

**“BABEȘ-BOLYAI” UNIVERSITY CLUJ-NAPOCA  
FACULTY OF ECONOMICS AND BUSINESS  
ADMINISTRATION**

**DOCTORAL THESIS**  
**synopsis**

**CONTRIBUTIONS TO  
THE CONCEPTION, DESIGN AND  
IMPLEMENTATION OF INFORMATIC SYSTEM  
FOR  
COMMERCIAL SMALL AND MEDIUM  
ENTERPRISES**

**Scientific advisor  
Prof. univ. Dr. Nicolae Ghișoiu**

**Ph.D. student  
Stănculea Liana Olimpia**

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**Keywords:** SMEs, small and medium enterprises, free market, new technology providers, economic strategy, commercial companies, management paradigms, information technology, information systems, lifecycle, design, object-oriented design, object-oriented modeling, UML (The Unified Modeling Language), ERP (Enterprise Resource Planning), CRM (Customer Relationship Management), CRM (Customer Relationship Management), PLM (Product Lifecycle Management), WINMENTOR, Microsoft Dynamics NAV, EBS Clarvision ERP, Enterprise Modeling, integrated information system prototype

## Introduction

We believe that, in general, SMEs can be started in any field, mostly in the service domain, general construction work and retail or wholesale. In the realm of services, these entities offer specialized services with a predominant technical character, such as hair or beauty salons, shoe repair shops, laundry, etc. Such services can be offered both to individual consumers or businesses.

I appreciated that in retail SMEs offer goods for sale directly to consumers, possibly materializing into chains of stores or independent shops. As for wholesale, they represent the middleman between production and retail.

Regarding the internal organization of SMEs we have to mention the fact that it is influenced by two issues:

1. In most (80%) cases, the management is also the owner, a fact which prevents to a certain extent the emergence and manifestation of authority dissociation,
2. Because employees are represented by syndicates to a lesser or no degree, it contributes to the formation of a privileged relationship between them and the owner, a relationship influenced by the leader's personality.

We consider that in order to increase performance, commercial SMEs should be considering the permanent evolution of information technologies and actively engage in the process of globalization and shift to a virtual economy which is becoming a reality in the 3<sup>rd</sup> millennium. Commercial businesses are forced to upgrade or replace their information systems, considering that aligning to modern management trends requires the development of better performing systems in which users can communicate at a distance and the support of decisions made towards streamlining the management process.

[Although these requirements might seem presumptuously formulated, we consider that SMEs must be convinced these changes represent the main road towards a higher efficiency of their activities.](#)

The paradigms of design and implementation of information systems are presented in this thesis paper through the looking glass of utilizing various communication techniques, environments and programming languages without stopping at the obsolete stage of procedural languages, instead orienting towards the technique of objectual and distributive programming.

We already established the main objective of this paper as being the design and implementation of an improved information system in commercial SMEs, with the purpose of influencing the development and optimizing operational efficiency in such businesses.

We believe that in order to obtain higher performance, commercial SMEs must carefully manage their resources and capitalize them with highest possible results. Also,

they have to achieve a competitive administration, ensuring the economic and financial equilibrium that can be obtained.

We consider that only through the restructuration of the management system, its and their subsystems and the operationalization style of management functions can we obtain the expected performance. The more service levels offered by commercial SMEs to their customers go up, the easier it will be to obtain a viable profit which will determine the increase of the value of the organization and of shareholder wealth.

I appreciate that improving the management system of these SMEs pertains to all components of this system (decision, organization, methodology and information system). The purpose of this paper was, among others, the benchmarking of possibilities for using modern information technologies to ensure the integration of internal and external entities with suppliers, customers, financial and banking bodies and the introduction of "e"-type concepts which have the effect of globalizing information systems and the increase of the reaction speed of economy players.

I consider that the policy of commercial development of SMEs is based on the totality of plans, programs, strategies and methods used with the purpose of maintaining internal order and an optimal ratio between its own development and overall development policy of the enterprise.

I think that, given the importance of SMEs in the world, a special place in the paper is represented by their role in the European economy, the new definition, the position held by the suppliers of technology in the development of the SME system in Romania. To ensure the framing of commercial SME activity in Romanian law, I presented the current legislative framework in our country, the legal requirements regarding commercial activity and the legal provisions concerning the organization and operation of SMEs. Also, taking into account the provisions of Romanian law, we present the requirements for the creation of SMEs in our country.

For research purposes, we addressed problems of information systems found in commercial SMEs, where we presented the structure and trends of development of information systems in these entities, the subsystem structure of the information system, the premises of information systems in the economy, the computerized management of supply and retail at "S.C. Ardealul S.A.", using both UML diagrams and issues regarding the organization and planning in the assembly of the computer system, computer system design, implementation, the proper documentation and maintenance of these systems. A special place in this chapter is reserved for the development of aspects regarding approaches to processes of assembling information systems, aspects of object-oriented modeling, UML modeling language, UML diagrams, specific association cases for particular commercial entities and categories of models used in the analysis of UML applications.

My opinion is that it is in such a fashion the conditions for improvement of management system for SMEs through the commercial ERP systems, CRM, SCM should be presented, just like the influence of ERP on commercial companies, ERP applications and MFG / PRO, streamlining business activities of SMEs through the usage of SCM, CRM and SCM solutions for these enterprises. Being easily handled by an already modeled enterprise, Microsoft Dynamics NAV as ERP system (a product in the family Microsoft Dynamics) is aimed at financial management, manufactured product management, customer relationship management, supply chain management and

electronic commerce in SMEs. Representing a viable solution for depreciation and process optimization within a SME, the integrated system Clarvision EBS Romania, Cluj-Napoca, is a Romanian software and does not have the inconveniences foreign applications can manifest. It enables integration of all departments of an SME enabling tracking, control, and regulation of activities within the company.

In order to understand the latest methods of analysis and development of integrated information systems we have presented: Enterprise Architecture - enterprise architecture, basic concepts, its use in the process of modeling the information system; Enterprise Modeling - modeling of companies; and finally, the object-oriented modeling language, UML.

I think that regarding the integrated information systems in SMEs, for “S.C. Ardealul S.A.” we had to analyze integrated computer systems, existing information systems in the enterprise, solutions to improve the existing system by applying ERP paradigms, integrating the application for the commercial subsystem into the SIARD system and integrating a web application at “S.C. Ardealul S.A.”

I consider increasing managerial performance of SMEs in the commercial domain as being linked to: performance goals of commercial SMEs, performance management, the impact of increasing management performance through computerization on the competitiveness of these enterprises and economic efficiency of information management system. Here we present the influence factors and effectiveness indicators of commercial SMEs. I think that the commercial SME orientation towards performance constitutes a natural phenomenon given that these companies play an essential role in the economy.

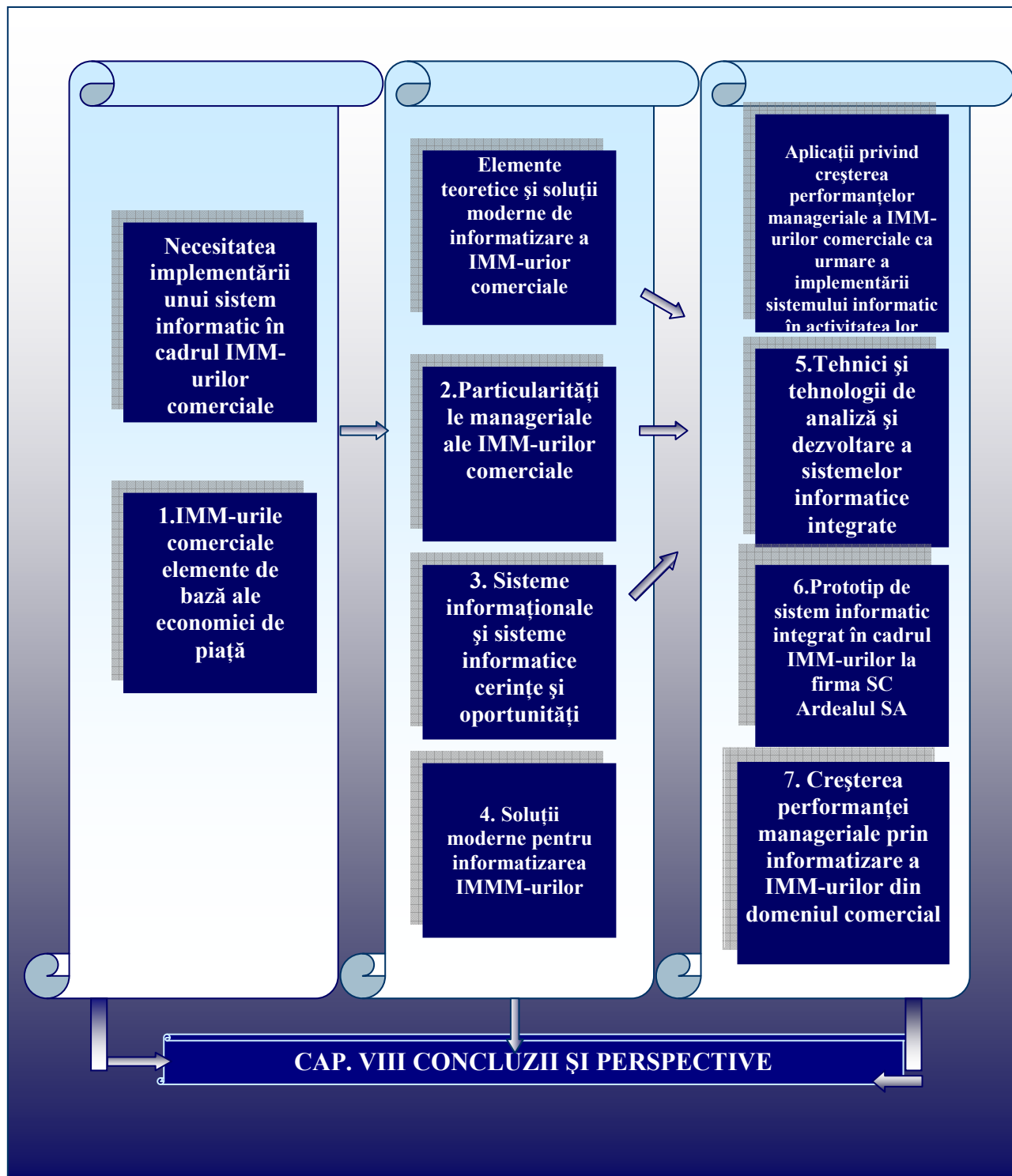


Figure 1.1 Conceptual diagram of the thesis paper



## **CHAPTER 1. Small and Medium Enterprises as Basic Components of a Free Market Economy**

I appreciate that the continued operation and development of SMEs is determined by the way in which they respond to market demands that have led to their creation.

