Developing an ERP Strategy Based On the IT Solution Life Cycle

Constantin Daniel AVRAM, Razvan Daniel ZOTA, Laurentiu CIOVICA
Academy of Economic Studies, Bucharest, Romania
costin.avram@gmail.com, zota@ase.ro, laurentiu.ciovica@gmail.com

This paper describes the benefits of developing an Enterprise Resource Planning (ERP) strategy. The research starts with an analysis of the current ERP market, in terms of products and related services, in order to identify the beneficiaries' needs and behavior. ERP projects have been experiencing a period of strict budget control. This led to a more mature approach of the customers during the selection of the ERP products, vendors and system integrators. As a result we see more realistic expectations regarding ERP's functionalities and a stronger focus on the business value generated by ERP implementations. In this context companies understand the meaning and the importance of developing ERP strategies. The paper explains ways of creating efficient ERP strategies based on the entire ERP lifecycle, from business analysis, process engineering, system analysis and design, implementation and maintenance support, and focusing on the organization's strategic processes.
Keywords: ERP Strategy, Benefit Realization, Business and Technological Strategy, Process Engineering, Systems Analysis and Design

1 Introduction

From the report Panorama, 2011: pp. 1-15, [1] we discover the effects of the current economic crisis on the international ERP market. The study was conducted on 185 companies from 57 countries working in manufacturing, service industries, transportation, communications, electricity, gas, sanitary services, public administration, construction and wholesale trade. Only companies that implemented an Enterprise Resource Planning system, ERP, during 2010 were considered.

The report shows that at international level the ERP implementations didn't decrease in terms of number of projects. Instead a reduction of budget was registered.

Table 1. International ERP Implementations. Statistics: Source Panorama, 2011 [1]

Indicator	Average of 2010	Average of 2009
Implementation Cost	$5.48 million	$6.2 million
Implementation Duration	14.3 months	18.4 months
Return on Investment (ROI)	2.5 years	2.7 years
Budget (% cost/revenue)	4.1%	6.9%

The implementation cost was reduced in 2010 from 2009 with more than 10% perhaps by accelerating or skipping some project phases. In Table 1 we see that the implementation period was also reduced from 18.4 months to 14.3 months. The return on investment was aimed for 2.5 years in 2010 instead of 2.7 years in 2009. It seems that during the economic recession, ERP implementations are registering strict budget control. In terms of costs, the results show that in 2010 less money were spent than in 2009 with reference to total revenues. In 2010 a level of cost to income of 4.1% was registered instead of 6.9% in 2009.

The same report, Panorama, 2011: pp. 1-15 [1] shows in Table 2 that the effects of cost reduction have led to disadvantages such as project overrun or budget problems.

Table 2. International ERP Implementations. Risks: Source Panorama, 2011: pp. 1-15 [1]

Risk	Average of 2010	Average of 2009
Over period	61.1%	35.5%
Over budget	74.1%	51.4%
Benefits realization(<50%)	48%	67%
Benefits realization(<30%)	21%	55%
Benefits realization(>50%)	42%	33%

Correlating information from Table 1 and *table 2* concerning the ERP projects at international level, the conclusions are:

- while organizations are decreasing the implementation budget with 10%, more companies are registering budget overruns;
- while project duration is decreasing with more than 20% the number of companies exceeding the period allocated for the ERP implementation has doubled in 2010 compared to 2009;
- while the total cost of implementation represents a smaller percentage from the total revenues, most implementations fail to provide to end-users all their demands and requirements; however this is happening less in 2010 compared to 2009.

The last risk indicator, benefit realization, counts the implementations that fail to deliver in terms of requirements fulfilment. In 2010 only 48% of the implementations delivered less than 50% of the benefits while in 2009 this indicator reached 67%. In 2009 no less than 55% of the projects delivered only 30% of the requirements while in 2010 we see huge improvements as only 21% of ERP implementations are delivering so little. A very good news is that in 2010, 42% of ERP projects are registering more than 50% of benefits delivering while in 2009 only 33% of the implementations did so.

