Faculty of Organizational Sciences

Software Quality & Testing Laboratory

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Systems analysis

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Statement
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As a participant in the course Computer Science and Informatics, I will follow (a) general ethical and professional norms:

- contribute to the well-being of society and humanity;
- avoided harming others;
- I will be honest, trustworthy and take action against discrimination;
- respect intellectual property rights including copyrights and licenses;
- respect intellectual property rights even when they are not specifically protected;
- respect the privacy of others;
- consistently implement the principle of confidentiality, except where the law obliges me to disclose;
- strive for the highest quality, efficiency and dignity both in the manufacturing process and in my products;
- to the best of my ability to acquire and maintain professional competence;
- to respect contracts, agreements and assigned responsibilities - to use information and communication technology only when I am authorized to use;
- considered the violation of the above norms as unacceptable and incompatible with the status of a participant in the subject Computer Science and Informatics.

Contents

1 The Analytic Hierarchy Process

You are in the role of team leader, who has to select one new project associate for IS development. Your team already has several employees, and you, as the team leader, must include another employee in the project budget. The agreed selection criteria are shown in the figure below. You choose from four candidates - A, B, C, D and E. Replace symbolic names with the names of your classmates. Write a selection report that includes:

- the selection goal (already defined - the most suitable collaborator)
- define the criteria and their hierarchy (they are defined in the picture above)
- define the alternatives (replace A, B, C, D and E with proper names)
- create and show in the report matrices of relationships between criteria or. alternatives

Use the relationship representation with the matrix, where the estimates are your own preference:

- the matrix of relationships between the main criteria (dimension 3 x3)
- the matrix of relationships between the subordinate criteria (dimensions of the matrices are: twice 3x3, once and 2x2)
- the matrix of relationships between alternatives elementary properties (8 matrices with dimensions 5x5)
- calculate eigenvaules and eigenvectors of given matrix
- Use eigenvectors that are real and whose elements are all equally predicted (either only positive or only negative) to calculate the normalized eigenvector.

Show in the report: original eigenvectors, normalized eigenvectors, eigenvalues and mark the maximum eigenvalue separately. Calculate the inconsistency index for each matrix. If greater than 0.1, correct the estimates in this matrix so that the correction is consistent with preferences and the inconsistency index is within tolerance limits. Calculate and display the benefit functions for alternatives A, B, C, D and E. Explicitly write who is the most appropriate collaborator. The report should cover the exact course of all steps 1 to 8). Data for all matrices must be displayed as text (not graphic elements). If you have used additional literature, add it to the list of used literature.

Solution:

Description of the entire procedure with all matrices, partial results and the final result - which collaborator you have selected in the project group Using the AHP method, through the following steps I determined the most suitable worker among the five candidates. Namely, the first procedure was to make a hierarchy between the main criteria, and this is done as follows:

```
 a  =

   1.          2.    3.
   0.5         1.    2.
   0.3333333   0.5   1.

--> [vector,value] = spec(a)
```

```
 value  =

   3.0092027   0.                       0.
   0.         -0.0046014 + 0.166348i    0.
   0.          0.                      -0.0046014 - 0.166348i

 vector  =

   0.8467969  -0.8467969                -0.8467969
   0.4660103   0.2330052 - 0.4035768i    0.2330052 + 0.4035768i
   0.2564554   0.1282277 + 0.2220969i    0.1282277 - 0.2220969i


--> nlv=vector(1:3, 1:1)/ sum(vector(1:3, 1:1))
 nlv  =

   0.5396146
   0.2969613
   0.1634241
```

Using matrices and his own evaluation of the criteria, I determined and calculated the values for individual criteria:

- Ability = 0.5396146
- Motivation = 0.2969613
- Opportunities = 0.1634241

Next, I'll make three 5x5 matrices, where I assessed the individual criteria for each candidate, and came up with the following results:

Ability

```
--> A = [1 1 3 2 3; 1 1 3 3 2; 1/3 1/3 1 4 3; 1/2 1/3 1/4 1 2; 1/3 1/2 1/3 1/2 1]
 A  =

   1.          1.          3.          2.    3.
   1.          1.          3.          3.    2.
   0.3333333   0.3333333   1.          4.    3.
   0.5         0.3333333   0.25        1.    2.
   0.3333333   0.5         0.3333333   0.5   1.
```