Since these requirements are constantly changing, the SMEs need to consider the same goals, that being the results of their work to be better, more efficient, more accessible - or in other words, to achieve superior results.

We believe that managers of commercial companies have the main task of finding the most effective ways of ensuring their business performance, achieve superior results within short time spans and ensure the continuity of the improvement process of their business activities.

This goal requires the development of efficient and sustainable strategies. We believe that the key to the success of an SME, now at the beginning of the third millennium, lies in the support of an appropriate strategy at the enterprise level.

It is for this purpose why in this chapter we addressed the problem of economic strategy in which we defined the concept of an economic strategy, the objectives of the strategy of companies, the factors influencing this strategy and the market strategy of commercial firms. We also found that strategic and operational planning of SMEs ensures the corrections and changes necessary to achieve success and reduce economic risk.

By treating the problem of SMEs in the free market economy we have underlined the crucial role of these enterprises in the European economy, in the world economy and in the Romanian economy.

In order to frame the commercial SMEs into the Romanian legislation, we mentioned the existing and necessary legal forms for doing business in the legislative framework underlying the organization and operation of commercial SMEs in our country. Also, in order to understand the structure and evolution of commercial SMEs we have deemed important the description of the life cycle stages of these companies, the procedures for the creation of SMEs in our country, taking into account the conditions under which these companies can be established.

The financial assistance programs supported by the EU pertain to agricultural companies mainly. Thus, agricultural businesses and research represent 26.6%, while commercial SMEs represent only 0.6%.

Such a small percentage of commercial SMEs is due to the ineligibility for non-refundable financial assistance to this sector. Companies use both their own resources and bank loans regardless of size class.

Accessing public funds and non-refundable financial assistance provided by the EU is greater for medium companies and smaller for micro-enterprises [Stănculea07a].

We believe that in case the SMEs would structure their commercial objectives focusing on long-term technological upgrade plans, they have the possibility to improve communications, to increase flexibility of commercial processes and to ensure secure communications for employees, customers and trading partners. The plan provides a mutual understanding between policy makers from the commercial level and technical

staff, because it eliminates confusing elements and helps businesses to quickly realize their objectives by achieving a state of profitability [Stănculea05a].

Some studies regarding SMEs in the U.S.A. have concluded that, frequently, these businesses consider business goals and IT spending priorities as two important elements, focusing on total revenue growth by utilizing resources with maximum impact on the creation of profit.

## **CHAPTER 2. Management Features of Commercial Small and Medium Enterprises**

We considered it possible to approach the managerial activity of commercial business on a systemic basis, because these companies are essentially self-regulating systems with adaptability options, self-regulating their activity through their management in order to resist in a competitive environment, adapting to a free market economy, becoming more effective.

In order to generate a clear picture of commercial SMEs, we presented the concept of management, the various forms in which the managerial process is manifested in SMEs and the performance of the managerial activity of the entrepreneur.

The existence and the operations of commercial SMEs fall within certain coordinates defined or assigned by their distinctive particularities, determining a series of management features.

The organizational and managerial particularities of commercial SMEs also impose certain stages in the life cycle. The presentation of certain styles of leadership and human resource management was made with the purpose of determining the interaction sphere of influence domains over the activities of an SME and the strategy of advantage generation that would make them more efficient [Stănculea08e].

In order to better understand the organizational structure of commercial SMEs, we deemed necessary to illustrate the business organization framework as well as its production and operational structure.

Drawing up plans and programs for SMEs represents a stage which in time itemizes the basic actions that make a strategy functional. We considered that the strategic management of the commercial company can be defined as being the process of adoption of a set of decisions and activities which are realized by implementing designed plans or programs, and elaborated for the purpose of achieving the fundamental business goals.

Product quality control within the company's operation also plays an important part, ensuring the survival of the enterprise in a competitive market. Appreciating the importance of information technology, we consider that it has a growing and decisive role in the functioning of commercial SMEs, since they operate in an environment that is both competitive and dynamic.

Information technology providers are able to target their solution packs (which include products and services) to specific vulnerable points of SMEs, offering solutions for long-term planning of technology infrastructure purchases [Stănculea08g].

## **CHAPTER 3. Information and Computer Systems – Requirements and Opportunities**

Given that any leader needs to be continuously informed about the way business objectives are fulfilled, and that he in turn has to inform their superiors on the manner in which they meet the obligations they have, this process should be designed in such a way as to comply with a modern leadership and allow the use of automated means for collecting, processing and transmitting information.

Tackling issues of information systems, in this chapter we noted that the information system includes the computer system as a component. The information system is designed on a general level and is implemented according to the individual organizational diagram of the economic agent, creating a whole unit, being adapted to its traits and particularities.

We appreciated that, as part of the information system in which automated data handling is predominant, the computer system is a coherently structured entity composed out of computation and communication electronic equipment, software programs, processes, automated and manual procedures.

I believe that within commercial SMEs, the computer system provides the information necessary for management and the proper flow of activity. I considered that, due to the permanent evolution of information technology, SMEs are obliged to engage in the globalization process and to switch to a virtual economy that is a reality of the third millennium.

Commercial businesses are forced to upgrade or replace their information systems, considering that aligning to modern management trends requires the development of better performing systems in which users can communicate at a distance and underline the decisions made towards management process accomplishment.

The design and implementation of computer systems is necessary when we are discussing new computer systems or for the development, upgrade and maintenance of existing computer systems.

Within the confines of system planning we underlined the necessity of modeling the business information requirements, developing strategies and planning projects which would guide the current computer system and available technologies.

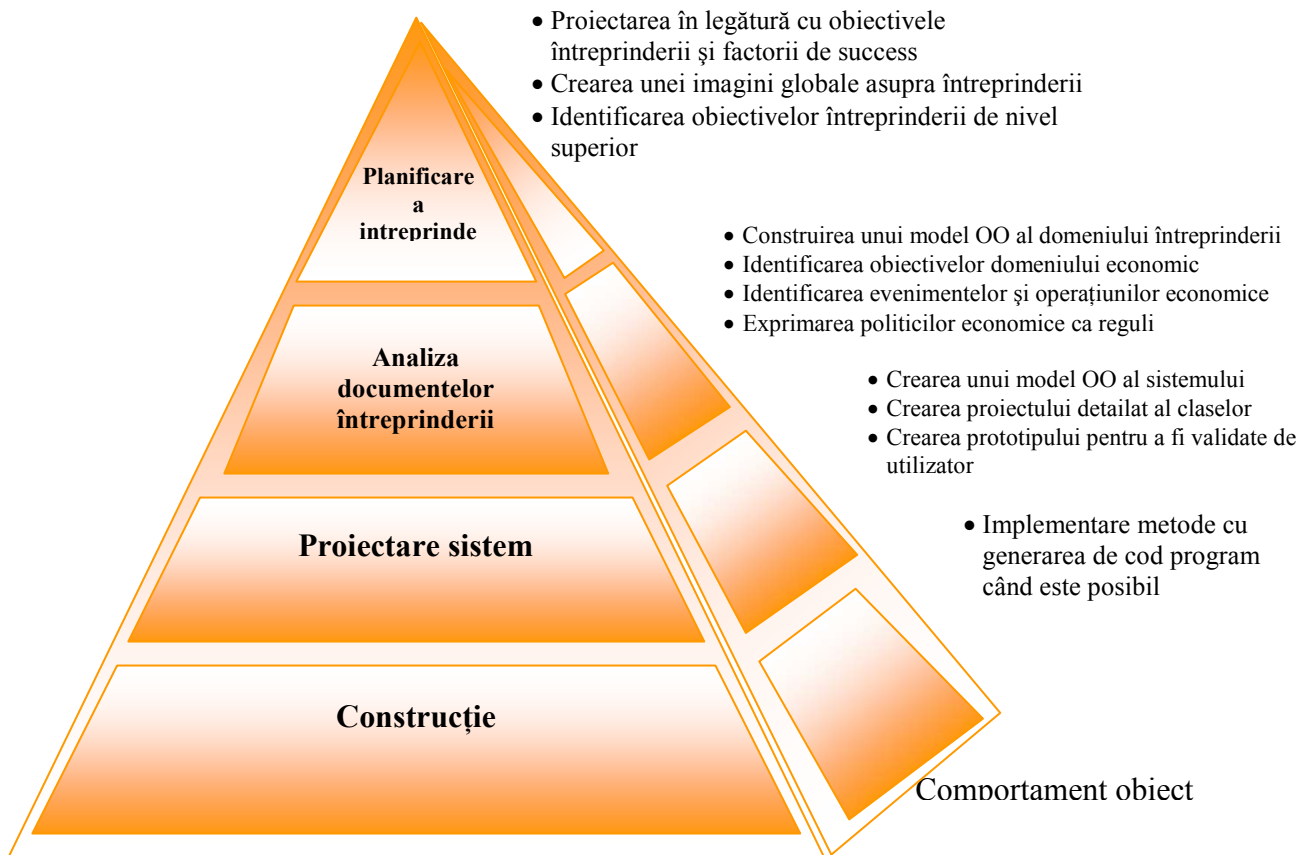
To support the system planning process, specific methodologies were developed, such as: BSP (Business Systems Planning) - IBM and IE (Information Engineering). The steps taken in the planning process of the computer system are the following:

1. describing the current situation,
2. describing the desired target situation, trends and restrictions,
3. developing a transition strategy and plans [Stănculea05g].

