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IMPROVEMENT OF TIME ANALYSIS QUALITY IN NETWORK DIAGRAMS BY IMPLEMENTATION OF SOFTWARE SUPPORT

Abstract: *This paper presents a software solution for improving analysis of time in network diagrams. Introduction of modified method for the analysis of time in network diagrams imposed the need of creating application solution for its support. As a result, presented application solution is now a unique computer support for this method. Practical application of the discussed software allows gaining high quality of time analysis in network diagrams.*
Keywords: *Application Software, Network Diagrams, Time Analysis*

1. INTRODUCTION

Contemporary architecture of software solutions is characterized by their possibility of upgrades by the users themselves. This allows maximum utilization of the entire functionality of existing software packages. In additionis achieved their significant personalization.

Visual Basic for Applications (VBA) [1-3] is a universal programming language designed to upgrade a large number of software packages, primarily widely applied MS Office. A significant tool that is characterized by the functionality is MS Project [4-6], focusing primarily on project management. Software support to project management is of great importance. In this sense Orłowski i Ziółkowski (2010) stand out [7]: "The natural development of information technology area stimulates intense growth of various technologies which support basic organization processes".

This paper describes a software solution which is an upgrade of MS Project software tool in improving the analysis of time in network diagrams [8-10]. The software is based on improving the functionality of MS Office that enables implementation of software modules created in VBA programming language.

2. IMPLEMENTATION OF PROGRAMMING SOLUTION

This paper describes a software solution for improving time analysis in network diagrams. Software support is based on a modified PERT method. This paper presents a methodology for modified solution for the analysis of time in the form of key segments of code.

Software support is an upgrade of application software MS Project in terms of establishing the necessary macros, for the calculation of the parameters that are new to this approach, for the analysis of time.

By application of PERT analysis is done the calculation of the expected duration of the activity. The calculation is based on the mean of the optimistic time, the time under normal conditions and a pessimistic time. The usual approach in

this case is applied four times the value of time under normal circumstances. Figure 1 shows the weight range for the PERT calculation, which allows MS Project. Further calculations allows obtaining the variance, ie. indicators of uncertainty, by which is estimated input data. Figure 2 shows a table of MS Project for detailed classic PERT parameters for the analysis of:

- Name of the activity
- An optimistic time
- Time under normal circumstances
- Pessimistic time
- Calculated value of the expected duration of the activity

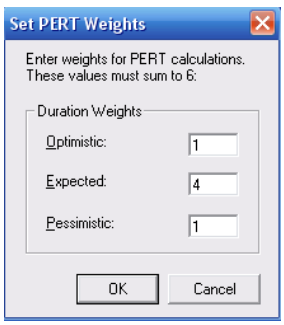

Figure 1. Selection of weight for PERT calculation

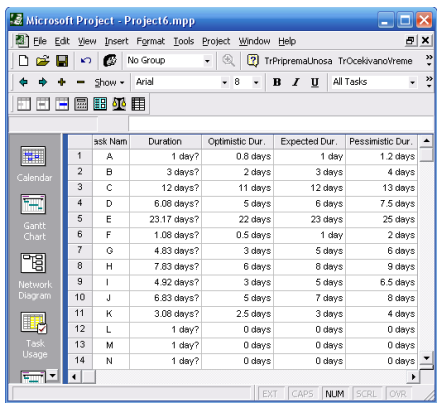

Figure 2. Classic parameters of PERT analysis

A modified method of time analysis in network diagrams is based on a number of parameters of time estimation (x_i). Also, to each each parameter of time estimation is added the associated variance $p(x_i)$. As a result, it is necessary to create a customized specialized form of MS Project for entering these parameters, Figure 3. The same tabular view provides insight into the calculated values. In the Figure 4 are shown values:

- Expected time of execution of activities
- The associated dispersion of individual activities
- The start and end activity time
- The last activity