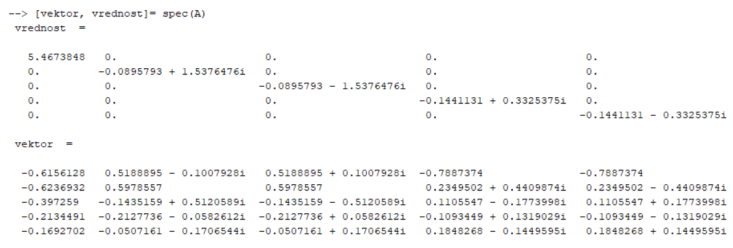

Figure 1: Vector caluclation results

```
--> nlv=vektor(1:5, 1:1)/ sum(vektor(1:5, 1:1))
 nlv  =

   0.3048668
   0.3088684
   0.1967326
   0.1057053
   0.0838268
```

Motivation

```
--> A = [1 3 4 1 2; 1/3 1 5 3 3; 1/4 1/5 1 1 1/4; 1/4 1/3 1 1 2; 1/2 1/3 4 1/2 1]
 A  =

   1.          3.          4.   1.    2.
   0.3333333   1.          5.   3.    3.
   0.25        0.2         1.   1.    0.25
   0.25        0.3333333   1.   1.    2.
   0.5         0.3333333   4.   0.5   1.
```

```
> --> [vektor, vrednost] = spec(A)
>  vrednost  =
>
>    5.3631601   0.                      0.                      0.                      0.
>    0.          0.0642798 + 1.1084874i  0.                      0.                      0.
>    0.          0.                      0.0642798 - 1.1084874i  0.                      0.
>    0.          0.                      0.                     -0.2458599 + 1.2114363i  0.
>    0.          0.                      0.                      0.                     -0.2458599 - 1.2114363i
>
>  vektor  =
>
>    0.7114128   0.8317606               0.8317606               0.5704466               0.5704466
>    0.5779802  -0.2138809 + 0.3704864i  -0.2138809 - 0.3704864i  -0.1610966 + 0.0917048i  -0.1610966 - 0.0917048i
>    0.1398726  -0.0531926 + 0.0641442i  -0.0531926 - 0.0641442i  -0.2689362 + 0.1115774i  -0.2689362 - 0.1115774i
>    0.246303   -0.2240096 - 0.1569448i  -0.2240096 + 0.1569448i  -0.0189104 - 0.5478334i  -0.0189104 + 0.5478334i
>    0.2821369   0.1500639 - 0.1445475i   0.1500639 + 0.1445475i   0.4336242 + 0.2587346i   0.4336242 - 0.2587346i
>
>
```

Figure 2: Vector caluclation results

```
--> nlv=vektor(1:5, 1:1)/ sum(vektor(1:5, 1:1))
 nlv  =

   0.3633911
   0.2952335
   0.0714472
   0.1258121
   0.1441161
```

Opportunities

```
a = [1 4 5 4 2; 1/4 1 5 4 1; 1/5 1/5 1 2 2; 1/4 1/4 1/2 1 2; 1/2 1 1/2 1/2 1]
 a  =

   1.     4.     5.    4.    2.
   0.25   1.     5.    4.    1.
   0.2    0.2    1.    2.    2.
   0.25   0.25   0.5   1.    2.
   0.5    1.     0.5   0.5   1.
```

```
> --> [vektor, vrednost]= spec(a)
>  vrednost  =
>
>    5.8730091   0.                      0.                      0.                      0.
>    0.         -0.1169109 + 2.2031516i   0.                      0.                      0.
>    0.          0.                     -0.1169109 - 2.2031516i   0.                      0.
>    0.          0.                      0.                     -0.3195936 + 0.0897181i   0.
>    0.          0.                      0.                      0.                     -0.3195936 - 0.0897181i
>
>  vektor  =
>
>    0.8212368   0.7443622               0.7443622              -0.9138416               -0.9138416
>    0.4497587   0.1413047 + 0.5353869i   0.1413047 - 0.5353869i   0.3119475 - 0.0655222i   0.3119475 + 0.0655222i
>    0.2132262  -0.1973716 + 0.0550747i  -0.1973716 - 0.0550747i   0.0041513 + 0.1204875i   0.0041513 - 0.1204875i
>    0.175937   -0.1658612 - 0.0867774i  -0.1658612 + 0.0867774i  -0.083369 - 0.1384096i   -0.083369 + 0.1384096i
>    0.2164902   0.1268488 - 0.2149413i   0.1268488 + 0.2149413i   0.1354144 + 0.0656508i   0.1354144 - 0.0656508i
>
>
```

Figure 3: Vector caluclation results

```
--> nlv=vektor(1:5, 1:1)/ sum(vektor(1:5, 1:1))
 nlv  =

   0.4376081
   0.2396606
   0.1136207
   0.0937506
   0.11536
```