The results of determining the requirements will materialize into various forms of the collected information. In the design stage of computer systems, we considered to be important the particular design techniques used, and we presented object-oriented design which facilitates the clear definition of interfaces, allowing the generation of software program modules identified as objects [Stănculea08a].

Designing the system is completed before coding starts, and the project will model the system in an implementation-independent fashion. The implementation-dependent model will include high-level characteristics of a development language, such as a relational database management language or an object-oriented language [Stănculea08b].

I also mentioned that detailed implementation plans are drawn up after the management of the business approves the new system project. In order to ensure possible upgrades of computer systems, I made a brief presentation of the main approach models of these systems.



In the modeling and the design of the database I considered that it is important to mention the development of computer systems with the aid of CASE instruments and the UML object-oriented modeling language. In order to emphasize changes after the CASE apparition, I mentioned the I-CASE acronym which pertains to aspects of integration, regardless of whether the systems are open or closed.

In order to better analyze and design such software programs, various programming languages were created, culminating with UML (The Unified Modeling Language).

## CHAPTER 4. Modern Solutions for the Informatization of Small and Medium Enterprises

I consider that information systems such as ERP, CRM and SCM which appeared relatively recently on the global market ensure a growing increase in the efficiency of the companies using them. Out of these three possible solutions, most companies adopt ERP. From surveys made, we conclude that both in the SME sector and local management such solutions are adopted, even if they are in their initial stages. We find that at the same time, companies that offer ERP target the SME sector.

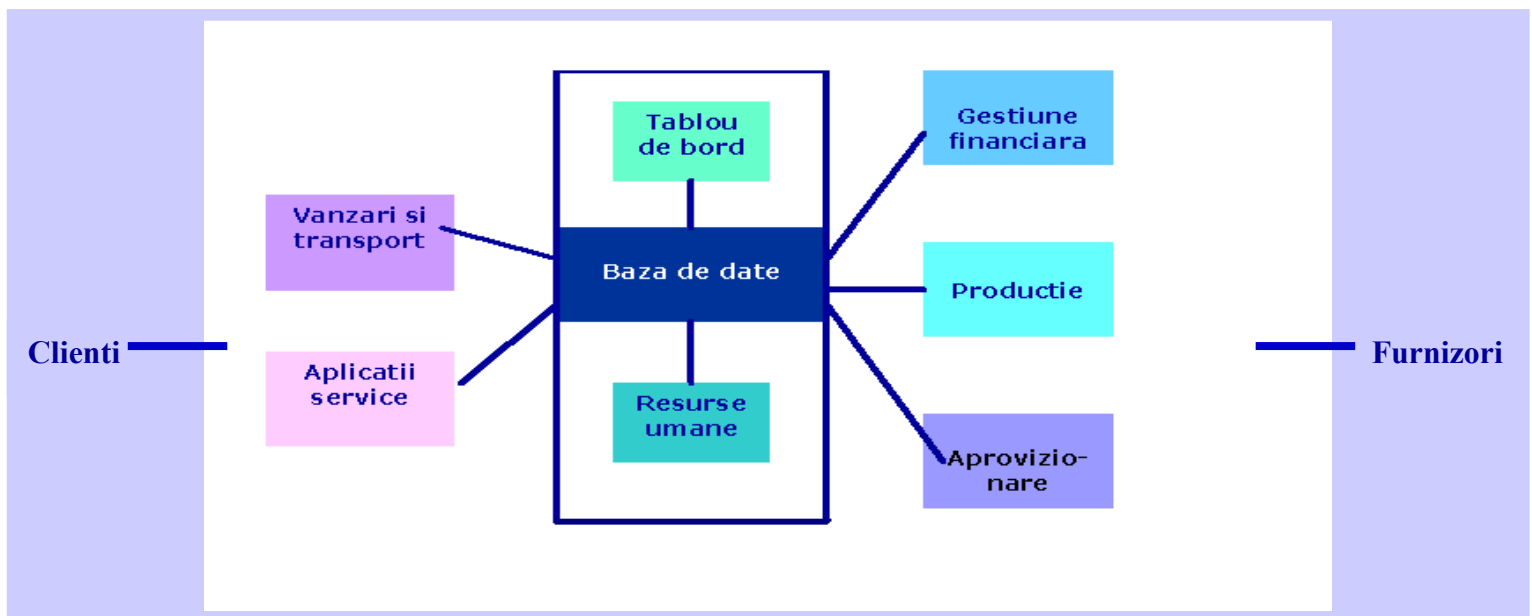


Figure 4.1 The conceptual structure of the ERP system

I appreciate that the main roadblock that prevents SMEs from investing in ERP systems are high costs and possible risks. Although the Enterprise "Class" of CRM applications doesn't directly interest SMEs, the most recent CRM versions try to cover as many features as possible at a low cost.

It is well-known that certain categories of retailers are attacking the SME market, taking the step from the vendors that are traditionally focused on the enterprise sector to those oriented on SMEs. Keeping in mind that one of the priorities of SMEs is the improvement of the management system and the fight against low performance in the management echelon of the business, we consider that this action should encompass all components of this system, namely decision-making, organization, methodology and information.

Since the CRM objective is to assist companies in the utilization of technology and human resources in order to identify new perspectives regarding client behavior and their value, based on a functional CRM strategy, the income of an SME can increase by:<sup>1</sup>

- providing the services and products that the customers need,
- providing improved client service,
- cross-selling of products,
- faster completion of agreements,
- keeping old customers and attracting new customers [Stănculea08c].

It is my opinion that in order to solve the special and oftentimes difficult problems of commercial companies, systems like ERP, SCM and MRP, being the result of implementing trans-organizational systems and the computerization of the supply and integration chain, can easily solve these problems.

I consider that improving these instruments within commercial SMEs leads to the increase in performance of the business. In order to describe a multi-modular computer system designed to improve the efficiency of the main activities taking place within a commercial enterprise we use the ERP system, which represents an extension of the MRP1 and MRP2 systems.

An ERP system, by automating company activities, will improve the control exercised on the business, enabling the possibility to take necessary measures in a timely fashion when a problem presents itself, increases efficiency and speeds up the activity flux, provides faster access to the information necessary by protecting such information, has an easier to use interface, which has as a consequence the recovery of an important part of the investment made by purchasing the ERP system [Rusu05].

In order to implement a high-performance ERP system for commercial SMEs, I consider it is necessary that the integration of the computer systems to be followed by a process of redesign of the organization management system using BPR.

In our country, ERP systems have emerged as solutions for the increasingly rapid changes in the business environment, and pertain to the constant and accelerated adaptation of SMEs, which oftentimes test the capabilities for effort and analysis of the human factor.

To meet an increasing level of customer requirement satisfaction, CRM represents a managerial strategy. This strategy aims to identify key wishes and behaviors of commercial enterprise customers, and then make beneficial use of the acquired data. The CRM systems make connections between the possible modes of interacting with customers, the obtained information being protected by operational and analytical systems that are able to parse the data in order to find new models of interaction.

The CRM solution provides sales professionals with all the necessary tools to achieve and maintain a clear picture of their clients, from first contact to the completion of a transaction, then post-sales services.

At the same time, SCM or logistic chain management corresponds to a profound reality of commercial enterprises, generating an efficient flux which is capable to ensure its correlation and satisfying customer requirements. SCM allows the generation of added value in all levels of the enterprise and also cost reduction, as can be seen in the following figure [Stănculea08d].

