Statistical data processing with R - metadata driven approach

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Statistical data processing at SURS

▶ Rationalization of statistical processes

▶ The need for transition:
  ▶ from custom made solutions for surveys (stove-pipe approach) to generalized process solutions
  ▶ from domain oriented to process oriented solutions

▶ Main goals of the project:
  ▶ repetability of the data production process
  ▶ transparency of the data production process
General solutions - main characteristics

Modernization and standardization of the system of statistical production at SURS is based on the development of small generic solutions - building blocks.

All the parameters for the particular survey and the particular reference period is located in special database, called metadata database.
Schematic presentation of the building block
Metadata driven principle for data validation with R

Short illustrative example on the data from Monthly Statistical Survey on Earnings Paid by Legal Persons.

- Ad-hoc program
- Metadata
- General program
- Results of data validation
Ad-hoc program

- Input work table with microdata about earnings paid out by around 50,000 legal persons of the public and private sector

- Key variables:
  - BRUTO_PLACA - gross earnings paid out for the reference month
  - NETO_PLACA - net earnings paid out for the reference month

- We save our microdata table into temporary table data.
In our case the metadata table is constructed in Excel, but in general it can be located in any other database, which can be connected to R, for example MS Access or ORACLE.

Structure of metadata table for data validation:

- **LC_LABEL** - Label of the logical check. It has to begin with LK.
- **ERROR_DESCRIPTION** - Description of the error.
- **CONDITION** - Condition which determines our check.
- **ERROR_TYPE** - Type of an error e.g. error, warning or other options.
- **VALIDITY** - Validity for the specific check. If the value is zero, the check will not be executed.
### Metadata - 2

<table>
<thead>
<tr>
<th>TABLE</th>
<th>LC_LABEL</th>
<th>ERROR_DESCRIPTION</th>
<th>CONDITION</th>
<th>ERROR_TYPE</th>
<th>VALIDITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA</td>
<td>LK002</td>
<td>Error, if the net wage is greater than gross wage.</td>
<td>BRUTO_PLACA&lt;NETO_PLACA</td>
<td>ERROR</td>
<td>1</td>
</tr>
</tbody>
</table>

```r
checks <- read.xlsx("Metadata.xlsx", sheet = 1, startRow = 1, colNames = TRUE, skipEmptyRows = TRUE, rowNames = FALSE)
> checks
```

<table>
<thead>
<tr>
<th>TABLE</th>
<th>LC_LABEL</th>
<th>ERROR_DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>LK002</td>
<td>Error, if the net wage is greater than gross wage.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>ERROR_TYPE</th>
<th>VALIDITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRUTO_PLACA&lt;NETO_PLACA</td>
<td>ERROR</td>
<td>1</td>
</tr>
</tbody>
</table>
First, we create new variable R_st, where the programming code for logical checks is defined.

\[
R_{st} \leftarrow \text{paste}(\text{checks$TABLE, ",", checks$LC_LABEL, ",", \text{ifelse("}, \\
\text{checks$CONDITION, ",", 1, 0)"}, \text{sep = ""})}
\]

\[
> R_{st}
[2] "data$LK002 \leftarrow \text{ifelse(BRUTO\_PLACA<NETO\_PLACA, 1, 0)"
\]
General program - 2

- Attach the variables in the workspace

```r
attach(data)

- Execute the code, defined in R_st

```r
for (i in 1:length(R_st)){
  eval(parse(text=R_st[i]))
}
```
Results

- Output by ID

<table>
<thead>
<tr>
<th>MAT_ST</th>
<th>LK002</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

- Summarised table

```
nr_down  ERROR_DESCRIPTION
LK002   0      Error, if the net wage is greater than gross wage.
```
Conclusions

- Advantages and disadvantages of using R
- The importance of the data validation
- Opportunities of using R in the future
Thank you for your attention!