ERP SYSTEM BASED ON A MODEL FOR GIS POSITIONING OF FIBER OPTIC NETWORK

Dejan Konevski, M.Sc. Ilija Jolevski, Ph.D. Dragan Mihajlov, Ph.D.

TFB FCSE

Skopje, Macedonia Bitola, Macedonia Skopje, Macedonia

ABSTRACT

ERP system for GIS positioning of fiber optic network, which is subject of this paper, deals with problem of combining different activities of different types of fiber optic network by creating new routes, monitoring existing ones, and store capacities of available routes which form one fiber optic network.

The integral parts of fiber optic network (nodes, vertices/cables, clients) are described and processed in each module developed in the system.

I. INTRODUCTION

Geographic Information Systems (GIS) are now being implemented and widely used all over the world in both private and public sectors. One of the major goals of using GIS is to support decision making and simple data representation for all sectors in one corporation.

The information needed for the model construction comes from various sources such as manuals, test and repair procedures, repair statistics and, most importantly, from experts. These sources provide us with a simplified view of reality, which our model needs to simplify even further. The flows of information are most important part of professional development and maintenance of fiber optic network.

Also, this paper describes the problem that telecom operators are facing for managing and combining different activities of different types of processes for preserving the stability of their core fiber optic network.

Numerous and complex data models that consist one optical fiber network is the biggest challenge for aggregating all models into one consistent system for data manipulation and system analysis.

Also, the users have different levels of familiarity to the system and the underlying processes. The user interface and its performance are essential for the system's adoption as much as the systems reliability and scope of functionalities.

II. SYSTEM ARCHITECTURE

The key problem is to construct the model so that we capture all of the important aspects of system reality from the point of view of the diagnostic process.

The application that was developed can be use both in Intranet and Internet environments. It is web based solution developed by new technologies that are currently offered by Microsoft, SQL Server 2005, Microsoft Visual Studio.NET 2010 development tools, Visual Basic.NET and ASP.NET.

Dynamic programming algorithm is used for the purpose of optimization of used data. Implementation uses a real example of already set optical infrastructure on the territory of the city of Skopje and Republic of Macedonia.

In the backend of the application is made cross platform relationship that allows connection to a server-client model for data transmission and display the data of interest.

The advantages of JQuery and JavaScript were frequently used to achieve the desired goals for data manipulation on client side.

Instead of heavyweight development of software projects, for development and implementation of the software which is the subject of this paper, we used agile (lightweight) development as well proven method of application development and implementation.

III. USER INTERFACE

Information's that are integral part of the modules are well grouped and organized, which brings the user experience to the next level of easy accessibility, data manipulation and use.

The user interface was developed according to user's requirements and the key note of success of the interface by itself was participation of some of the user's at the process of development.

Each user of the system was given manual for using the system and was given enough time for experiencing the system.

Users of the system demanded several important features which were essential for them:

- Displaying all nodes on one screen (Fig. 1)
- Aggregating logical and physical data models
- Grouping of several forms in one module
    - o Ease of access to desired information
    - o Decreased need for navigation
- Process automation
- Module independence

These features are integrated into a complete ERP model for GIS positioning of optical networks. During the integration phase these features were tested to check if they all were coordinated with each other and that they all together form the system as a whole [1].

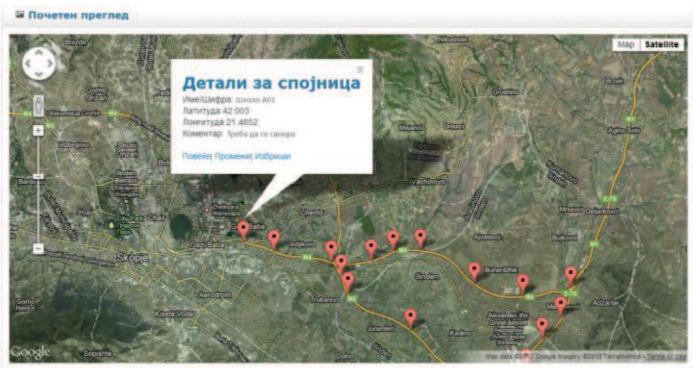

Figure 1: Start page – Displaying all nodes on one map in satellite view

The system was developed as a web application and the biggest goal was avoidance for leaving the current page which was solved with multiple popups.

Geographically represented data (Fig. 1) was supported by background computed logical data (Fig.2). Also one of the few important models during the phase of creating the models was cable monitoring (Fig. 2). This was achived using different tehniques, equipment and methods.