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<sup>1</sup> <http://www.computerworld.ro/imm/show.Php?id=9201.5/8/2007>

## SCM permite crearea valorii la toate nivelurile intreprinderii

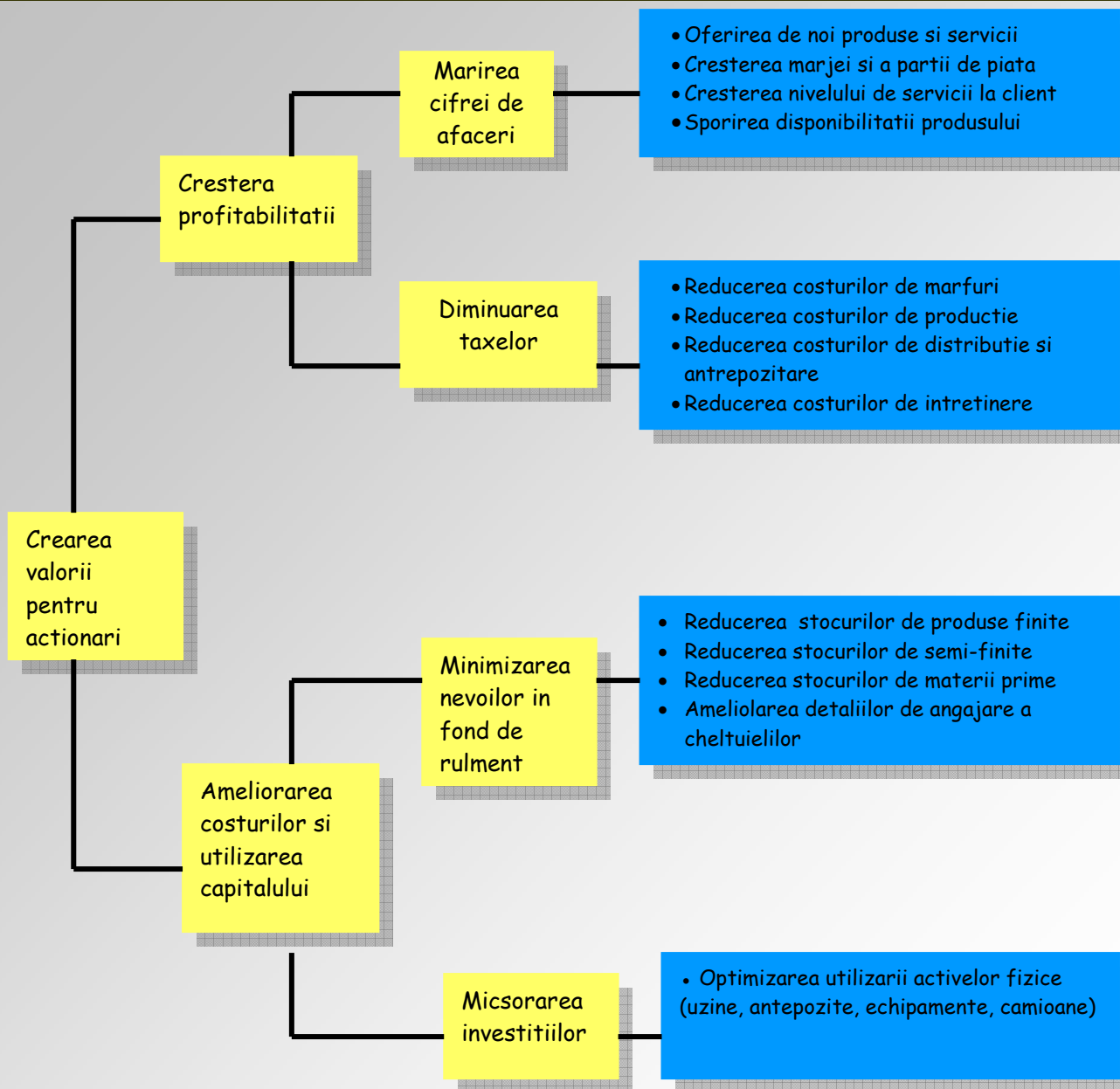


Figure 4.2 Generating added value at the enterprise level

Source: [www.Sap.Com](http://www.Sap.Com)

Microsoft Dynamics NAV is an ERP system manufactured by Microsoft, aimed at finance management, manufactured product management, customer relationship management, logistic chain management and electronic commerce in SMEs. By using a source code for an already modeled enterprise, it enjoys the reputation of being easy to use and it offers a series of advantages compared other existing solutions.

Likewise, Clarvision EBS, being a Romanian software, constitutes a powerful tool for resource planning and monitoring costs of applications in a commercial SME. This product provides the implementation of a software solution which is perfectly modeled, offering a series of advantages.

## **CHAPTER 5. Analysis and Development Techniques and Technologies for Integrated Computer Systems**

In this chapter I presented a series of issues regarding certain analysis techniques and technologies used in the development of integrated computer systems. I considered particularly important, in order to ensure the achievement of enhanced performance by commercial SMEs, the tackling of such tasks as: enterprise architecture and its use in the modeling process of computer systems for SMEs, enterprise modeling, enterprise grid computing, SOA services and UML.

The knowledge of such techniques and technologies ensure a new direction for commercial SMEs, with beneficial effects for activity performance increase. I also consider that commercial SMEs are interested in merging such high-performance techniques and technologies into their activities in order to ease the workload and ensure the achievement of revenues while confronting marketplace surprises.

The result of their work and activity is dependant on the good organization of their activity and on the use of advanced technological assets

The development and upgrade of integrated computer systems within commercial SMEs leads to a superior organization of manufacture and workload, and the achievement of increased performance.

While presenting EAI (Enterprise Application Integration), we concluded that it represents a rescuing solution for integration, even if it is both expensive and requires great efforts, demanding adaptation and personalization for each individual project.

By using a structured and rational approach, founded on technologies validated by practice, EAI solutions proved to be viable and effective. Born out of the reunion of several technologies, Enterprise Application Integration surfaces as a new syntagm.

I considered that, from a technological standpoint, system integration consists out of the combination of diverse and oftentimes incompatible application and data technologies into an uniform architecture, and the implementation of a functional work structure.

It is my opinion that considering expenses related to CRM and SCM applications, one must also consider integration costs, which have to be correlated with front-office



and back-office products. In order to adopt EAI solutions, the enterprise has to consider the following five domains:<sup>2</sup>

1. web expansion (e-commerce and e-business applications),
2. mergers and acquisitions,
3. ERP suites,
4. CRM applications,
5. SCM applications.

My opinion regarding the definition of EAI does not exclude the fact that EAI represents integration of application groups in order to obtain a free flow of information and processes.

I believe that EAI can be regarded as a technological process through which a series of applications and data structures are merged in order to assemble a larger centralized data entity. For problems generated by EAI, an EAI service represents a solution for the de-integration of applications within the enterprise.

When applied strategically on the fundamentals of internal management, EAI can be considered a temporary workflow upkeep instrument, in order to avoid the division of administrative solutions. EAI can provide new functions for basic architectures, without generating downtime nor impeding the proper operation.

Although EAI solutions are not suitable on a long-term basis, they can ensure a safe migration towards a stable platform at optimal costs.

I consider that the integrated computer system provides a series of features for a commercial enterprise, among which we note the unique processing of every piece of information and its dissemination to all applications that request it.

It is my opinion that enterprise application integration represents a framework of integration which is a part of the collection of technologies and services that enable the system and application integration within an enterprise. Supply Chain Management applications, Customer Relationship Management applications (guiding existing and potential clients), decisional information applications (finding a model in the existing database of operation) and other types of applications (controlling data such as human resources, healthcare or interior communication databases) which can't otherwise communicate with each other in order to share data or business rules.

It is for this reason that, sometimes, each application is reformed as an automated island or an information depot. The lack of communication leads to inefficiency, as identical data is sorted in multiple locations or advanced processes that can not be automated.

Enterprise application integration is the process that links such applications within an organization with the express purpose of simplification and automation of the business process, extending it as far as possible, while avoiding significant changes in existing applications or in the data structure. The Gartner Group believes EAI is an unrestricted partitioning of business processes and databases between any application connected or any data source within an enterprise.

A great challenge of EAI is the fact various systems that need to be linked together are housed in separate operating systems, using different database solutions or programming languages, and in some cases legacy systems maintained by the original

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<sup>2</sup> Doina Fotache, Lumunița Hurubean , “Soluții informatice integrate pentru gestiunea afacerilor”,Ed.Economică 2004 pg.152

suppliers. In some cases, such systems are known as “stovepipe systems” or “top-hat systems”, because they are comprised of components designed to only work together and are very difficult to upgrade or modify [Stănculea09c].

I consider that enterprise modeling represents the process of generating a model for the entire enterprise or for one of its divisions using procedural models, data models, resource models or new ontologies. These models are built upon enterprise knowledge, previous models and reference models as well as ontological domains that use a model representation language. Generally, an enterprise is an entity of the economic organization or of its activity. These activities are necessary in order to develop and distribute products or services for its clients. An enterprise includes a numbers of functions and activities such as: retail, manufacture, marketing, finance, engineering, research and development. The enterprise sections we are interested in are those corporate functions and operations that are necessary for the manufacture of current and potential products.