In our opinion and according to Table 1 and Table 2 companies are defining smaller budgets for ERP implementations and they are overrunning these budgets. This will increase the pressure on the ERP vendors and ERP system integrators. This will lead to a more modular approach of the implementations and it will create more space for outsourcing which can be very interesting for Romania. We have noticed a growing interest of countries such as Germany, Belgium, Holland, France, UK, Switzerland, in outsourcing their IT solution to countries such as Romania, Hungary, and Poland. According to Pierre Audoin Consultants (PAC) report, ERP Romania 2011, [2], the local IT market didn't overcome the recession period by the end of 2010 and first semester of 2011. However, the IT sector itself grew due to outsourcing projects. The choice of working with Romanian companies is strengthened by Romania's capacity to work at low rates while maintaining a good quality level of the service. This is also possible because of no insurmountable cultural barriers between Romania and Central and Northern Europe. The decision of outsourcing IT projects in countries such as Romania is a strategic decision. It is not only a tactical decision since it has huge global impacts and it needs years of analysis, internal decisions and reorganization. It needs several pilot projects to understand risks and benefits. According to our experience, most companies are developing from six to 24 months proof of concept projects before deciding to outsource big maintenance projects. Cost reduction, especially during support and maintenance, is a must, but it has to be defined and implemented at a strategic level.

Simultaneously organizations are asking for smaller implementations periods because they expect to reduce costs this way, and on the other hand they need really fast an operational ERP system. In Avram, 2010: pp. 196-208, [3] we can find solid arguments regarding the correct definition of budget and the complete and realistic project scheduling. An incorrect budget definition will also increase the pressure on ERP system integrators and they will engage in unrealistic competitions with the rest of system integrators. In the end, the ERP beneficiaries will suffer. Having these two requirements, budget and implementation period reduction, more maturity is required from the beneficiaries themselves. They shouldn't have less expectation instead they should have more realistic expectation regarding the ERP's functionalities and most of all they should develop an ERP strategy. For instance, a strategic approach in case of time pressure would be to consider the cloud solutions. A cloud solution has no initial investment costs and it can be live faster than a solution on premises. Theoretically, a cloud solution is also scalable. An organization can buy a correct dimension of the ERP solution and it can extend it depending on its growth.

Companies should concentrate on the really important functionalities of the ERP, so called *"must be"* functionalities and postpone the *"nice to have"* requirements for a different period. We think that this is actually happing if we are analysing the benefits realization indicator from *table 2*. Beneficiaries are becoming more realistic regarding the project expectations.

Edward Yourdon in Yourdon, 2010: pp. 1-21 [4] states that even with more rigid budget implementations policies and with more realistic beneficiaries' expectations, *death-march* projects will continue to exist. The author thinks that projects will not become faster due to decisions' delays. They might become cheaper as we discovered in the Panorama 2011 ERP Report [1], but cheaper means more outsourcing, more junior-level consultants, smaller teams, less administration support, more fragmented teams with people working on different projects.

Using quantitative methods of market survey this paper is analysing the ERP trends both for products and related services, from a strategic point of view and in a tight correlation with the business strategy itself. Similar topics were analysed in Rizescu, 2008: pp. 131-139 [5] regarding the Romanian offer of ERP solutions with a focus on ERP's functionalities but we don't find there a correlation between ERP's functionalities, processes, business models and business strategy. In Gartner, 2011: pp. 1-9, [6] we find clear definitions for ERP solutions and ERP strategies and also useful hey considerations for understanding the need of an ERP strategy and how companies can develop such strategies.

This paper is using a qualitative approach, cause-effect based, to explain the benefits of an ERP strategy considering the entire application lifecycle of an ERP solution:

- Business Consulting: business strategy and technical strategy;
- Process engineering: process analysis and process development;
- Analysis and design: system analysis, architecture, usability and system design;
- Software development: specification, coding, testing;
- Implementation: implementation, training, change management;
- Support maintenance: first level and second level support, future development.

Going through the entire application lifecycle of an ERP solution this paper underlines the importance of an ERP strategy and the importance of choosing the best ERP product to start with. The paper also presents a brief catalogue of ERP products meant to help organizations when choosing the most appropriate ERP product. The paper and the ERP catalogue should give organizations some directions regarding the development of ERP strategies integrated with their business strategies with the big purpose of increasing business value.