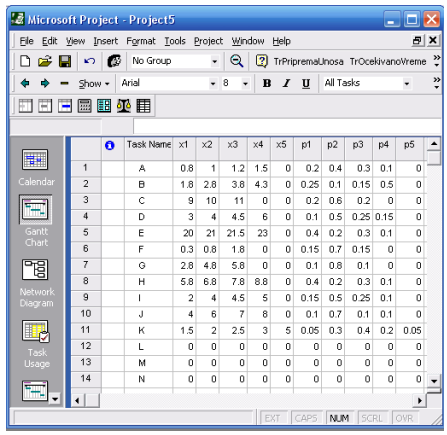

Figure 3. Form for entering the initial parameters of the modified PERT methods

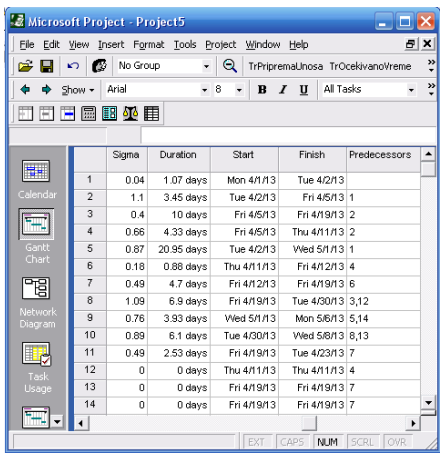

Figure 4. Calculated values

The following program listing shows the basic elements of programming code for the creation of specialized forms for entering the initial parameters of the modified PERT method.

The formation of columns for parameter entry of time estimation:

```
SelectTaskField Row:=1,
Column:="Indicators",
RowRelative:=False
SelectTaskColumn
Column:="Duration"
TableEdit Name:="&Entry",
TaskTable:=True, NewName:="",
FieldName:="",
NewFieldName:="Number1", Title:="x1",
Width:=10, Align:=2,
ShowInMenu:=True,
LockFirstColumn:=True,
DateFormat:=255, RowHeight:=1,
ColumnPosition:=2, AlignTitle:=1
TableApply Name:="&Entry"
...
```

The formation of columns for entering associated variance:

```
SelectTaskColumn
Column:="Duration"
TableEdit Name:="&Entry",
TaskTable:=True, NewName:="",
FieldName:="",
NewFieldName:="Number6", Title:="p1",
Width:=10, Align:=2,
ShowInMenu:=True,
LockFirstColumn:=True,
DateFormat:=255, RowHeight:=1,
ColumnPosition:=7, AlignTitle:=1
TableApply Name:="&Entry"
...
```

The formation of columns for detailed calculated values:

```
SelectTaskColumn
Column:="Duration"
TableEdit Name:="&Entry",
TaskTable:=True, NewName:="",
FieldName:="",
NewFieldName:="Number11",
Title:="Sigma", Width:=10, Align:=2,
ShowInMenu:=True,
LockFirstColumn:=True,
DateFormat:=255, RowHeight:=1,
ColumnPosition:=12, AlignTitle:=1
TableApply Name:="&Entry"
...
```

Figure 5 illustrates the segment of integration of the displayed programming code with MS Project software tool. Program module is formed as a function of the VBA language.