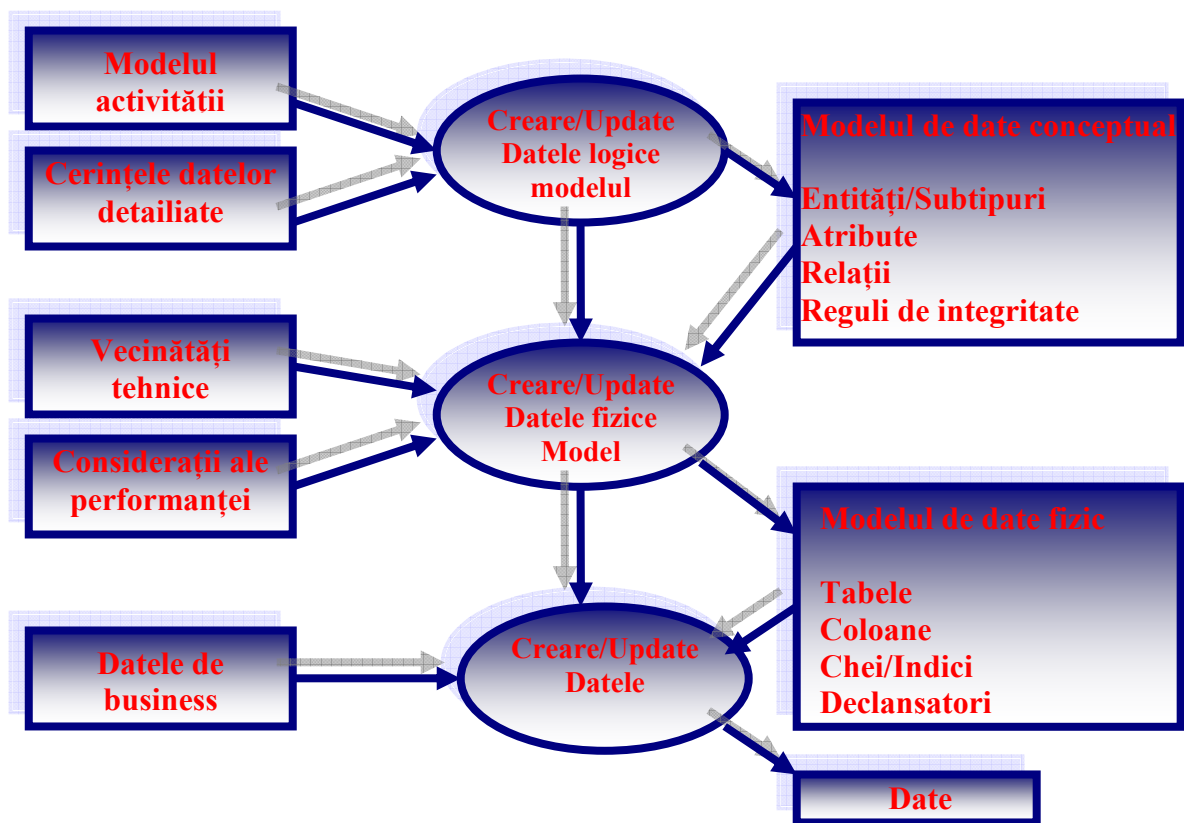


Figure 5.1 Data modeling process

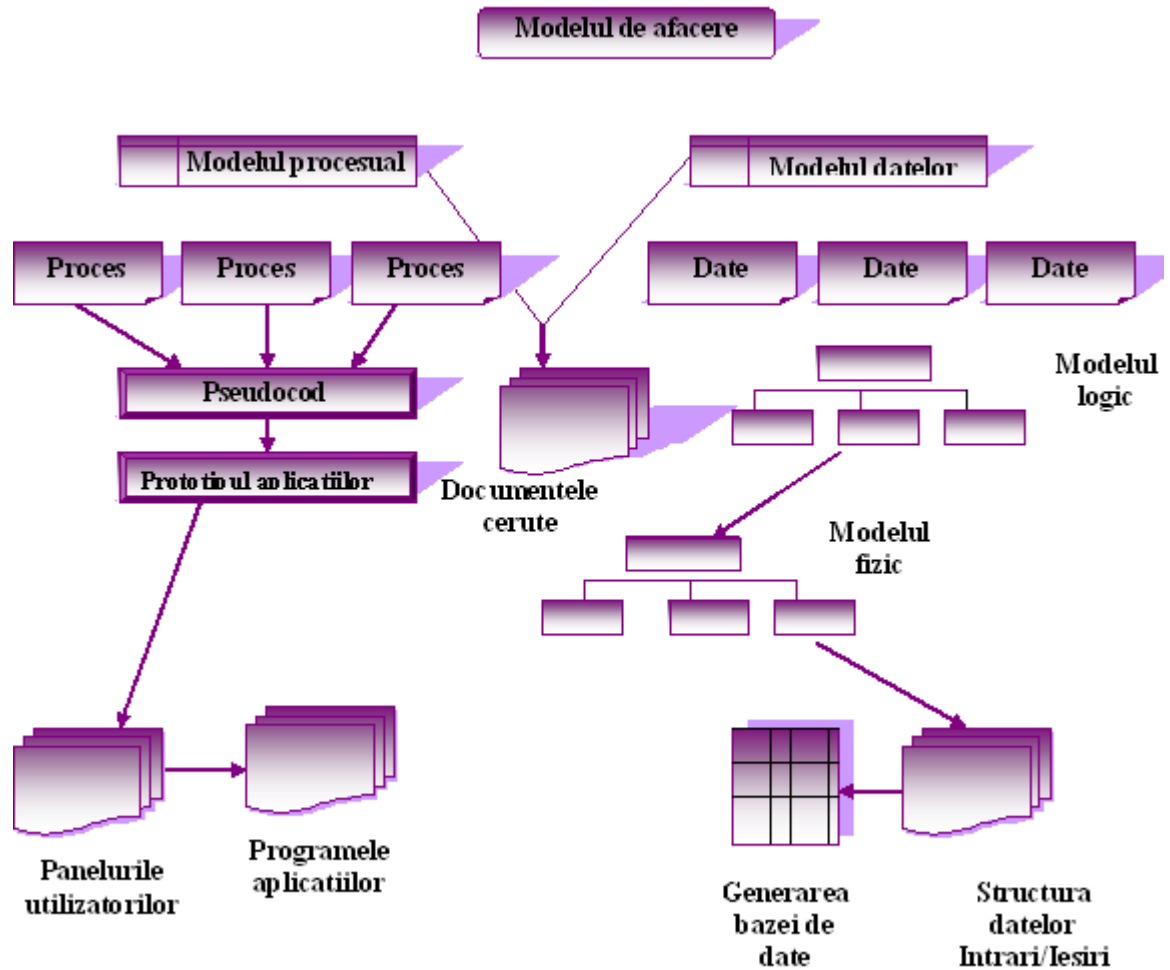


Figure 5.2 Business model integration

In recent years, the focus in the design and development area of computer systems has been the use of modern information technologies, amongst which we concentrate on the Unified Modeling Language (UML).

I believe this language is not just a simple object-oriented modeling language, but an universal standard language for all software developers. More than that, the language has begun to be used in other areas outside IT. For instance, we already have project management UML applications, Business Process Design ones, etc.

## **CHAPTER 6. A Prototype for Small and Medium Enterprise Integrated Information System at “S.C. Ardealul S.A.”**

The experience of commercial SMEs has revealed the difficulty is not in implementing an integrated application package, but rather obtaining and benefiting from the advantages offered by ERP systems. Economic entities encounter difficulties related to the complexity of ERP systems and the lack of understanding of their operation principles by their managers.

The basic modules of the SIARD prototype:

- Financial module - accounting
- Project administration module
- Human resources module
- Manufacture module
- Retail module
- Maintenance module
- Project management module
- Investment administration module

We consider that, through the proposed goals and the requirements associated with the system, the system prototype will both promote and sustain the company's competitiveness on the retail market and will, at the same time, have a major contribution in the process of computerization of SMEs in the commercial domain.

The application “Merchandise Stock Administration at S.C. ARDEALUL S.A.” was programmed using the Visual Studio 6.0 software platform, specifically the Visual Basic programming language.

The application's menus, as well as their access order are in concordance with the Structure Diagram.

The main menu of the application is a MDI (Multi Document Interface) window that loads upon launch of the executable file “Stocuri.exe”, from where we can (optionally) open all the other windows, considered by the program as being generated by the main window (“child” windows). Upon closure of the child windows, the application returns to the main MDI window level.

Each main module of the Application is correlated with an active window and is handled through program events from the active window or is launched by the triggering of a close event of the active window. It is at this time that the final updates of information are made within the database, as well as closing the connection to the stock database.