The received crude data (in many cases, the distances to the location of interest) are used through certain internal calculations in the system, in order to get precise locations of the cable cut (Fig. 2). This is the reason why we need to form a module for logical cable documentation and node capacity (Fig. 3).

Figure 2: Cable monitoring – Displays location based on some measurement with remote OTDR instrument

Cable documentation (Fig. 2) on the other site represents a logical part of geographically represented data model (node in Fig. 1).

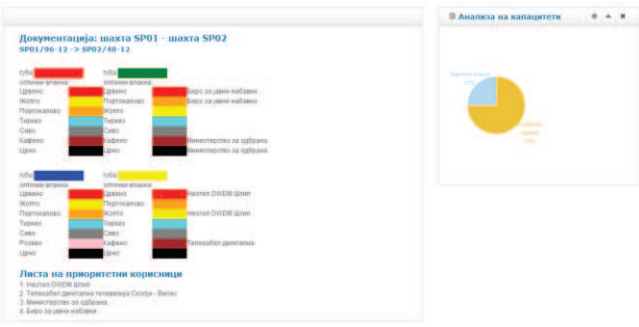

Figure 3: Logical cable documentation and node capacity

This documentation have to be given, or available to the experts from the engineering group and to the maintenance group. The main problem with the documentation is grouping the couples of active optical fibers (two fibers per user).

Figure 4: Multiple routes of client service activation

Besides the documentation which is one of the crucial parts of the system, we have made advanced connection between logical(Fig.3) and physical parts of the system (GIS and data). As result we got different drawings for different routes which are presented to the user in order of decision making (Fig.4).

IV. Evaluation

We evaluate the process into several phases: problem decomposition, sub-problem - module definition, design and testing of modules for subsystems. The system was evaluated by users in the phase of testing of modules and they assessed their opinions using a questionnaire that consists of 15 questions.

Each question was answered by the users with a grade of 1-5.
The user could answer with a 0 if he/she had no opinion on the matter. The questions were as follows:

Accessibility

1. How do you judge the accessibility to all nodes on main page?

2. How difficult was interaction with geographically represented nodes in the system?

3. Does your web browser display all of the information correctly?

4. In general, how difficult was the access to all modules of the system?

Layout

5. Was the map and layers displayed correctly?

6. Does the site have a consistent look and feel?

7. How satisfied are you with the readability of the content?

Navigation

8. How was the navigation menu grouped and organized?

9. Is the site search easy to access?

Learning

10. Easy to learn to operate the system

11. Easy to explore new features by trial and error

12. Easy to remember module names

13. Easy to remember interaction of consecutive modules

Quality

14. What is the overall evaluation of the system?

15. How accurate were the results given by the system?

V. Evaluation results

The users that participated belonged to 3 different sectors in one company. The answers provided were mostly positive.

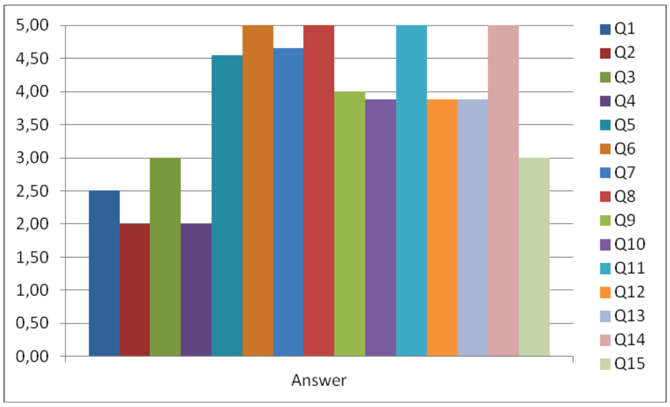

Figure 5: Average points of each question given by the users

The results of the evaluation questionnaire were analysed and average grades were calculated for each of the questions.

The quality of the system and the professional support met the needs of the users

VI. Conclusion

Many studies focus mainly on the potential benefits and critical success factors related to ERP implementation, but very few explore important issues of integration difficulties modules developed for this purpose facing in ERP implementation, especially in terms of the integration of knowledge[5] [6] .

In our researches we adopted a view of the integration of knowledge that focuses on the knowledge integration processes involved in the implementation.

Basically there is essential need to understand the nature, structure and process of integration of knowledge, which is expected during the ERP implementation [2].

Making a complex GIS system requires careful step by step development and implementation. Well developed user interface and programming of complex background logic as well as simple steps desired information brings a new layer of importance for effective and intuitive system.

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