A DECISION SUPPORT SYSTEM TAYLORED FOR ROMANIAN SMALL AND MEDIUM ENTERPRISES

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Keywords: Decision support system, cash-flow based DSS, financial decisions, business intelligence.

Abstract: This paper presents an overview of a prototype of a real-world decision support system (DSS) that was developed in order to improve financial decisions in Romanian small and medium enterprises (SME). The goal of the paper is to show weaknesses in strategic, tactic and operative financial decision making in Romanian SME and to show how improvement is possible by use of a cash-flow based DSS and several specialised expert systems. The paper focuses mainly on requirements elicitation and on system validation. The impact and benefits of using the Information Technology in decision-making processes within the enterprise are highlighted.

1 INTRODUCTION

Romanian economy is undergoing an almost 20 year transition from planned-economy in the communist regime to market economy. One of the consequences of this process was the creation of millions of small and medium enterprises (SME) that looked to take advantage of favourable circumstances. Only a fraction of those enterprises succeeded to consolidate their position and even less to grow (Isaic, 2006). In the new, post European Union integration market environment, many of the Romanian small and medium enterprises must increase economic efficiency or disappear.

In this paper we argue and demonstrate that for a SME a DSS for financial decisions can be the critical factor of success. Also, it can change the whole decision making process by giving the decisional process a scientifical base rather than an empirical/intuitive one.

Another objective of this paper is to show how data generated by the ERP system used by the enterprise can be transformed and enriched so that it better fits the needs of the managers. With this objective we contribute to the Business Intelligence layer of the enterprise's information system, as described by the domain's literature (Moss, 2003).

This paper is structured as follows. After the introductory remarks that introduce the objectives of the paper, the second section briefly presents the critical elements of the problem domain and the research approach. The third section starts with the architecture of the system, then presents some remarks on the development process. The fourth section presents the testing and validation of the system, followed by the section of conclusions.

2 PROBLEM DOMAIN

The main focus of our paper is the real world application of Information Technology, with support from Artificial Intelligence. The paper wishes to present a DSS that was developed for enhancing the financial decisions of Romanian small and medium enterprises, that also relies on five expert systems.

There are many different definitions for a DSS as the ones of Turban, Finlay, Inmon and Holsapple. The one that perfectly describes our system is obtained from aggregating the points of view stated by the authors mentioned above. We developed a system named CFAssist that addresses decision making in the financial department of the enterprise, based on cash-flows. Our DSS implementation uses both data (supplied by the enterprise information system) and models (that are stored as decisional models inside the DSS) in order to aid the decision maker in semi-structured problems that relate to financial management of the company. It also offers the possibility to conduct *what-if* analyses in order to

Petrusel R. (2008).
A DECISION SUPPORT SYSTEM TAYLORED FOR ROMANIAN SMALL AND MEDIUM ENTERPRISES.
In *Proceedings of the Tenth International Conference on Enterprise Information Systems - ISAS*, pages 208-211
DOI: 10.5220/0001683002080211
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determine which of the decisional alternative outcomes best fits the needs of the enterprise.

The need for such a system was revealed by questionnaires and interviews with 46 financial managers of Romanian small and medium enterprises in the city of Cluj Napoca. Small and medium enterprises are extremely important for national economy since they produce 57% of GDP and employ 55% of active population (RNSI, 2005). This was doubled by an on-line questionnaire (http://econ.ubbcluj.ro/~chestionar) applied to a sample based on the population of SMEs in Transylvania region. The sample considered the distribution of enterprises according to their business domain. The questionnaire (both on-line and face to face) tried to determine the current status of information system usage, the total amount that a manager will spend on decision support software and the domains of the enterprise where information systems are needed. The analysis phase of the system development is based on the knowledge elicited by those two means and the former practical experience of the author. The questionnaire results showed that:

- 86% of the managers of Romanian SME do not have any specific enterprise finance training;
- 93% do not understand accounting data and do not use it in decision making.
- the sole data provided by the accounting department that is used directly in decision making is the lists with payables and receivables. All other data is reported by the accountant of the enterprise to the manager only upon request.

Therefore, there is a strong need for a system that can transform accounting data in more understandable pieces of knowledge and provide it directly to the managers on a daily basis and with minimum effort for them. We approached this need by creating a system that can extract data from the ERP and transform it in information that is easy to understand even for untrained managers. Even more, we present it in an easy-to-understand format and in a timely manner.

Another group of questions tried to determine the financial decisions that require the most of support. 37% of the responders indicated for financing and business development related issues and 31% indicated payment and cashing activities. Our software development process addressed the two issues through several expert systems.