# Prototip SIARD

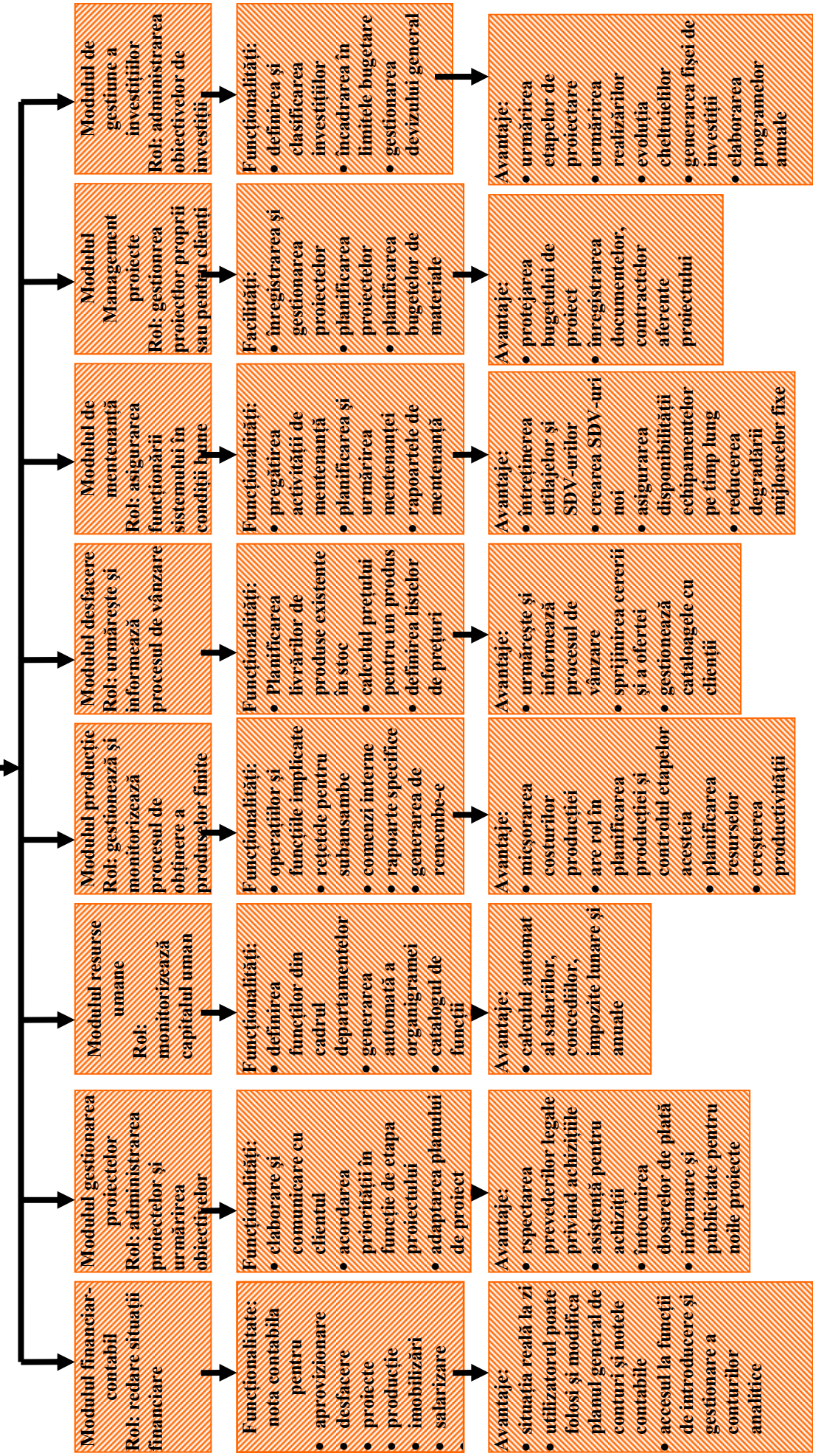


Figure 6.7 SIARD prototype modules, features and advantages

The data necessary for the operation of the Application are stored inside a single ACCESS database (“STOC.mdb”, located in the Application’s current folder), containing several relational tables.

The implemented work windows are the following:

- “S.C. Ardealul S.A.” identification data
- “S.C. Ardealul S.A.” provider management
- “S.C. Ardealul S.A.” client management
- “S.C. Ardealul S.A.” stock inputs
- “S.C. Ardealul S.A.” stock outputs

We view the database as a set of inter-correlated files. The connections are represented through relationship links, which can take shape as conceptual and logical data models, and represent the starting point of the physical design of databases. The relationship from the entity-relationship diagram is transformed into physical files.

I concluded that, in the design of database architecture, we have to consider several aspects, out of which the most important is system size.

The database administration system serves in the implementation of the relational architecture. For the commercial enterprise “S.C. Ardealul S.A.” we utilized a relational database model. The relationships, links or associations chosen were of the many-to-many type [Stănculea05f].

I considered that, in our country, the ERP, CRM and SCM solutions are predominantly used by larger companies, especially those that have a consumer-oriented business model. The majority of companies that have implemented ERP, CRM and SCM solutions also have a web interface for those systems.

These technologies were designed to access distributed and heterogeneous content sources and to utilize a fluctuating performance communication infrastructure. By building applications in a 3-tier distributed architecture, which implies the existence of a web interface, we enable the access to data and resources in a centralized fashion [Stănculea05b].

We designed and put into operation the website of the commercial enterprise “S.C. Ardealul S.A.”, a site containing the following pages: Home Page, History, Partners, Conducting Commercial Transactions and General Conditions, Request Form with the features of a commercial website.

## **CHAPTER 7. Increasing Management Performance through Computerization of Commercial Small and Medium Enterprises**

The trend towards performance of commercial SMEs represents a natural phenomenon, considering the essential role these entities play in the economy. In many world countries, this sector (of SMEs) becomes increasingly important, providing employment, stimulating entrepreneurial potential, ensuring economic stability and social development.

Having different goals and motivations than larger companies, the strategic objectives of SMEs manifest in a tendency to develop and ensure continuity in the acquirement of stable income. Amongst the basic concerns of commercial SMEs we find the selection of products and services that enable maximal commercial advantages. In order to do this, they employ new and performing technologies such as: smart-phones, videoconference systems, IP telephony.

In order to achieve high performance, we consider that commercial SMEs should carefully manage their resources and capitalize them with highest possible results. Also, we consider that they have to achieve a competitive administration, ensuring the economic and financial equilibrium that can be potential obtained. By restructuring the management system, its subsystems and the operationalization style of management functions, we can obtain the expected performance.

The more customer satisfaction levels go up, the easier it will be to obtain in these businesses a viable profit which will determine the increase of the value of the organization and of shareholder wealth. The improvement of the management system of SMEs pertains to all components of this system. Therefore, the price-cost relationship has to drive the conduct of all operations of commercial entities.

Using modern information technologies to ensure the integration of internal and external entities with suppliers, customers, financial and banking bodies, commercial SMEs are introducing "e"-type concepts which have the effect of globalizing information systems and the increase of the reaction speed of economy players [Stănculea05j].

The efficiency of commercial activity reflects, alongside the work done by commercial employees that of people that manufacture and make use of consumer goods. In order to better understand the influence factors of retail activities, we considered it best to analyze three factors: price, added cost and profit.

After explaining how each of the above-mentioned factors exert their influence, in order to coalesce this research paper, I considered necessary to underline the indicators which can be used to estimate the economic and social efficiency of commercial SME activity. I appreciated that a special role in the analysis of the economic effectiveness of commercial SMEs is represented by such financial indicators as: patrimony, social

capital, and net actives. By calculating and analyzing these indicators, we come to a better understanding of influence factors on economic efficiency and the necessary measures they impose.

The proper organization of merchandize circulation from the manufacture area to the retail outlet and the extension of direct delivery transit positively reflect on transportation expenses, goods circulation velocity and supply rhythmicity, which positively influence the economic and social efficiency of commercial enterprises. Increasing the performance of commercial SME activity represents the main goal of commercial entities.

## **CHAPTER 8. Final conclusions**

After the research and studies made regarding the commercial SME sector, I found that, given the importance of these entities in the development of the economy, the problems and circumstances they are faced with are solved by the practice of their activity, resorting to modern techniques, methods and procedures of problem-solving.

In order to get a clear picture of commercial SMEs, we presented the concept of management, the various forms in which the managerial process is manifested in SMEs and the performance of the managerial activity of the entrepreneur.

As part of the information system in which automated data handling is predominant, the computer system is a coherently structured entity composed out of computation and communication electronic equipment, software programs, processes, automated and manual procedures, being used as an automated data processing tool within a given activity field.

Within commercial SMEs, the computer system provides the information necessary for management and the proper flow of activity. I considered that, due to the permanent evolution of information technology, SMEs are obliged to engage in the globalization process and to switch to a virtual economy that is a reality of the third millennium.

Commercial businesses are forced to upgrade or replace their information systems, considering that aligning to modern management trends requires the development of better performing systems in which users can communicate at a distance and underline the decisions made towards accomplished management processes.

By researching field-specific literature, we gather that information systems such as ERP, CRM and SCM which appeared relatively recently on the global market ensure a growing increase in the efficiency of the companies using them.

Perfecting these instruments within commercial SMEs leads to an increase in the performance of these entities.

The integrated ERP system, such as mySAPERP, presents the advantage of being able to win new markets and rapidly adapt to permanent market changes, of responding



in optimal time to client requirements and of extending enterprise function processes, encompassing company clients and partners. To meet an increasing level of customer requirement satisfaction, CRM represents a managerial strategy. This strategy aims to identify key wishes and behaviors of commercial enterprise customers, and then make beneficial use of the acquired data.

In order to achieve high performance, commercial SMEs should carefully manage their resources and capitalize them with highest possible results. Also, they have to achieve a competitive administration, ensuring the economic and financial equilibrium that can be potential obtained.

Through the restructuration of the management system, its and their subsystems and the operationalization style of management functions can we obtain the expected performance. The more service levels offered by commercial SMEs to their customers go up, the easier it will be to obtain a viable profit which will determine the increase of the value of the organization and of shareholder wealth.

A special role in the analysis of the economic effectiveness of commercial SMEs is represented by such financial indicators as: patrimony, social capital, and net actives. By calculating and analyzing these indicators, we come to a better understanding of influence factors on economic efficiency and the necessary measures they impose. The proper organization of merchandize circulation from the manufacture area to the retail outlet and the extension of direct delivery transit positively reflect on transportation expenses, goods circulation velocity and supply rhythmicity, which positively influence the economic and social efficiency of commercial enterprises. Increasing the performance of commercial SME activity represents the main goal of commercial entities.

I considered particularly important, in order to ensure the achievement of enhanced performance by commercial SMEs, the tackling of such tasks as: Enterprise Architecture and its use in the modeling process of computer systems for SMEs, Enterprise Modeling, Enterprise Grid Computing, SOA services and UML.

