System Analysis of Information Systems for Local Economic Development Modeling – Case Study for the Region Pelagonia in R. of Macedonia

Snezana Savoska[1] , Branko Dimeskil[2],

[1,2] Faculty of administration and Information systems Management, University „St.Kliment Ohridski“ – Bitola,
Bitolska bb,
7000 Bitola, R.of Macedonia,
savoskasnezana@gmail.com, branko_dim@yahoo.com

Abstract. The system analysis is the necessary activity in designing information systems (IS), especially in creating complex IS which have to satisfy a wide pallet of users' demands. Installing the IS without expert's planning and leading can lead to the huge users' dissatisfaction, and maybe non - usage of system which often the consequent system do not work. This is especially emphasized when we talk about web based IS which demand a strong defined access rules as well as accurate data update procedures. In this paper is made a system analysis and design of IS for local economic development (LED). The problem of LED itself is very important because of the decentralization process that happens in R.of Macedonia in recent year as well as the global crises and the necessity of employment increasing. As an important factor we mention a need of increasing the usage of IS, especially when is concern of the issues that help for the young people's position. Analysis of the need of IS for LED's support is made on the couple of present local governments' (LG) web sites in R.of Macedonia as well as the interviews and a questionnaire of the LER's responsible in the LG and potential users of this kind of information. The results of this survey are decanting in analysis of the information needs as well as the LED's support System's proposition. We are using the structural analysis and logical design of IS as the working' methodology. For this purpose, a series of systematic undertaken processes were used. These processes, we think, that will enhance the information and usage of computer's IS in function of business climate and business community's better information. The proposed model for LED's support IS which have to cover the users' demands will be made with creating a redundant databases, loaded whit trigger procedures and intelligent agents.

Keywords: System analysis, Logical design, DFD, ER diagrams, Z-specification, Local economic development.

1 Introduction

The system analysis is an activity in analysis and IS design that includes a scientific approach for information gaining for "it is" IS as well as collecting users' information demands. It is particularly necessary in creating of wider IS or the complex ones which have to meet the demands of the biggest users' groups and to satisfy a wide range of users' demands. Installing this kind of IS without the expert's planning and guides lead to huge users' dissatisfaction, causes the system do not satisfy the users' needs and in final – the dysfunctions of IS (Langar,2008). The system analysis of the IS which have to support LED is necessary activity because this concept is extremely complex which demands systematic approach in defining the information needs.

LED is a term with that is increasingly exploited in this region, especially with decentralization in R. of Macedonia and separating local from the central government. Globally, this concept of localization is implemented in different manner and can be found good or less good examples of LG's concept implementation. But, the fact is that in the globalization era, the role of LED for municipalities' development is undoubtedly huge, especially in gaining information and conditions for concrete support to the business community as well as all individuals which won't to start a new business. One of the most important LED's supports will be development of inventive environment which will contribute for organizational culture changes and also creating conditions which will enable the young people to start new businesses and prevent their leaving from R. of Macedonia, which is evident n the last years. One positive sparkle in this situation is the IT's global development which enable couple of young people to work - are employed in the global companies via internet connections (free lenders). But, this is not only way for IT to help in this manner. With usage of IT, there is strong influence of the level of transparency and information knowledge which is necessary for the business.

For those reasons, the primary goal in the paper will be to create system analysis and logical design of IS for support of LED. With this system analysis the "it is" IS will be detect the gap between the "it is" and desired "to be" IS. Also, the need of information for more intensive LED and data sources disposal in that moment will be detected. With system design the system's proposition for IS will be modeled and it has to meet the needs of potential users of LED's information. For this objective, it is necessary to analyze the work of LG's and governments' administrative institutions which have the common point with business sector. Also, there is necessary to analyze data which is necessary for LED's promoting in the LG in R. of Macedonia, but obtained from the potential survey about the use of LED's data.

