The Impact of GIS Implementation on Increasing Business Efficiency

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Introduction

GIS Implementation and quantification of its benefits

GIS implementation – How to start it?

Company management dilemmas:

- Why should we invest in it?
- What will we get from it?
- When can we expect return on investment?

′How much money?′

The path to success:

- Recognize and quantify the benefits – express them in financial terms
- Do the math i.e. cost-benefit analysis (CBA)
- Give persuasive presentations, emphasize advantages and lobby

In this presentation:

- GIS implemented for real property management purposes
- Estimation/quantification of benefits
- Impact on business efficiency
NIS (Petroleum Industry of Serbia)

One of the largest, vertically integrated energy companies in the South-East Europe

Its core business includes: oil and gas exploration, production, refining, sales and distribution of petroleum products, implementation of petrochemical and energy projects

Until 2009 - state owned company - since 2009 majority shareholder Russian oil company Gazprom neft
Several thousands of diverse real estates across Serbia, Hungary, Romania, Bulgaria, Bosnia and Herzegovina
Initial need for GIS application in NIS

- Increased need for different types of data in one place for real property registration activities
- Asset management
- Recognized need of other company departments for enterprise GIS web application

**Initial status of real property data in the company (2010)**
- Disorderly and unsystematic documentation throughout the Company departments
- Majority of documentation still in analog format
- No possibility of spatial search for data
- Duplicated documentation
- Nobody was responsible for data of common interest—time-consuming search for specific data

**Primary activities that GIS was supposed to enable**
- Registration of real property rights
- Property formation activities
- Spatial overview of company assets
- Real estate lease management
- Purchase and selling of real estates
- Project design support

Recognized need for GIS

- Application - v1.0
  - Data collection

- Initial data input

- Operational usage
  - Application - v2.6

Upgrade & further development

2010 | 2011 | 2012 | 2013 | 2014
The concept of GIS ODEON application

**SYSTEM**
ESRI ArcGIS Standard Enterprise
Custom intranet web app
Fully operated since January, 2013
Integrated with SAP, Lease database, internal database for retail (called Orfej)

**FEATURE CLASSES**
- Business units
- Land parcels
- Buildings
- Appartments and offices
- Reservoirs
- Wells
- Pipelines
- Other objects

**BASEMAPS**
(vector & raster)
Esri basemap: Imagery, Street maps
Digital orthophoto (10-40cm)
Scanned topographic maps
Scanned cadastral plans
Survey plans (CAD)
Municipality borders
Cadastral municipality borders

**PRINCIPLES**
Based on the Serbian real estate cadastre
Hierarchy between classes
No data redundancy
Distributed responsibility for keeping data up-to-date across departments

**DATA TYPES**
Spatial data - *location on map*
Alphanumerical data - general, geodetic, legal, accounting, technical *(Registered real property rights, assessed value of real estate, construction year)*
Scanned documentation - *(Building permissions)*
Functionality of GIS ODEON application
Implementation of GIS

Application users

<table>
<thead>
<tr>
<th>Application users</th>
<th>Real Property Management Department</th>
<th>Other departments within Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected in 2011</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>June 1, 2014</td>
<td>26</td>
<td>280</td>
</tr>
</tbody>
</table>

Average number of logins per day - **41**

Average number of active users per day - **31**

Number of logins in 2013 - **10,386**

Number of hours that users spent working with GIS application in 2013 - **7,688 h**

Types of GIS ODEON web application users within NIS

- Technical specialists: 25%
- Managers: 32%
- Other specialists: 43%
Recognizing benefits

Potential types of GIS benefits

1. Reduction of working time needed for operations

2. Reduction of financial resources needed for business operations

3. Avoiding costly errors that might occur without GIS technology

4. Improved decision making process

5. Leveraging GIS technology to achieve completely new outputs

6. Enhanced quality and efficiency – increased profit
Estimating benefits - premises

1. Estimating time & money needed for an alternative

2. Average costs for standard data

3. Data obtained from the questionnaire  (November 2013)

4. One login – information for 1 entity

5. Intangible benefits – excluded from estimation

6. Value of one working hour -  5$/h (for estimation purposes only)
Questionnaire results (November 2013)

Usage of data types (per 1 login)
- Spatial: 86%
- Alphanumeric: 78%
- Documents: 50%

Alphanumerical data usage (per 1 login)
- General: 62%
- Geodetic: 70%
- Legal: 56%
- Accounting: 14%
- Technical: 62%

How often do you use functions for graphical report creation?
- Often: 46%
- Sometimes: 32%
- Never: 6%

How often do you use functions for measuring length, area and coordinates?
- Often: 44%
- Sometimes: 46%
- Never: 10%
Estimating benefits – savings in terms of time

Web application

\[ \text{Estimation} = (\text{Alternative} - \text{GIS}) \times \text{Nº of logins per year} \times \text{data usage coefficient} \times \text{weight within data type} \times \text{hour value} \]