The knowledge of such techniques and technologies ensure a new direction for commercial SMEs, with beneficial effects for activity performance increase. I considered that commercial SMEs are interested in merging such high-performance techniques and technologies into their activities in order to ease the workload and ensure the achievement of revenues while confronting marketplace surprises.

In the section regarding the analysis of the existing information system at “S.C. Ardealul S.A.”, I included the project orientation, database creation and implementing a reference system, strategic variable identification, main variable selection, the information system components, the cardinality of association, including entity-association diagrams, processing flux diagrams, design stages of the database structure, loading the information into the database, operation and maintenance of the database, stockpile administration and record subsystem and the proving documents regarding records of administration and movements of stock.

Regarding the objectives of the SIARD integrated system, we underlined the integration perspective improvement of computer systems vis-à-vis sales, relations with other businesses and suppliers.

Application integration regarding the commercial subsystem into the SIARD system started with the documentation flux related to the commercial subsystem of “S.C.

Ardealul S.A.”, the specific type of retail administration, critical analysis of the existing system, defining goals and establishing requirements and application design.

Keeping in mind that in each subchapter we have presented author observations regarding theoretical and practical elements, this represents a contribution to the doctoral thesis.

Other than that, we can consider as contributions to this paper a series of works such as: in the “Information and Computer Systems” chapter, in order to reproduce in a form as synthetic as possible the main types of information and computer systems, and to obtain a general picture of the evolution of such systems, I have elaborated a table containing the main types of information and computer systems.

Also, EAI, being a strategic structure which surpasses the product-program development, the redesign of the organizational environment includes future technologies with maximal efficiency, acceptable costs and low data redundancy.

For “S.C. Ardealul S.A.”, EAI represents a possibility to open up new business perspectives which include web applications, internet/extranet technologies, mobile and wireless technologies.

In the analysis of the information system at “S.C. Ardealul S.A.”, we have taken into account the complexity and particularities of the information system, the actual working condition and the experience of intrinsic auditors.

The “Merchandize Stock Administration” application for “S.C. Ardealul S.A.” was implemented using the Visual Studio 6.5 software platform, specifically the Visual Basic programming language. The application menus and their access hierarchy was respected. Most parts of this paper have already been published as articles for international conferences or in national magazines rated by CNCSIS (categories C and B+).

These followed chronologically, underlining new elements. Starting in 2001, various articles were published such as: [Stănculea03] “*Browser-e Web*” (web browsers), [Stănculea05a], “*Aplicații informatice de Business la IMM-urile din domeniul comercial, strategii de dezvoltare*” (business software applications in commercial domain SMEs, development strategies), [Stănculea05b], “*Elaborarea unui Web site în IMM-urile din domeniul comercial*” (designing a website for commercial domain SMEs), [Stănculea05c], “*Importanța cunoașterii operative a modului de desfășurare a activităților în cadrul IMM-urilor pentru a putea interveni operativ în reglarea și menținerea proceselor*” (the importance of operative knowledge of the activity operating mode within SMEs enabling operative interventions for the regulation and maintenance of processes), [Stănculea05d], “*Aplicații informatice ale analizei economico-financiare*” (software applications of the economic-financial analysis), [Stănculea05e], “*Cresterea, scopul fiecărei societăți comerciale*” (growth, the goal of every commercial company), [Stănculea05f], “*Gestiunea informatizată a stocurilor în cadrul societății comerciale*” (computerized administration of stockpiles within a commercial company), [Stănculea05g], “*Realizarea produselor informatice de gestiune ale firmei de comerț*” (implementing commercial enterprise computerized administration products), [Stănculea2005h] “*Sisteme informatice manageriale pentru IMM-urile din domeniul comerțului. Modele și funcții utilizate în proiectare*” (managerial information systems for commercial domain SMEs. Models and functions used in design), [Stănculea05j] “*Tehnici moderne de creștere a performanței*” (modern techniques for performance

improvement), [Stănculea05j], “*Modeles utilise dans le project des systemes managerials informatiques des petit et moyen entreprendre dans le domain de comerce, modeles et fouctions*” (models used in the design of managerial information systems of commercial domain SMEs), [Stănculea05k], “*Using Java for e-shop Development*”, [Stănculea05l], “*Practical Issue in E-shop Development*”, [Stănculea05m] “*fundamentarea stiintifica a deciziei conditie pentru realizarea obiectivelor care stau in fata IMM-urilor din Romaniaia*” (the scientific basis of the conditional decision for achieving objectives facing Romanian SMEs), [Stănculea07a], “*Dezvoltarea IMM-urilor în România*” (the development of SMEs in Romania), [Stănculea07b], “*Sistemul decizional al IMM-urilor din domeniul comercial*” (decision-making system of commercial domain SMEs), [Stănculea07c], “*Managementul aprovizionării și desfacerii la o întreprinder comercială*” (supply and retail management of a commercial enterprise), [Stănculea08a] “*Proiectarea sistemelor informatice*” (the design of computer systems), [Stănculea08b], “*Proiectarea orientată pe obiect a sistemelor informatice*” (object-oriented design of computer systems), [Stănculea08c], “*Sisteme informatice de tip CRM*” (CRM computer systems), [Stănculea08d], “*SCM-soluția care aduce beneficii pe termen lung*” (SCM – the solution with long-term benefits), [Stănculea08e], “*Particularitățile organizatorice și manageriale ale IMM-urilor*” (the organizational and managerial particularities of SMEs), [Stănculea08f], “*Sistemele ERP, CRM, SCM, perfectionarea sistemului de management la IMM-urile comerciale*” (ERP, CRM and SCM systems, improving the management system of commercial SMEs), [Stănculea08g], “*Managementul performanței și informatizarea la IMM-urile comerciale*” (performance management and computerization of commercial SMEs), [Stănculea08h], “*Elaborarea planurilor și programelor de acțiune ale IMM-urilor comerciale*” (creating plans and action programs for commercial SMEs), [Stănculea09a], “*Criterii generale de evaluare a produselor informatice*” (general criteria for evaluation of software products), [Stănculea09b], “*Service Oriented Architecture*”, [Stănculea09c], “*Enterprise Modeling-Modelarea întreprinderii comerciale*” (enterprise modeling – the modeling of a commercial enterprise), [Stănculea09d], “*Sisteme informatice integrate, directii de integrare*” (integrated computer systems, integration vectors), [Stănculea09f], “*Enterprise Grid Computing*”, [RusuStănculea05] “*Sisteme integrate și sisteme ERP*” (integrated systems and ERP systems), [RusuStănculea04] “*Tehnici și tehnologii distribuite în aplicații Java*” (distributed techniques and technologies in Java applications), [RusuStănculea04], “*Analiza managerială a firmelor utilizând Office Web Components*” (managerial analysis of companies using Office Web Components), [Ghișoiu02], “*FOX PRO Culegere de programe*” (FOXPRO – programming samples).

## Bibliografie selectivă

1. [Andone93] Andone I. Inteligența artificială și sisteme expert în contabilitate Ed. Moldova 1993
2. [Andone94] Andone I. Sisteme Expert – Principii și dezvoltarea aplicațiilor de gestiune, A-92, 1994
3. [Andrew97] Andrew S. Tanenbaum, Rețele de calculatoare, Computer Press Agora Târgu Mureș 1997
4. [Avornicului01] Avornicului C. Proiectarea sistemelor informatice, Ed. Risoprint Cluj N. 2001
5. [Avornicului04] Avornicului C., Tomai N., Avornicului M., Proiectarea Obiectuală și UML Ed. Risoprint Cluj N. 2004
6. [Avornicului99] Avornicului C. Tomai N. Proiectarea sistemelor informatice și utilizarea Internetului în diverse domenii, Ed. Risoprint, Cluj N 1999
7. [Buchman04] Buchman Andrei, Conceperea, proiectarea și realizarea afacerilor pe Internet, Ed. Risoprint Cluj N 2004 . 16 16 [CĂL2003] Călin Ioan Acu, Optimizarea paginilor Web Ed. Polirom 2003
8. [Fotache04] Doina Fotache, Lumunița Hurubean, Soluții informatice integrate pentru gestiunea afacerilor ERP, Ed economică Buc., 2004
9. [Ghișoiu00] Ghișoiu N, Lacurezeanu R, Țarcă N. STĂNCULEA L. FOX PRO Culegere de probleme Ed. ICPIAF Cluj N. 2000, 129 pagini ISBN 973-98209-0-5
10. [Ghișoiu02] Ghișoiu N. Programarea Ed. Risoprint Cluj N. 2002
11. [Ioniță05] Ioniță F. Impactul creșterii performanței manageriale prin informatizare asupra competitivității unităților de producție, Conf. Ec. Internațională Binomul “Sărăcie-Bogație” Ed. Univ. “Lucian Blaga “Sibiu 2005
12. [Lăcurezeanu93] Lăcurezeanu R. și M. Banca virtuală, volum Simpozion Univ. »Bogdan Vodă » 1993
13. [Lazăr02] Lazăr I., Vereș Vicențiu și Mostan Matia, Management general Ed Dacia Cluj Napoca 200
14. [Matiș94] Matiș D., Aplicații practice ale noului sistem contabil, Ed. Eșantion Cluj N. 1994
15. [Nițchi99] Nițchi St. Esential în comunicarea pe Internet și [www.Ed.Risoprint](http://www.Ed.Risoprint) Cluj N. 1999.
16. [Nițchi99] Nițchi Stefan, Sisteme suport de decizie, Curs universitar 1999
17. [Oprean94] Oprean D. Proiectarea și exploatarea sistemelor informatice, Tipografia Univ, Creștine” Dimitrie Cantemir Cluj N. 1994
18. [Oprea99] Oprea D., Analiza și proiectarea sistemelor informaționale economice, Ed Polirom 1999
19. [Oprea02] Dumitru Oprea și col. Sisteme Informaționale pentru afaceri, Ed. Polirom Iași, 2002.
20. [Oprean01] Oprean D. ITSC informare și comunicare management și informative, proiectare de tehnologii informațional-decizional. Ed. Risoprint Cluj N. 2001
21. [Păunescu93] Păunescu F. Goleșteanu D, P. Sisteme de prelucrare distribuită și aplicațiile lor Ed. Tehnică Buc. 1993
22. [Păunescu01] Păunescu Dan Proiectarea paginilor Web Ed. Spirit Românesc, Craiova 2001