2 The Preparation for System Analysis and Logical Design

Planning the usage of information communication technology in the Local government first of all means satisfying the needs of transparent information which LGs are obligated to provide (Valacich, 2006). In almost all local governments in R

.of Macedonia the transparency is achieved with Content management web sites[1] where located information is accessible for public usage. In this way, more or less, LGs provide transparent information that have to be transparent and for public usage. But this information is huge and unstructured, difficult for researching and without defined dictionary for the means, concepts and notations. However, almost all of them possess information with transparent character (contacts with institutions, important telephones, on-line reading of local informers, organizational structure, ongoing projects and the other). Nevertheless, we mean that these sites do not provide real useful information for the business community to find the desired information on the sites if they haven't enough IT skills. Also, many of them are not ordinary updated (some of them are not updated many years), they are static (without the user's interaction, except the e-mailing possibility to send to contact person, which usually do not provide the answer) and do not possess a part for inventiveness development which is very important for LED's development.

The LED employees can be contacted beside e-mail also by the blogs, which are the popular tools for communication and collaboration as well as the other forms of Wiki-logs (blogs) or by the social frameworks as Facebook, Twiter and the similar ones. Some of LG already have their profiles but, usually they provide for information to same or similar policy opinion members. Ordinary, the information exchange between the business community and LG unit's produce outputs, but they are not provided at all almost in all LG's in the R .of Macedonia.

3 System Analysis of the Available IS for LED's support

To obtain more accurate apprehension for overall problem that is the issue of our analysis, first we have to answer the following research questions:

1. Which IT policy exist at the local level in the LGs in R .of Macedonia or strategies for IT development in order to achieve a quality infrastructure which have to help business sector and to foster LED in LG?
2. Are some of these policies successful implemented in the LG? If they are, in which way can be improved in order to gain more qualitative and more accurate on-time information for the business community?
3. If there are not defined policies for LED' support, how they have to be defined? What kind of IS has to be created, with which procedures for LED business community support?

3.1 Unobtrusive Methods for Information Gathering

The analysis with unobtrusive method is done on the base of LG's web sites analysis. In this case we get information about the LG's policy for IT support for

[1] Usually the hardware and software in LG are obtain as donations from donors and are installed without previously created strategy for integrated IT development of LG, only for providing transparency for the Macedonian citizens;

LED. Although in many of the LED's strategies we found relatively accurate defined information which is available for LED, yet they don't have a real support, they do not contain the real need data neither links to that data2 from LED strategy. Somewhere data wasn't updated couple of years. Also, we met data for international collaboration and their links which suite call for project funding (fund raising). Most of the LG in R. of Macedonia already consider about creating Information communication technology (ICT) strategy in which frame they will provide a part for LED support. Some of LGs already have the ICT strategies which are accessible from the LG's web sites. But, the fact is that there is only a declarative support for these strategies in the LG not only because they contain the prerequisites and the needed data which LG have to provide, but they contain neither the real databases nor the links to the specific institutions' links where the data can be found. The researchers were made on the analysis of twelve web sites of local governments in R .of Macedonia.

In almost all LG in R .of Macedonia exists sectors for local economic development. Usually they have announced the main information which is in the scope from defining of their competency (LED planning, creating strategies and priorities, law obligations etc.), to the contact person in this sector and links to the relevant institutions, agencies, NGO and other factors. Besides that, the information for the facts about LG are published as well as the information which has to be published announced. The data that they deem important for LED include databases on the situation in LG, analysis of business climate, opportunities, strengths, weaknesses and threats to business. Although these data can be significantly important for the business community, they do not transparently publish, but should be looking after advertisement that exists on their web pages. However, when it comes to strategic planning of the use of ICT in the LED, we can say that there are significant results.

3.2 The Detected Information Need for LED

After the phase of using unobtrusive methods of obtaining information about LED, with a population survey of the business community, consumers and potential users of the web site to support the LED, the most important data that businesses need to get the IS for this purpose are:

- Data on existing business subjects in the municipality (LG);
- Data on supply and demand of labor in local government and social map of LG;
- Data available for business locations and available utility infrastructure;
- Data for road, telecommunication and logistics structure;
- Data on economic events, fairs, other events;

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2 For example, http://www.opstinagpetrov.gov.mk/index.php?option=com_content&view=article&id=2372&Itemid=100

- Data required documentation for registration of a company, tax obligations, tax benefits and other legislation;
- Donor organizations, banks and credit opportunities;
- Benefits of International Business Ventures;
- Help with creating a business plan and other start-up activities;
- Data to support innovation and development activities;
- Data for needed goods and services in the municipality;

In the phase of using interactive methods for exploring the information requirements we have incorporated these questions and tried to get answers from those interviewed.