* - from the questionnaire results

<table>
<thead>
<tr>
<th>activity</th>
<th>GIS time</th>
<th>Alternative time</th>
<th>Logins per year (2013)</th>
<th>Data usage coeff.</th>
<th>Hours saved</th>
<th>Value of one hour</th>
<th>Money value of the saved time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position of object within parcel</td>
<td>10s</td>
<td>1h</td>
<td></td>
<td>0.2</td>
<td>1,786.39</td>
<td></td>
<td>8,931.96$</td>
</tr>
<tr>
<td>Distances and areas</td>
<td>20s</td>
<td>2h</td>
<td></td>
<td>0.4</td>
<td>7,145.57</td>
<td></td>
<td>35,727.84$</td>
</tr>
<tr>
<td>Finding location by coordinates</td>
<td>20s</td>
<td>3h</td>
<td>10386</td>
<td>0.86</td>
<td>1,339.79</td>
<td>5$</td>
<td>6,698.97$</td>
</tr>
<tr>
<td>Overview of pipeline route</td>
<td>20s</td>
<td>3h</td>
<td></td>
<td>0.05</td>
<td>1,339.79</td>
<td></td>
<td>6,698.97$</td>
</tr>
<tr>
<td>Graphical report</td>
<td>30s</td>
<td>1h</td>
<td></td>
<td>0.3</td>
<td>2,679.59</td>
<td></td>
<td>13,397.94$</td>
</tr>
<tr>
<td>Docs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to documentation</td>
<td>20s</td>
<td>1h</td>
<td>10386</td>
<td>0.5</td>
<td>5,193.00</td>
<td>5$</td>
<td>25,965.00$</td>
</tr>
</tbody>
</table>

Total money value of the saved time: 97,420.68$
## Estimating benefits – savings in terms of money

### Web application

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Alternative – Price/value per one item</th>
<th>Number of logins in 2013</th>
<th>Reduction by usage</th>
<th>Savings</th>
<th>Reality reduction*</th>
<th>Real savings in money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Information</td>
<td>The Official Copy of Cadastral plan - 10$</td>
<td>10386</td>
<td>0.86</td>
<td>89,319.60$</td>
<td>0.75</td>
<td>66,989.70</td>
</tr>
<tr>
<td>Alphanumeric Information</td>
<td>Query for legal data in official state web application - 2$</td>
<td>10386</td>
<td>0.78</td>
<td>16,202.16$</td>
<td>0.75</td>
<td>12,151.62</td>
</tr>
<tr>
<td>Documentation</td>
<td>Issue of document copy - 15$</td>
<td></td>
<td>0.50</td>
<td>77,895.00$</td>
<td></td>
<td>58,421.25</td>
</tr>
</tbody>
</table>

**Total savings in money (web app):** 137,562.57$

*Reduction – it does not necessarily imply that the amount of information/documentation would have been purchased without GIS

### Desktop application

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Number of maps created in 2013</th>
<th>Estimated average price per one item</th>
<th>Savings in 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maps</td>
<td>199</td>
<td>350$</td>
<td>69,650.00$</td>
</tr>
</tbody>
</table>

**Total savings in money:** 207,212.57$
## Costs & Benefits

<table>
<thead>
<tr>
<th>Costs</th>
<th>total costs for 3 years (2011-2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software&amp;hardware</td>
<td>&lt;300,000.00$</td>
</tr>
<tr>
<td>Staff</td>
<td></td>
</tr>
<tr>
<td>Data collection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Benefits</th>
<th>savings for 1st year (2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings in time</td>
<td>304,633.25$</td>
</tr>
<tr>
<td>Savings in money</td>
<td></td>
</tr>
</tbody>
</table>

### Chart

- **Benefits**
- **Costs**

### Table

<table>
<thead>
<tr>
<th></th>
<th>1st Q 2013</th>
<th>1st Q 2014</th>
<th>increase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N° of logins</strong></td>
<td>2510</td>
<td>2891</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Maps created</strong></td>
<td>68</td>
<td>97</td>
<td>42%</td>
</tr>
</tbody>
</table>
Intangible benefits

Not included in benefits estimation

- Spatial reference for every single real estate of the company combined with different basemaps
- Fast access to different data types related to each real property
- Graphical reports with a possibility for users to draw and make markings on the map and share
- Spatial queries - including different data types
- High accuracy of spatial data with tools which enable measurement of coords, length and area
- Avoided errors referring to real estate location, relation between object and parcel (cadastral municipality) which used to cause delays and incur unnecessary costs
- More effective (faster and easier) task solving in everyday real property management
- More effective communication between departments related to specific real estate
- More effective decision making for optimization of resources – cutting operational costs
- Supporting tool for project design
Further development of GIS ODEON

GIS ODEON PRO application

GIS web application for:

- Fuel market price analysis
- Retail network development
- Both competitors’ and NIS’ gas stations

Mobile Application for Android:

For efficient data collection from the field

- Spatial – GPS location
- Alphanumeric attributes
- Photo from mobile device

since March 2014
Further development of GIS ODEON

GIS ODEON for HSE, UPS, Assets in the region

GIS ODEON – HSE
Web application for HSE risk management

GIS ODEON – UPS
Web application for upstream (Planned connection with SCADA system this year)

GIS ODEON – REGION
Web application for real property management outside Serbia
Conclusion

1. Time & money – scarce resources

2. Efficiency – lower amount of inputs produces a greater amount of outputs

3. Increased business efficiency with the implementation of GIS

4. Quantification of benefits enables measurement of efficiency – further investments in GIS

To what extent has GIS ODEON application increased your daily business efficiency?

- 74% significantly
- 26% to some extent
- 0% none
THANK YOU FOR YOUR TIME!

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