2 ERP strategies

Faced with the economic recession, ERP beneficiaries are defining smaller budgets and are becoming less tolerant to failure, delays, extra time or extra budget. Their attitude is normal since they are only asking for quality, acceptable and justified prices, and a functional and sustainable ERP system. This however, is not easy to achieve. Not during this period and not using these terms. What beneficiaries are actually asking for is increasing business value. In order to obtain this kind of benefit from an ERP system, we need to analyze an ERP lifecycle implementation, as described in Figure 1.
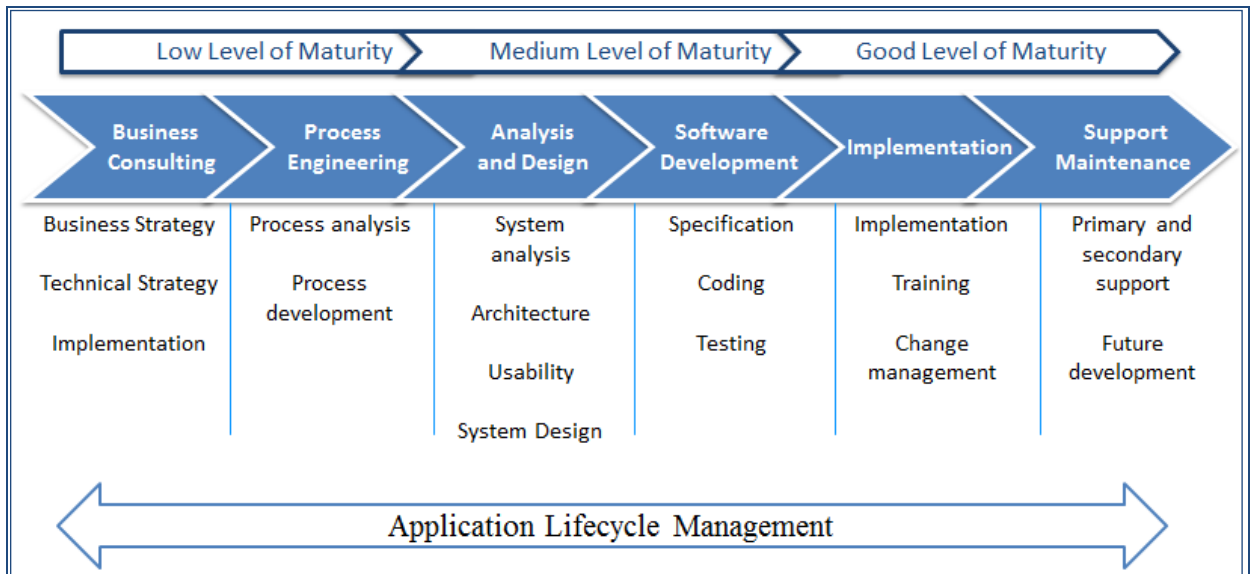
Fig. 1. Application Lifecycle Management

We believe that a key success factor in increasing business value using ERP systems comes from the beneficiaries' maturity. We refer to maturity in terms of business understanding, vision and IT strategic importance. We have noticed that ERP implementations begin with requirements such as IT cost reduction, short implementation periods, and effectiveness increase of IT operations. Such requirements and goals do not lead to an ERP system meant to increase the business value, to help companies in gaining more market share and to ensure a successful future of the organization. These goals refer strictly to the ERP implementation. Having a running ERP system becomes the objective itself. It is not a competitive approach and surely not a long term investment. The capacity of an organization to understand the best ERP solution increases during the ERP implementation itself. By the end of the implementation the beneficiary is more mature and is able to look back at the entire process, to understand what went good and what went wrong. We can even say that implementing an ERP system is like building a house. You will be able to project and build the right house after you have built at least one before. This is because we don't understand from the beginning our real needs and because we cannot predict the future needs of the market. It is a good thing to use best practices and others' experience but in the end, the ERP system, like the house you will live in, must fully comply with our real needs. According to *figure 1*, the maturity of the ERP beneficiary increases step by step, as we move forward with the implementation:

- there is a low level of beneficiary's involvement and awareness regarding the strategic importance of the ERP systems, during the first two phases of an implementation: Business Consulting and Process Engineering;
- there is a medium involvement during System Analysis & Design and Software Development;
- there is a high level of involvement and a sudden awakening of the entire implementation team, including of the beneficiary's team, during the Implementation phase and during the Support & Maintenance phase.

This kind of behavior is project oriented. The organization purchases an ERP product from a popular vendor and is hiring the best system integrator on the market, which of course is very expensive, hoping that by doing this, all the problems will be solved and benefits will certainly appear. The entire team, vendor, system integrator, the beneficiary's stuff will concentrate on the implementation and adaptation of the system. There is small interest in the ERP strategy and small interest in actually measuring the business value.