3.3 Interactive Methods Used in System Analysis for LED Support

By using structured interviews (two) and questionnaires (five) with employees in LG and interviews with potential users of information on LED (10 questionnaires), we tried to get the required information directly from the top people in charge of the LED in municipalities and the latter directly from businesses - potential users of IS for the LED. We put 16 questions for specific IT support LED in municipalities and 10 issues of customer information.

From the analysis of responses to the first interview and asked groups we could get their thoughts for the need for LED IT support and also for the current support which they give to the business sector. The general conclusion is that local government employees still have a "bureaucratic view" of problems that are not put into function (operation) of the LED, as predicted EU policies for transforming of Public administration (PA). They generally believe that what we have on web pages to municipalities and ministries, government agencies are sufficient for the business sector. Also it is considered that the Chamber, if the business entity is subscribed, it gives enough information about investment opportunities, calls for projects, etc. (Davis, 2009). Also, electronic documents are available on the web pages and can be downloaded from there.

As to the second group questioned, it is important that they feel that they haven't enough knowledge to themselves to obtain necessary information, especially when dealing with subtle issues such as finding information for the new businesses, relationships with foreign partners, donors or partnerships with foreign companies. Considering that the required information is better placed in one place and has links to the necessary institutions where to seek information about themselves. The important thing about them is that they haven't sufficient funds to pay for information (as in the case of membership in the Chamber, where there is already some information on possible business partnerships, funding opportunities, etc.) and expect it to get the LED offices in LG. Prefer web-based IS that will bring all the information on the desktop of potential users, and this information will be accurate, timely and successfully managed from LED in LG.

4. Analysis of Obtained Results and Defining the Information Needs for the LED's IS Users

If we analyze the needs of potential users of IS for LED support for transparent information it is necessary to create a web oriented IS which will merge the disparate data through a common database that would be redundant for data but consistent for the LED's needs. It would be loaded with triggers - some kind of intelligent agents that will provide timely data (using the trigger procedures) and predefined data sources. This software application would implement the necessary links to sites where the data are extracted and the sites of donors, banks, governmental and nongovernmental agencies and organizations and all information what can help LG's LED.

Contacts with staff in LED Department of LG may, except e-mail to be done with the help of blogs, and other types of collaboration such as discussion groups, expert groups etc. Although some information is not completely public, it is necessary to find a way to see them by interested or be willing to form and shape that will not endanger the Low of Protection of personal data3 and will be in accordance with Law on Free Access to Public Information4. Although the LG have a piece of information that have to be included in the databases, they are not prepared adequately for use, but in Office documents and should additionally be transformed into a format suitable for placing in the databases. For support of inventive capacity of the business community, it is possible to use the collaboration tools like blogs, discussion groups and expert groups where besides LED experts will participates the universities - i.e. teachers and students which will be engaged in research on market opportunities and the other critical areas.

5. Preparing the Systems Proposal – The Logical Structure of the System Proposal and DFD

The logical design of IS for LED support should give those information and flows that are necessary for everyday users. It will be made using the tools: DFD - Data flow diagram and ER (Entity Relationship) diagram. The first one is a graphical representation of processes and connections between them as well as system inputs, system outputs and databases, while the second one defines the entities and links between them which are the basis for further definition of databases. Based on the analysis, we defined DFD diagram of proposed IS for LED support, shown in Figure 1. Each DFD process diagram can be put to single forms as end screens - single processes. It is important that the complex DFD diagrams can be partitioned in accordance to the software engineering principle with purpose to be more manageable. Therefore, in the Figure 1 is shown a part of IS for LED support as decomposed DFD diagram of the process. During decomposition, the principles of conservation and balancing the DFD diagrams were kept (Kendall, 2007). For each

[3] http://www.uvmk.gov.mk/files/zakoni/ZZLP_Precisten%20tekst.pdf

[4] http://www.stat.gov.mk/pdf/SlobodenPristapDoInformacii/zakon_za_informacii.pdf

process, depending on the process' complexity, you can write logic of documenting and analyzing the processes and tools with structured English, decision tables and decision trees (FIS, 2008).

