Business process optimization – experiences of students’ independent process examination in Institute of informatics, Maribor

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UNIVERSITY OF MARIBOR
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Agenda

• FACULTY/UNIVERSITY SURVEY RESULTS
• ASSISTANT SURVEY RESULTS
• SUBJECT’S SURVEY RESULTS
• STUDENTS SUCCESS/ATTITUDE RESULTS
• CONCLUSION AND FUTURE PLANS
General success of students at Institute of Informatics (FERI)

<table>
<thead>
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<td>4</td>
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[Student Affairs Office]

Students surveys

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2016/2017 – results not representable due to technical issues
2017/2018 – final results not yet available
Students surveys – personal evaluation

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Surveys are accompanied by student’s comments:
- The assistant talks to fast
- The feedback is too slow
- The labs are not according to lectures
- Not enough literature is provided
- Too much focus on the tool
- Too simple „hello world type“ examples
- ....

Students surveys – subjects evaluation

<table>
<thead>
<tr>
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The subject’s dynamics

Main subjects evaluation

Dynamics through the years

Students surveys – subjects evaluation

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Students survey: Business process optimization

Motivated to evaluate, what CAN GO wrong!

CHANGE #1
Introduction of real-life motivation for optimization

- Managing increasing complexity of business processes
- Reacting to strategic change due to digital transformation / data law regulations
- Trying to be up to date by continuous measurement and improvement
- Taking all possible steps (methods) to improve/simplify processes
CHANGE #2
Challenging the use of existing approaches

• Using modeling techniques (BPMN, UML, BPEL, XSD)
• Focusing on implementation of the modeled process (IBM WebSphere)
• Focusing on the tool rather than the process
• Computerization/automation above the process examination/understanding

• Introduction of a holistic „content oriented“ approach with several possible methods
• The students had more freedom when choosing their projects.

CHANGE #3
Introduced methods/approaches

• Modeling
• Detailed analysis based on Activity Analysis Worksheet
• Key Performance Indicators definition
• The Lean Six Sigma approach
• The Root Cause Analysis
• The AS-IS / TO-BE concept
• Revision
• Simulation
• Linear programming for maximum profit/minimal cost calculation based on defined KPI’s
• Sensitivity analysis
• ...

To be able to analyze process characteristics properly, we have to document them, model them, if possible simulate them and evaluate possible alternative scenarios.
Leaded exercises (with three focused quizzes)

- Finding the process (smart home, smart city, production processes, business processes....)
- Description of the activity characteristics, indicators of success
- Modeling
- Process simulations
- Definition of risks, burdens, imbalances
- Root cause analysis (Fish bone diagram)
- TO-BE process construction
- Revision by fellow students
- Analysis/presentation of results

DATA GATHERING
IMITATION OF REALITY
DESCRIPTIVE ANALYSIS
ADJUSTMENTS MARKETING
SEVERAL FOCUS AREAS

Definition of Key Performance Indicators

- Metric system in measuring process quality
  - based on the identified risks and possible/expected problems
  - defined to help measure the success or effectiveness of the process
- Usually numerical values such as time, cost, profit, number of complaints, number of rejections.
The Lean Six Sigma approach

• Improving the process through combination of Lean management and Six Sigma
  – a set of principles that aim to improve efficiency based on improvement strategy from manufacturing and other industry
  – systematically removing waste and reducing variation

• It includes:
  – wastes identification
  – Identification of loads, imbalances and potential bottlenecks
  – Identification of non-added value activities

Wastes - activities without any added value

(1) Defects - products or services that do not meet the specifications
(2) Overproduction - overproduction over the possibility of selling
(3) Waiting - for the previous activity to end
(4) Non-utilised talent - employees who are not involved in the process effectively
(5) Transportation - transfer of items or information that are not necessary for execution
(6) Inventory - sources or information that are not used in the process
(7) Motion - unnecessary movement of people, information or equipment due to inadequate position or storage
(8) Extra processing - performing activities that are not necessary for the performance of the required product or service.
The Root Cause Analysis

• A method of problem solving used for identifying the root causes of defects or problems in a process

• The problem is often based on past identified risks or simulation results. The analysis is conducted by using the following steps:
  – Identification of (potential) problems
  – Creation of a causal diagram (Ishikawa or a bone diagram)
  – A 5-why approach is used to find the cause

Simulation

• Imitation of the real process, supported by a tool (Signavio)
  – of the original process (AS IS in present state)
  – of the renewed process (TO BE after optimization)

• Provides data:
  – To compare whether the changes will provide positive influence:
  – To identify weaknesses, wastes, bottlenecks and possible options for improvement.
A STUDENT’s PROJECT EXAMPLE

• OBJECTIVE: analyze and optimize process of student’s choice

• The smart city domain was largely analyzed

• A (simplified) process of blood donation from the health domain

List of activities

• Sending an invitation to the blood donors
• Treatment of a new blood donor
• Conducting a questionnaire
• Taking and testing the blood
• Writing a report
• Examination by a doctor
• Deciding if the candidate can be a blood donor or not
• Discharging the donor
• Collecting the blood
• Sampling the blood
• Treating the donor
• ...
18/09/2018