23. [Racovitan 2000] Racovitan D.s.a. Elemente de instruire la distanță prin internet Ed.Casa cărții de știință Cluj N. 2000
24. [Racovitan94] Racovitan D.M., Oprean D. Oprean V. Informatica de gestiune și managerială aed. Aeurounion Oradea 1994
25. [Racovitan97] Racovitan D.M. s.a Particularități ale managementului informatic al firmelor, Sesiunea de comunicări științifice Univ « Bogdan Vodă » Baia Mare 1997
26. [Rusu95] Rusu L., Rusu A., Pachete de programme, Ed.COMPREX Cluj N. 1995
27. [Rusu96] Rusu L., Pachete de programme în economie, Ed. ICPIAF Cluj N. 1996
28. [Rusu98] Rusu L., Rusu A., Informatică managerială și aplicațiile ei Ed.Risoprint Cluj N., 1998
29. [Rusu01] Rusu L. Aplicații clasice și moderne în afaceri, Ed.Mediamira Cluj N. 2001
30. [Rusu01] Rusu L. Java și Cobra în sisteme distribuite Ed.Risoprint Cluj N., 2001
31. [Rusu04] Rusu L., Robert Buchmann, Dezvoltarea aplicațiilor Web, Ed. Risoprint Cluj N. 2004
32. [Rusu05] Rusu L coordonator, Mureșan, L., Arba R., Breșfelean P., Rusu, STĂNCULEA L., Sisteme integrate și sisteme ERP, Editura Risoprint Cluj N, 215 pagini, ISBN 973-656-243-6J12005. 1
33. [Rusu03] Rusu L., Robert Buchmann Proiectarea și Realizarea Aplicațiilor Web Ed.Risoprint Cluj N., 2003
34. [RusuSTĂNCULEA04] RUSU L.Stănculea L, Arba R, 2004 Tehnici și tehnologii distribuite în aplicații Java, Volumul Simpozionului “Sisteme distribuite”, Suceava 2004
35. [RusuStănculea04] Rusu L., Stănculea L, Mureșan I 2004., Analiza managerială a firmelor utilizând Office Web Components, Volumul Simpozionului « Sisteme distribuite »Suceava 2004
36. [Stănculea03] StănculeaLiana, Browser-e Web, Tribuna Economică nr. 232003
37. [Stănculea05] Stănculea Liana, Aplicații informatice de Business la IMM-urile din domeniul comercial, strategii de dezvoltare, Tribuna Economică nr. 192005
38. [Stănculea05] StănculeaLiana, Elaborarea unui Web site în IMM-urile din domeniul comercial Tribuna Economică nr.312005
39. [Stănculea05] Stănculea Liana, Importanța cunoașterii operative a modului de desfășurare a activităților în cadrul IMM-urilor pentru a putea interveni operativ în reglarea și menținerea proceselor, Sesiunea națională de comunicări științifice Univ. « 1 Dec.1918 »Alba Iulia 2005 publicat în Annales Universitatis Apulensis 2005 pag.124- 127
40. [Stănculea05] Stănculea Liana, Aplicații informatice ale analizei economico-financiare, Tribuna Economică nr.382005
41. [Stănculea05] Stănculea Liana, Cresterea, scopul fiecărei societăți comerciale, Sesiunea națională de comunicări științifice Univ « 1 Dec.1918 » Alba Iulia 2005 publicată în Annales Universitatis Apulensis în 2005 pag.121-124
42. [Stănculea05] Stănculea Liana, Gestiunea informatizată a stocurilor în cadrul societății comerciale, Tribuna Economică nr.15/2005
43. [Stănculea05] Stănculea Liana, Realizarea produselor informatice de gestiune ale firmei de comerț, Tribuna Economică nr. 34/2005

44. [Stănculea2005] Stănculea Liana Sisteme informatice manageriale pentru IMM-urile din domeniul comerțului. Modele și funcții utilizate în proiectare Tribuna Economică nr.47/2005
45. [Stănculea05] Stănculea Liana Tehnici moderne de creștere a performanței Tribuna Economică nr.3/2005
46. [Stănculea05] Fundamentarea științifică a deciziei condiție pentru realizarea obiectivelor care stau în fața IMM-urilor din România, A XII Sesiune de Comunicări Științifice, Univ.Spiru Haret volumul Publicații Științifice Specializate 2005
47. [Stănculea05] Stănculea Liana, Modeles utilise dans le projet des systemes managerials informatiques des petit et moyen entreprendre dans le domain de commerce, modeles et foudctions, Uiv »Babeș Bolyai », Internațional Workshop Ed.Risoprint Cluj Napoca 2005.
48. [Stănculea05] Rusu, L., Raluca Arba, Stănculea Liana, Using Java for e-shop Development, Volumul simpozionului „Binomul sărăcie-bogăție și integrarea României în UE”, Sibiu 2005
49. [Stănculea05] Lucia Rusuu, Loredana Mureșan, Stănculea Liana., Pracovitanical Issue in E- shop Development, Volumul Simpozionului „binomul Sărăcie-bogăție și integrarea României în UE”, Sibiu, 2005.
50. [Stănculea07] Stănculea Liana, Dezvoltarea IMM-urilor în România, Tribuna economică nr. 26/2007
51. [Stănculea07] Stănculea Liana, Sistemul decizional al IMM-urilor din domeniul comercial, Tribuna economică nr. 15/2007
52. [Stănculea07] Stănculea Liana, Managementul aprovizionării și desfacerii la o întreprinder comercială, Tribuna economică nr. 30/2007
53. [Stănculea08] Stănculea Liana Proiectarea sistemelor informatice, Tribuna economică, nr.21/2008
54. [Stănculea08] Stănculea Liana, Proiectarea orientată pe obiect a sistemelor informatice Tribuna economică nr. 22/2008
55. [Stănculea08] Stănculea Liana, Sisteme informatice de tip CRM, Tribuna economică nr. 23/2008
56. [Stănculea08] Stănculea Liana, SCM-soluția care aduce beneficii pe termen lung, Tribuna economică nr. 24/2008
57. [Stănculea08] Stănculea Liana, Particularitățile organizatorice și manageriale ale IMM-urilor, Tribuna economică nr. 28/2008
58. [Stănculea08] Stănculea Liana, Sistemele ERP, CRM, SCM, perfectionarea sistemului de management la IMM-urile comerciale, Tribuna economică nr. 35/2008
59. [Stănculea08] Stănculea Liana, Managementul performanței și informatizarea la IMM-urile comerciale, Tribuna economică nr. 38/2008
60. [Stănculea08] Stănculea Liana, Elaborarea planurilor și programelor de acțiune ale IMM-urilor comerciale, Tribuna economică nr.44/2008
61. [Stănculea09] Stănculea Liana, Criterii generale de evaluare a produselor informatice, Tribuna economică nr. 21/2009
62. [Stănculea09] Stănculea Liana, Service Oriented Architecture, European Integration – New Challenges for the Romanian Economy 5th Edition 29 – 30 May 2009, Oradea, România p 184

63. [Stănculea09] Stănculea Liana, Enterprise Modeling- Modelarea întreprinderii comerciale, Tribuna economică nr. 28 2009.
64. [Stănculea09] Stănculea Liana, Sisteme informatice integrate, directii de integrare, Tribuna economică nr. 30 2009
65. [Stănculea09] Stănculea Liana, ENTERPRISE GRID COMPUTING, Challenges for Analysis of the Economy, the Business, and Social Progress, International Scientific Conference Szeged [Hungary], November 19-21, 2009.
66. [Tomai00] Tomai N. Rețele de calculatoare cu aplicații în timp real, Ed. Risoprint Cluj N.2000
67. [Tomai01] Tomai N. Elemente de programare distribuită, Ed. Dacia Cluj N. 2001
68. [ Tomai02] Tomai N. Rețele de calculatoare, structuri, programme, aplicații, Ed. Risoprint, Cluj N. 2002
96. [www.cisco.com/](http://www.cisco.com/)
97. [www.eafcere.ro](http://www.eafcere.ro)
98. [www.computerworld.ro/](http://www.computerworld.ro/)
99. [www.inf.ucv.ro](http://www.inf.ucv.ro)
100. [www.ltzone.ro](http://www.ltzone.ro)
101. [www.Sap.Com](http://www.Sap.Com)
102. [www.SearchCIO.Com](http://www.SearchCIO.Com)
103. [www.sme-basel12com](http://www.sme-basel12com).
104. [www.w3c.org](http://www.w3c.org)
105. [www.wiley.comcompbok](http://www.wiley.comcompbok)