I obtained each result exclusively using the AHP method and SciLab software, and calculated the normalized vectors which we gave within the formula for the final values and ranking:

```
A = (0.54 * 0.30) + (0.30 * 0.36) + (0.16 * 0.43)
A = 0.3388
B = (0.54 * 0.30) + (0.30 * 0.29) + (0.16 * 0.24)
B = 0.2874
C = (0.54 * 0.20) + (0.30 * 0.07) + (0.16 * 0.11)
C = 0.1466
D = (0.54 * 0.10) + (0.30 * 0.12) + (0.16 * 0.10)
D = 0.106
E = (0.54 * 0.08) + (0.30 * 0.14) + (0.16 * 0.11)
E = 0.102
```

It is clear that based on the criteria and assumed abilities, candidate A is the most suitable with a value of 0.3388.

2 Modeling of processes, data and user interfaces

2.1 Process modeling - data flow diagrams

The task is to draw a data flow diagram for the vendor quote editing process. All processes refer to the submitted description of a specific company. Your task is to place the detailed diagrams in the appropriate area (sales, purchasing, administrative processes) and structure the processes as deeply as necessary to get to "your" process. Use the Oracle SQL Developer Datamodeler software. The building blocks of a data flow diagram are described in lecture notes.

2.2 Data modeling

Create a logical and relational data model. Document them in this report. The data model (logical and relational) must be stored in the same project as the process models.

2.3 GUI Modeling

Write a script to create sequences and triggers for all tables that have numeric, integer primary keys. Sequence names should start with the letter S and trigger names T. Use the tool as a text editor or edit directly in Apex. Create user interfaces for the tables that are associated with your detailed process diagrams. Make at least: three simple forms (forms) to add / change / delete for different tables of your data model, one composite form (master-detail, eg invoice header and details).