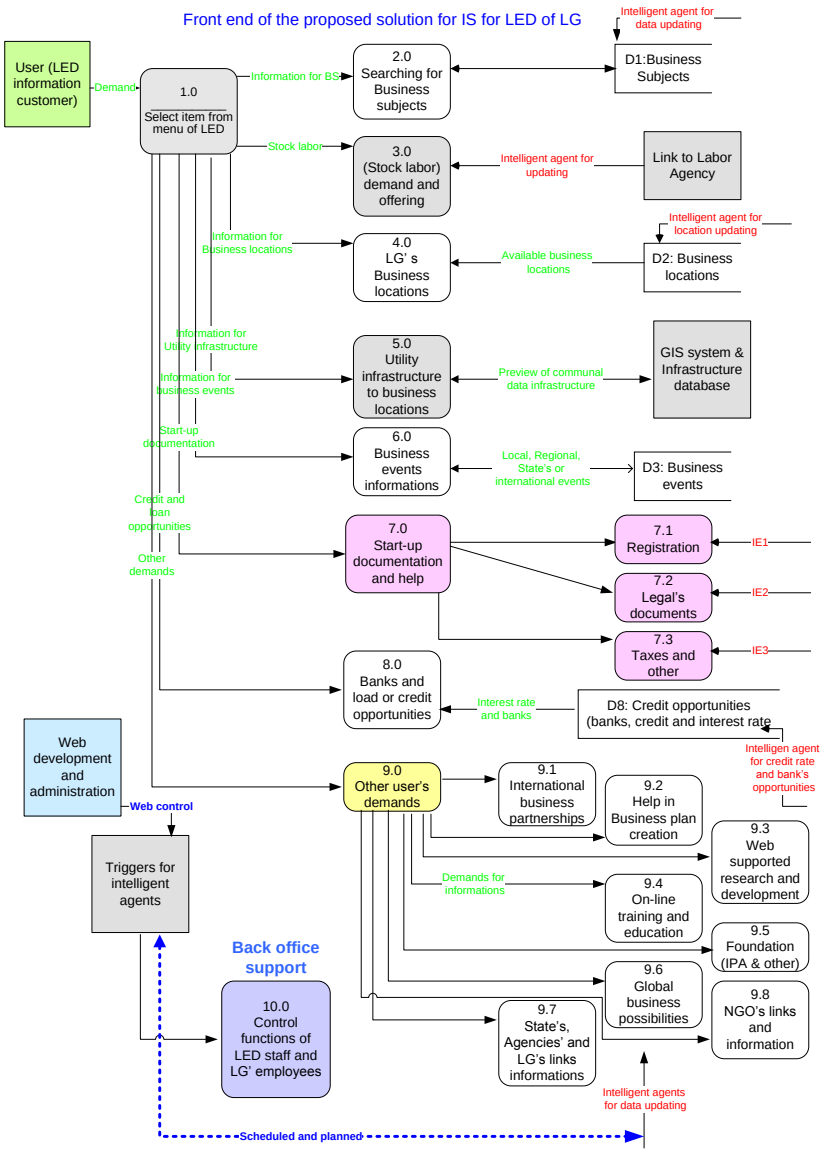

Fig. 1. The proposed DFD diagram for IS for LED support

6. ER diagrams for IS for LED support

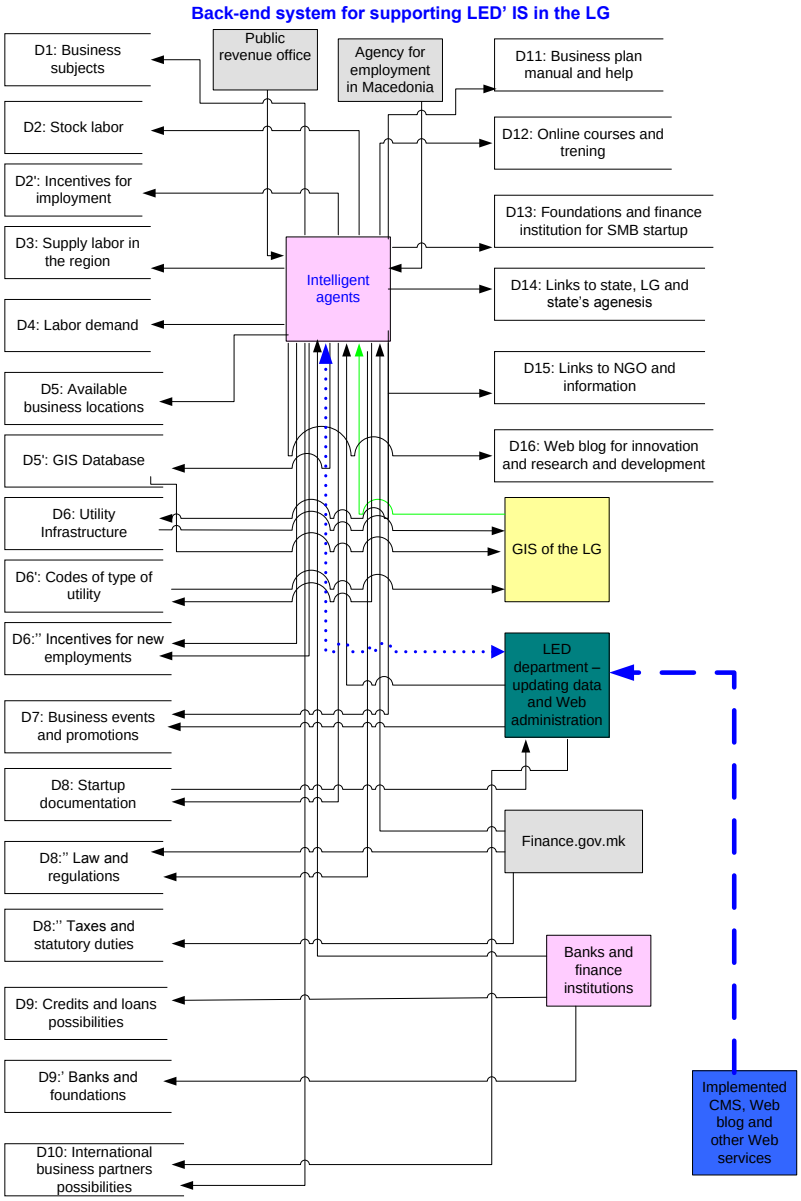

Fig. 2 The structure of the database from the proposed solution for IS for LED support

The definition of entities and relations between them is a part of the physical design of the IS, so we define ER diagrams of some of the entities - objects related to a process of logical DFD diagram was first decant in the physical DFD diagram.

Because of the limited space in this paper, only the part of the structure of the ER diagram is shown. It is represented by databases – as groups, parts of the snow-flake structure of databases.

Defining the logical diagram is just one step toward the design of the system. While he defines business processes which have to be supported by IS and close to understands for non-IT staff, system analyst should prepare a proposal for system developers for IS for LED support. They have to prepare in detail the physical structure of IS based on physical DFD diagram and ER diagrams. They should be prepared on the logical diagram base and also the business logic which have to be supported by IS for LED support. Example of a physical diagram of the processes is presented in Figure 3.