The third group of questions tried to determine the critical factors of success for a DSS. The overwhelming majority of responses (91% ranked it as number one choice) showed that the essential factor of success is the easiness of use.

As the overall conclusion, we argue that the involvement of the user in the development process creates the premises for a successful DSS for financial decisions in Romanian SMEs. This is why our development process was focused on the user involvement and feedback. Our experimental study concluded that the main features of a DSS for Romanian SME financial planning are:

- transform accounting data in easily understandable information;
- offer assistance in decisions relating to cash management, financing decisions and business expansion;
- offer possibility to conduct *what-if* analyses and/or analyze different scenarios;
- present information in an concise format and no more than a couple of clicks away;
- a low acquiring and maintenance cost regarding the software product.

Our system fits the Business Intelligence (BI) area, viewed as technologies, applications and practices for the collection, integration, analysis and presentation of business related information and knowledge (Moss, 2003). Its position in a SME is:

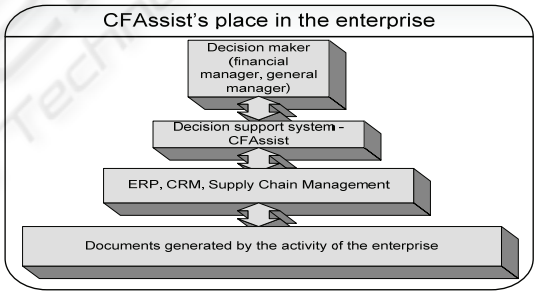

Figure 1: The position of CFAssist in the environment.

We argue that a possible solution to the lack of training in enterprise finance is the transformation of regular accounting data (revenues and expenses) into cashing and payments. This means the transition of current accounting data to cash-flows. Cash-flow is easier to understand. It is also better to evaluate the enterprise based on cash flows than on net income (Fernandez, 2006). The cash-flow report is required as part of the financial statements for large enterprises. However, the SMEs that we questioned do not use it. Usually, even large companies hire experts for drawing it up.

3 DEVELOPMENT PROCESS AND ARCHITECTURE

We aimed to look at different methodologies and techniques for system development since this is a research project and not commercial software. The system development was a mixture between established or emerging software engineering (SE) methodologies. The main approach to the software process was the one recommended by Rational Unified Process (RUP) because it allows the usage of abstractions, thus giving the system a higher degree of generality and modularity. At the same time we used a rapid prototyping for getting a quick feedback from the potential users group. Some ideas, like the feature driven paradigm and permanent delivery of functional parts of the system, from Agile software development process were also used. For object modelling and specification purposes we used UML artefacts. For model generation and analyze we used morphological analyze and MTIS. As additional model representation techniques we used decision trees, influence diagrams, rules and occasionally Bayes networks.

The components of the system are presented in the following figure:

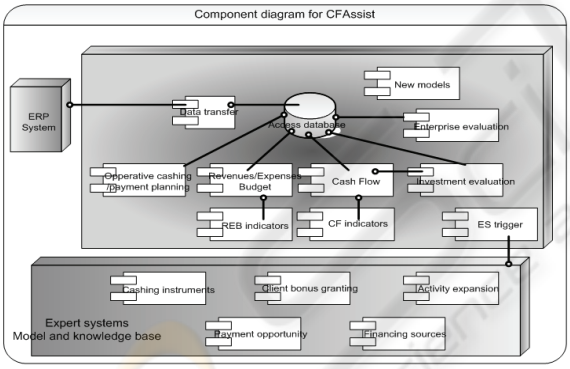

Figure 2: Architecture of CFAssist prototype.

According to the general use-case created in the requirements analysis phase the system was divided into two major sub-systems:

- the data intensive sub-system which extracts data from the ERP used by the company and constructs: the cash-flow; the operative cashing and payments report; and the revenues and expenses budget;
- the model intensive sub-system that produces recommendations based on several expert systems.

The cash-flow, the operational cashing and payment report and the revenues and expenses budget (REB) are built based on previous periods and also include forecasts. As shown in Figure 2, the cash-flow and REB (both historic and forecast) are the starting point for enterprise evaluation based on several selected indicators. This gives the decision maker an overview of the enterprise and constitutes the base for comparisons of company's health over several periods. For this class of financial decisions we built two expert systems that give recommendations to the decision maker regarding the cashing method for an invoice and regarding the opportunity of payments at a certain time.

Granting of bonuses for clients and the choice of the most suited financing sources affects the finances of the enterprise for a medium period of time. Two expert systems were implemented focusing on the above problems.