Solution

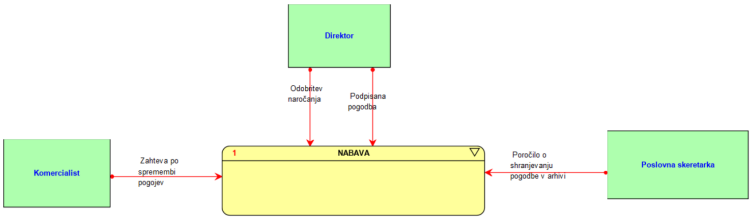

Figure 4: System Diagrams

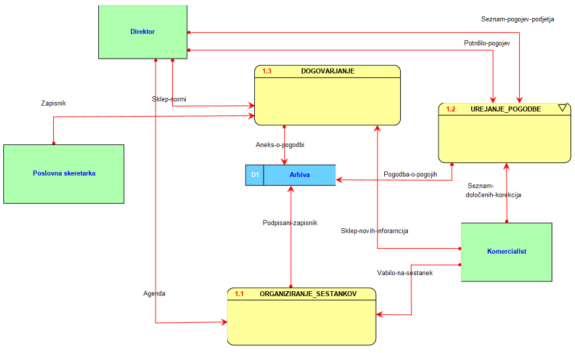

Figure 5: System context diagram

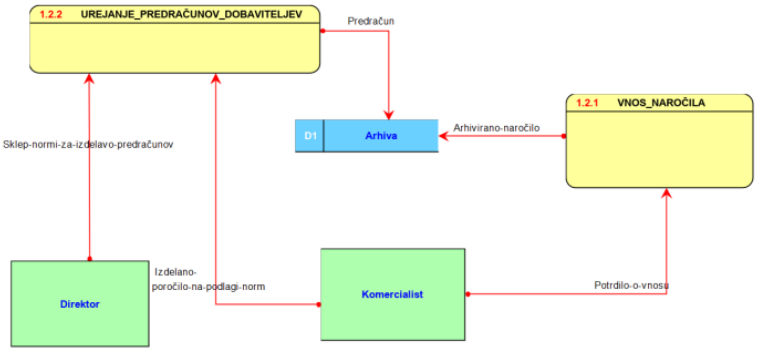

Figure 6: Detailed diagram

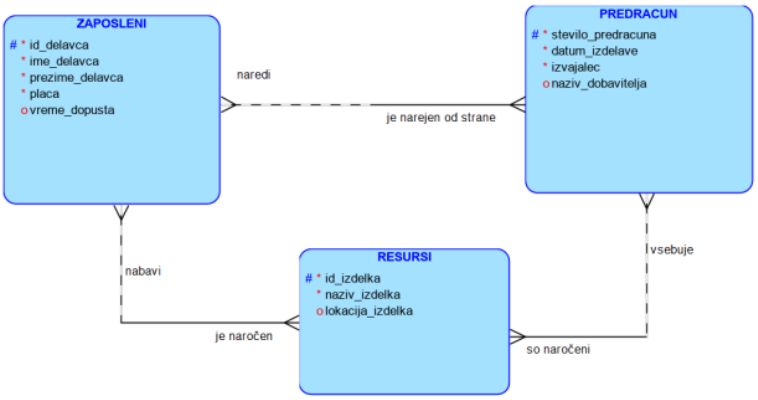

Figure 7: Entity relationship diagram

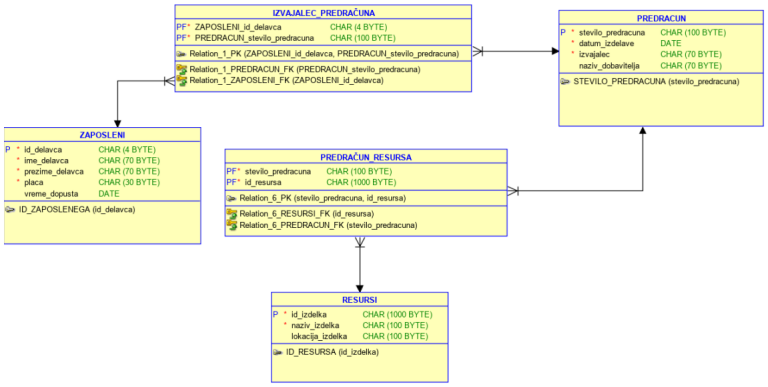

Figure 8: Relationship model

SQL script for developing the supply application database system

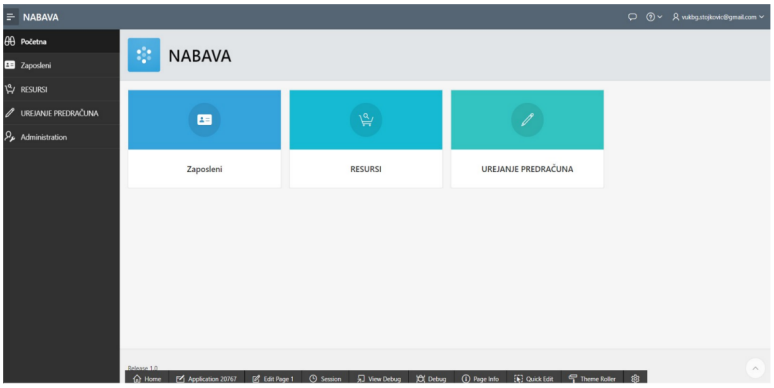

Figure 10: Supply app landing page

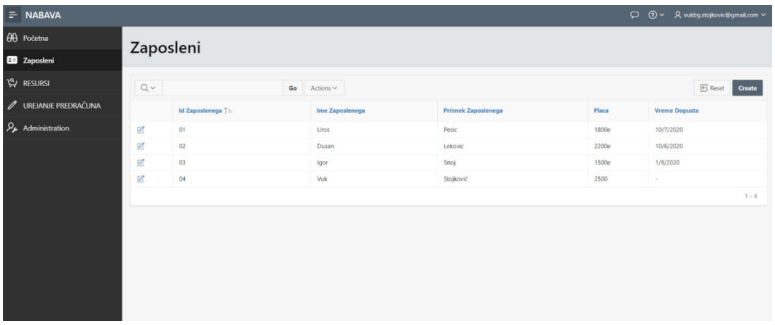

Figure 11: Employers

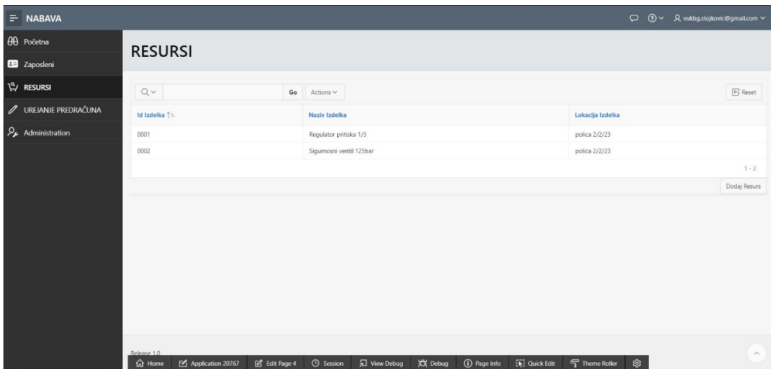

Figure 12: Resources

PL/SQL script for developing supply application