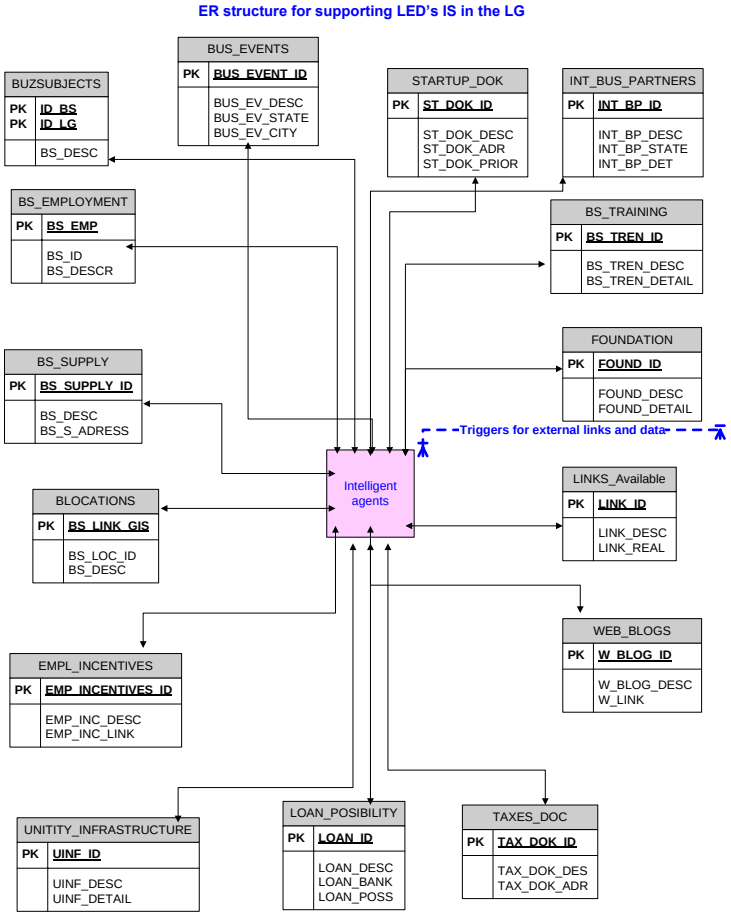

Fig. 3. ER diagram for IS for LED support

7. Integration of logical and physical diagram and ER diagram and systems proposal

When the logical and physical DFD diagrams, ER diagrams are defined and the logic that specifies processes DFD diagrams is also defined, you can start by creating a system proposal for IS for LED support. Despite detailed diagrams, it should include cover, title page, and contents of the proposal, a summary for the donors of the project, notes and proper documentation and also detailed results of system studies, system alternatives and recommendations of system analysts (Kendall, 2007). It should be described in the summary and followed by accessories which will contain all analyses, forms, diagrams and working documents. In this documentation must be found also the value of the investment and to evaluate efforts for system analysis and design of IS (Oestereich,2001).

The physical system, as it will use the users should be developed in end-users screens that need to intercept the detected information needs (Bowman, 2004) and should translate into concrete solution. In the testing phase, it is necessary to compare the requirements with the achieved outcomes and to evaluate the new IS also achieved customer satisfaction, followed by implementation of the system proposal.

To better explain the proposed system, it is good to make the relational model of data for the system. Relational model presented using UML diagrams would help in the qualitative analysis of the system. Furthermore, we can use Z-specification for development of UML model at higher level of abstraction, as it is explained in [9,10].

8 Conclusion

The creation of IS for LED support is the present challenge, because of the need arising from decentralization and also because of complexity which is not only a challenge for developers, but also for members of the LED community in Macedonia. The successful design of the project largely depends on proper system analysis as well as properly established logical model of IS. Certainly the greatest benefits from the implementation of the project will get users of IS to support LED and the business community, and thus the municipalities and the state. However, logical design, physical design, development model and the programming of web-based solution means a successful implementation. It will certainly depend on a number of other factors such as dissemination of the use of IS, conducted training for the unemployed and small and medium sized companies for its use and engagement of employees in local government responsible for LED. In this phase NGOs can be included primarily in promotion of usage of the IS and indirectly in training, which should be allowed from the local government' site. Therefore our future research will be focused on organizational aspects of implementation and the presentational interface and how data will be provided and will result in the databases of IS for LED support.

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