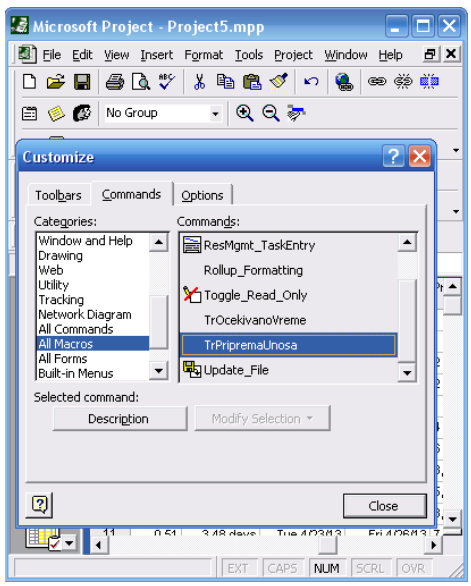

Figure 5. Integration of programming code with MS Project

The following program listing shows the basic elements of the programming code for the calculation of the final values:

```
Sub TrOcekivanoVreme()
Dim x1, x2, x3, x4, x5, p1, p2, p3, p4,
p5, Racun, Sigma As Double
Dim Red As Integer
Dim Naziv As String
Red = 0
SelectTaskField Row:=Red,
```

```
Column:="Name"
Naziv = ActiveCell.Text
  SelectTaskField Row:=Red,
Column:="Name"
   SelectTaskField Row:=Red,
Column:="Number1"
   x1 = ActiveCell.Text
   SelectTaskField Row:=Red,
Column:="Number2"
   x2 = ActiveCell.Text
...
   Racun = x1 * p1 + x2 * p2 + x3 * p3
+ x4 * p4 + x5 * p5
   Sigma = x1 ^ 2 * p1 + x2 ^ 2 * p2 +
x3 ^ 2 * p3 + x4 ^ 2 * p4 + x5 ^ 2 * p5 -
Racun ^ 2

   SelectTaskField Row:=0,
Column:="Duration"
   SetTaskField Field:="Duration",
Value:=Racun

   SelectTaskField Row:=0,
Column:="Number11"
    SetTaskField Field:="Number11",
Value:=Sigma
```

A significant feature of the integration of the formed software solution with existing application software MS Project relates to the use of all existing functionality. This allows further analysis of the considered initial and calculated values. Figure 6 shows a graphical display of the segment of the network diagram.

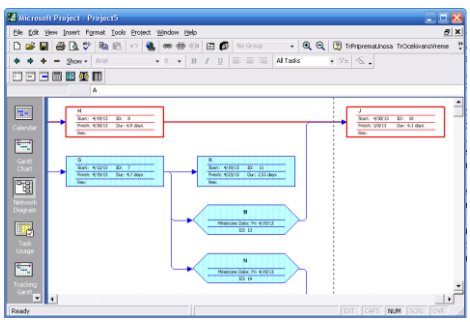

Figure 6. A Segment of the network diagram

Another significant functionality of integration with existing application software MS Project is reflected in communicating with other general-purpose applications. This allows further analysis of the data by the end users and other software tools. Figure 7 shows the dialogue of exporting the resulting data discussed in this paper in MS Excel file format. By adding the selected columns is enabled exporting results specific to the discussed software solution.

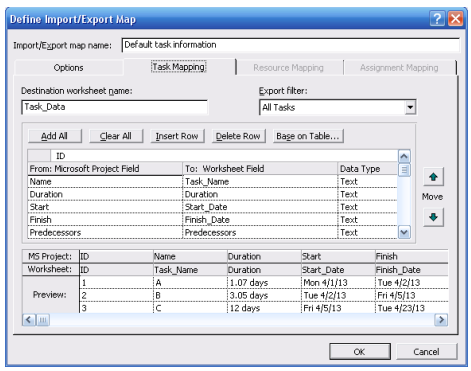

Figure 7. Exporting of the resulting data

3. CONCLUSION

Possibility of upgrading existing software solutions by integration of specialized software modules is an important concept of modern information technology. This allows:

- The use of all functionality of the developed software solutions, without the need for forming entirely new applications
- Development of programs only in key elements, which is an upgrade of existing software solution
- The implementation of a unified programming language (VBA) in software applications, particularly MS Office
- The possibility of simple integration with other software tools, as an

expression of functionality of the use of existing software packages.

Displayed software solution in this paper is based on these concepts. The basic elements of the code, that are illustrated in this paper, provide a universal applicability for upgrading MS Project tool in this regard. This paper presents only the key segments of the programming code, whose logical extension allows the overall design of programming code for this purpose.

It is undisputed that considered software support, for improvement of the analysis of time in network diagrams, has a significant role in improving the quality of project management.

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