documentation.

The Output tab must contain direct information, such as the alternative(s) of the solution and its range of weights that a specific solution is selected (Table 16).

Table 16: Output Excel spreadsheet.

Excel Cell	A	B	C	D	E	F	G
1		k _{C1}	k _{C2}	k _{C3}	k _{C4}	k _{C5}	Maximum Value
2	Alternative						
3							
4		k _{C1}	k _{C2}	k _{C3}	k _{C4}	k _{C5}	
5	Maximum Limit						
6	Minimum Limit						
7							
8							