This approach is no longer good enough during economic recessions and not only. Many customers end up working for the ERP system instead of making the ERP system working for them and support them in producing business value. Developing an ERP strategy, implementing it and act accordingly during the entire IT solution life cycle will reduce the risk of failure during ERP implementations but even better, it will help organizations to measure the business value derived from the ERP project and increase this value.

2.1 Business strategy and technical strategy

From Gartner, 2011: pp. 1-9, [6] we find out that only 37% of companies are analysing the benefits brought by an ERP implementation. This means that there is no strategy regarding the ERP product since there is no measurement of the business value gained after the implementation. Gartner defines an ERP in terms of *"technology strategy that integrates a set of business functions, such as finance, HR and purchasing, with operational aspects, such as manufacturing or distribution, through tight linkages from operational business transactions to financial records"*, Gartner, 2011: pp. 2, [6]. According to Gartner's definition an ERP system is part of the organization strategy and this strategy should include:

- business objectives and goals;
- business processes in the scope of the ERP;
- the level of ERP customization;
- the level of integration;
- vendor selection;
- integrator selection.

We didn't mention budget as total cost of ownership and we didn't mention the implementation period, as part of the ERP strategy. They are, of course, important but since most of the ERP projects are configured around costs and duration, we would like to keep these elements outside the strategy. They will continue to represent a selection criterion during the vendor and integrator selection. But before that, an organization should consider the objective of the implementation, the

processes in the scope of the ERP, the level of customization and integration.

What an organization should really think before starting an ERP implementation is medium and long term objectives. If a manufacturing company holds 10% of the local market and aims to reach 20% in the next three years, then we have a problem of dimension. The ERP solution should work perfectly with the current company's dimension but should also work for a double size company. Another issue concerns integration and compatibility. A company that wants to double its market share may have an organic growth or may acquire partners or competitors from the market. When doing that, the roll out of the ERP solution, should be easily possible. If the acquired companies are already using efficient ERP systems and the steering committee decides to keep them, then a strong integration between applications should be possible. We have seen many integration projects between ERP solutions, even using the same product. These integrations are not easy since each company is already running a certain solution, with stable and mature processes. But not always a good solution for one part of the organization is the best solution for the entire group. In this case, the remaining ERP solution that will replace or integrate the other systems should be easily accepted and extended.

Key users from acquired companies, already working with an ERP system, are reticent to a new product. This always happens since changing the ERP system is not an easy process. Therefore, a detailed analysis should be done before deciding between integrating the ERP solutions and replacing them with a single system.

According to [7], there are eleven criteria a company should consider before deciding to change the current ERP system. First of all, the new ERP solution must be ***sustainable in the future*** [7] and this means it should be compatible with the business reality for the next ten years at least. The ERP solution must be ***very solid***, [7]. Solid means a very good technological background but focused on the organization's core business. Since

most of the times a new ERP system is changing almost the entire ***know how of the company***, [7] the system integrator must be chosen very carefully. An experienced system integrator, focused on ERP strategies and replacements of ERP product must be considered. The new ERP system must be implemented according to a ***well-defined methodology***, personalized for the company's configuration. If we are dealing with mergers of companies when there is a central and stable ERP solution that must substitute all the others, the implementation plan should be adapted accordingly considering the main processes to be implemented and the main locations. Let's consider a manufacturing company using SAP as the main systems and acquiring other factories that are not using SAP. If the decision is to extend SAP for the entire new group, the implementation should be done by processes. At first, the management is interested in having the commercial area all together: sales orders, contracts, offers, prices, discounts. All this must have a single and central accounting so the implementation will start with sales & distribution and with the financial modules. After these areas will be successfully implemented and live, the group should consider implementing the logistics area and the production planning area. This is part of the implementation strategy that comes right after the ERP selection. Having an ERP strategy means more than choosing the most appropriate ERP product. It means choosing the right systems integrator, developing a good implementation plan and negotiating a good maintenance contract.

2.2 Process engineering

An ERP solution, no matter how complete, will not fit perfectly the company's needs. A good ERP strategy must divide the processes in two main categories:
- ❖ core business processes;
- ❖ adjacent processes.