In what concerns the strategic decisions (that affect the activity of the enterprise for a period over five years) the most important one regards the expansion of the business. The problem is similar for decisions on increasing production for the current markets or for expansion to new ones. Actually, the latter is becoming increasingly important since Romania joined the EU common market.

Our modelling efforts were directed towards the decisional process but also towards the creation of decisional patterns that can be recommended as "best practice advice" by the system for several common decisional situations. A modeling technique we used is morphological analysis. We employed it with success as a knowledge acquisition tool because users found it easy to understand and the scale of the created models could be decreased by elimination of solution areas containing incompatible decisional variables (Swemorph, 2002).

Regarding the expert system development we decided that the knowledge base should be composed of rules derived after several interviews with a domain expert. The form of the rules was ECA (event condition action). This simple approach allowed us to explain to the users the logic behind each model and involve them into the knowledge acquisition process as secondary experts. The learning and updating of the models are manually done by the knowledge engineer based on user detection of the need for a change and on user inputs.

4 SYSTEM VALIDATION

CFAssist testing was concerned in the discovery of conceptual misjudgements regarding the design of each generation of prototypes. We did not necessary aimed to find errors (debug the prototype) but tried to prove that it satisfies the goals that were set in the requirement phase. Testing was done at several levels (Copeland, 2003), while keeping in mind that the developed prototype does not have a target customer and is not a commercial product.

We used for testing: test cases, test suites and scenario testing. A test case is defined by IEEE as a known input and an expected result. There were two test cases for each requirement, one for positive testing and one for negative testing, as required by RUP. Since the development process is centered on the user we considered usability testing as a major concern. It aroused some interesting conclusions like, for example, to remove menus in the prototype and instead to use only buttons.

We consider implementation to be the final step of testing, more like beta-testing or user-acceptance testing. We did not present the prototype to the users as independent software but we integrated it in an enterprise simulated environment. CFAssist addresses the business intelligence level, as shown in the first section, and cannot function as stand-alone. This is why, for the implementation effort, we followed several steps: determine the environment; determine necessary data; train the users; observe the user's reactions; request the user to describe good and bad parts of the prototype.

5 CONCLUSIONS

This paper tried to briefly present a DSS developed for financial decisions in Romanian SMEs. We shortly presented the requirements determination phase, the architecture and the validation of the system. We argue that such a system is needed for financial decisions in SMEs because this kind of enterprises does not have well trained managers in financial department and also lack adequate computer-based systems for decision support. A tool that can provide easy to understand data and is also user friendly is essential. Second, success for such a system can be achieved only if the system is used regularly in daily decisions. In order to achieve such a system the user must be involved in all stages of the development. Involving the user can bring two advantages: the user will understand the system and will consider it as a personal project becoming more attached to it and the user will be able to provide all necessary data for initial correct and complete modelling and for future updates of the system. The architecture of the system must be a dual one, with data processing components and also with a model base (several expert systems). The data intensive part is concerned in transforming hard to understand accounting data in easy to understand cash flows and allows what-if analyses. The expert systems give advice for tactical and strategic decisions. The development was done using a mixture of methodologies and techniques, ranging from traditional to emerging. The result is a knowledge-based system that can improve enterprise position and can prevent uninformed and intuitive decisions regarding the finances of Romanian SMEs.

ACKNOWLEDGEMENTS

This research was founded through Grant type PN2 no. 91-049 / 2007 "Intelligent Systems for Business Decision Support (SIDE)".
We would like to acknowledge the valuable advice of Mr. Cosmin Gheorghe Silaghi.

REFERENCES

Copeland, L., 2003. *A Practitioner's Guide to Software Test Design,* Artech House, London.

Drudzel, M.J., Flynn, R.R., 2002. Decision Support Systems, *Encyclopedia of Library and Information Science*, Allen Kent, New York, 2nd edition.

Fernandez, P., 2006, *Cash flow is cash and is a fact. Net income is just an opinion*, http://www.iese.edu/research/pdfs/DI-0629-E.pdf;

Isaic-Maniu, A., Nicolescu, O., Isaic, I., 2006. *Cartea albă a IMM-urilor din România*, Arvin Press, Bucharest, 4th edition.

Moss L.T., Atre S, *Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications*, Addison Wesley Professional, Boston MA.

Romanian National Statistics Institute http://www.insse.ro/anuar_2005/zip_r2005/cap7-rezult.pdf

http://www.swemorph.com/pdf/it-webart.pdf , 2002.