THE CASE STUDY MODEL

List of KPI’s in the analysed process

<table>
<thead>
<tr>
<th>Indicator</th>
<th>State of success</th>
<th>State of failure</th>
<th>Performance measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (t) to implement the entire process</td>
<td>t &lt; 60 minutes</td>
<td>t &gt; 80 minutes</td>
<td>Record the time from the beginning of the treatment and to the end</td>
</tr>
<tr>
<td>Time of entering information about the donor on the computer (Nurse)</td>
<td>15 min / blood donor</td>
<td>30 min / blood donor</td>
<td>Measurement of venous blood donors</td>
</tr>
<tr>
<td>Percentage of successful (selected) blood donors</td>
<td>0%</td>
<td>More than 5%</td>
<td>Measuring how many candidates were not appropriate and therefore rejected</td>
</tr>
<tr>
<td>Record how many needle inserts are needed when taking blood</td>
<td>1 needle insert / blood donor</td>
<td>2 needle inserts or more ...</td>
<td>Measuring the effectiveness of the blood removal, number of needed needle sticks</td>
</tr>
<tr>
<td>Percentage of accepted blood donors</td>
<td>100%</td>
<td>Less than 70%</td>
<td>Measuring how many candidates were taken to the blood donors</td>
</tr>
<tr>
<td>The percentage of new donors received by invitations</td>
<td>100%</td>
<td>Less than 50%</td>
<td>Measurement of how many new blood donors have been obtained with the sent invitation</td>
</tr>
<tr>
<td>The cost of taking blood</td>
<td>20 EUR / blood donor</td>
<td>Costs are greater than EUR 40 / donor</td>
<td>Measuring the number of blood events</td>
</tr>
<tr>
<td>The time needed to see the donor</td>
<td>15 min / blood donor</td>
<td>30 min / blood donor</td>
<td>Measuring the examination time of blood donors</td>
</tr>
</tbody>
</table>
### Defined wastes in the analysed process

<table>
<thead>
<tr>
<th>Waste</th>
<th>Risk placement in the process</th>
<th>Proposal solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waiting</td>
<td>Occasionally there is congestion because the doctor is overloaded</td>
<td>Additional doctor work, and job sharing.</td>
</tr>
<tr>
<td>Defects</td>
<td>Occasionally, unsuccessful withdrawal of blood from candidates may occur</td>
<td>Repeating blood retrieval after a few minutes Review the equipment</td>
</tr>
<tr>
<td>Non-utilised talent</td>
<td>Absence of a reference nurse</td>
<td>A reference nurse could take over tasks from a doctor</td>
</tr>
<tr>
<td>Motion</td>
<td>The patient must move from one office to another</td>
<td>Ordinations should be positioned close together, which would reduce the movement and waste of time</td>
</tr>
<tr>
<td>Waiting</td>
<td>Occasionally there are congestions because the nurse is overloaded and fails to process all data when entering the PC</td>
<td>Employment of an additional nurse and division of works.</td>
</tr>
<tr>
<td>Non-utilised talent</td>
<td>Unused young doctor</td>
<td>Reduced norm for 17min, hour price 30 €</td>
</tr>
</tbody>
</table>

### Step 2 – The PRODUCTION LINE APPROACH

- Why was the blood donor waiting for blood too long? - Because there are more people ahead of him waiting.
- Why are there a lot of others waiting for the take-off? - Because the doctor cannot examine so many candidates at the same time.
- Why can a doctor not examine so many candidates? - Because he is overloaded.
- Why is the doctor overloaded? - Because it works more than the norm for one doctor.
- Why does it work more than the norm for one? - Because the health institution did not employ an additional doctor.

### The root cause analysis

```
Human Factor

- Too few employees
- Motivation of employees
- Patient's health condition
- Incorrect patient information

Equipment

- Poorly functioning diagnostic equipment
- Printer problems
- Defective needles

System

- Distance between clinics
- Space barriers

Environment

- The donor has to wait for too long
```
Simulation of the TO-BE versions

AS-IS and TO-BE comparison

<table>
<thead>
<tr>
<th></th>
<th>One Case - negative</th>
<th>One Case - positive</th>
<th>Multiple cases (20 instances per week)</th>
<th>Multiple cases (40 instances per week)</th>
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<tr>
<td><strong>AS-IS</strong></td>
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<td>Costs</td>
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<td>76,67€</td>
<td>1740,67€</td>
<td>32870,50€</td>
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<td>1d 15:15 h</td>
<td>11d 05:55h</td>
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<td>no</td>
<td>no</td>
<td>The Doctor</td>
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<td><strong>TO-BE – v1</strong></td>
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<tr>
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<td>Cycle time</td>
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<td>3d 19:50 h</td>
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<td>The nurse</td>
<td>The Doctor1</td>
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<td><strong>TO-BE – v2</strong></td>
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<td>no</td>
<td>no</td>
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CONCLUSION

• Through simulation the students are able to numerically evaluate the influence of their changes

• Through descriptive methods the students are able to understand the process and its characteristics better
  – identify bottlenecks
  – identify wastes
  – understand the core of the problem

• Through choosing their own assignments they are more responsible towards achieving a good result

Students grades development

<table>
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<tbody>
<tr>
<td>Average grade</td>
<td>65%</td>
<td>68%</td>
<td>79%</td>
<td>81%</td>
<td>82%</td>
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Student’s comments:
• The initially simple process turns out more complex and harder to optimize as thought earlier
• Most KPI’s are hard to obtain (most of them are not numerical
• It’s hard to predict the long-term influence of the changed process
• Not all KPI’s can be improved
Future work

Addressing the setbacks:
1. Difficulties to understand and gain enough data about an non IT processes (from an IT perspective)
2. Limitation to transform the real-life process in a simulation environment
3. Choose the right view on the problem (as the customer sees it)
4. Provide solutions not new problems
5. Use appropriate method within context

Thank you for listening!

Questions?
maja.pusnik@um.si