When choosing the ERP solution, the company should concentrate on the core business processes. The ERP system must support in a native way these processes, with a good level of flexibility. Adaptation and personalization should be possible and they are allowed. But this must be done with a minimum effort. Gartner, 2011: pp. 1-9, [6] calls these processes, *strategic processes* and they are represented by those areas that provide to the company business value and competitive advantages on the market. As for the adjacent processes, the company should adapt itself in order to find a good synergy with the ERP default functionalities. It is not an easy task to divide between strategic and non-strategic processes. Beneficiaries are tempted to declare all their processes strategic. But a clear distinction between strategic and important must be done. All activities inside a company are important but not all of them are strategic. In Avram et al., 2011a: pp. 211-215, [8] and Avram et al., 2011b: pp. 22-38, [9] a new business model for manufacturing industries is presented. The business model is based on a good integration between end-customers and producers in order to obtain personalized products, designed and executed to match perfectly the customer's needs. The business model could be used in the fashion industry, for instance in the footwear industry. A new production process was described, called *make-to measure*. This process is built around the theory of *customer order decoupling point*, as described in *figure 2*, and it deals with the automation of custom-made production. The business models places the customer in front of a *virtual factory*, projecting, designing and ordering personalized products. The theory of customer order decoupling point is built around the moment when the customer stops interfering with the production lines. As long as the end-customer is involved in the production process, influencing it, we are still in a phase called *customer order*. Once the control is passed to the production line, we use the term of *production order*. This is the point where modifications or customisation of the product are no longer possible and an execution phase starts. The more the end-customer is involved in the production process, the more personalized and *make-to-measure* the product will be. In the same time the production costs and delivery time will increase.
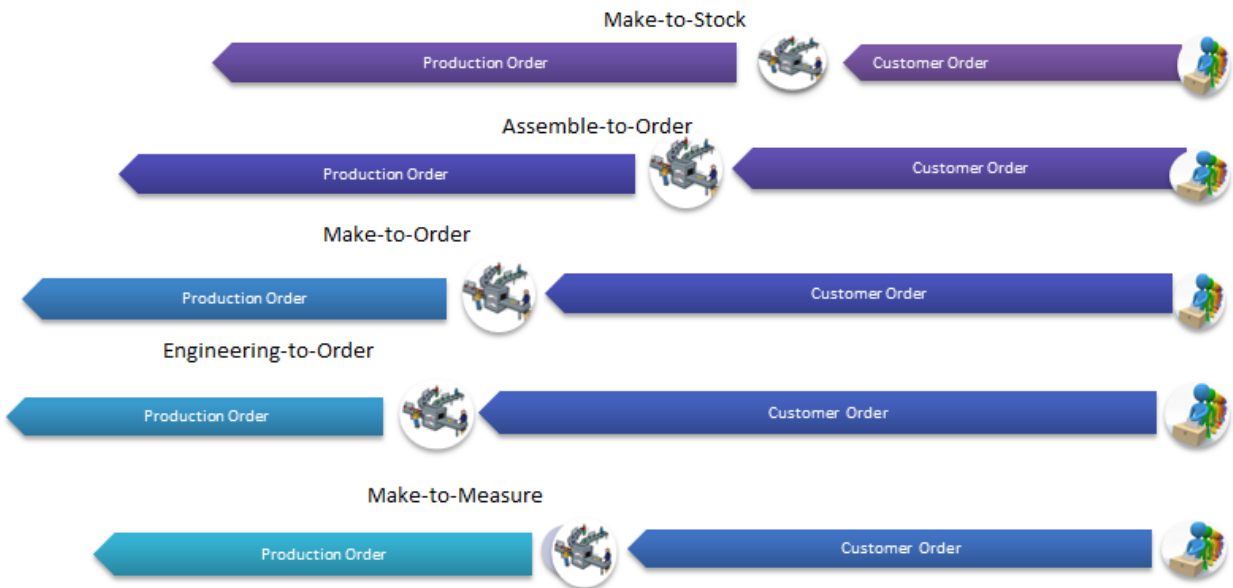
Fig. 2. Make-to-Measure Customer Order Decoupling Point

The new production flow finds its place among four main processes: make-to-stock, assemble-to-order, make-to-order and engineering-to-order. They all offer different levels of product personalization and different production costs. Each process is specific for a certain business model depending on the market an industry addresses. In Figure 3 we can see that by choosing a more customer oriented process we can obtain a more personalized product but with a higher production cost. The challenge is how to obtain *make-to-measure* product at competitive prices.
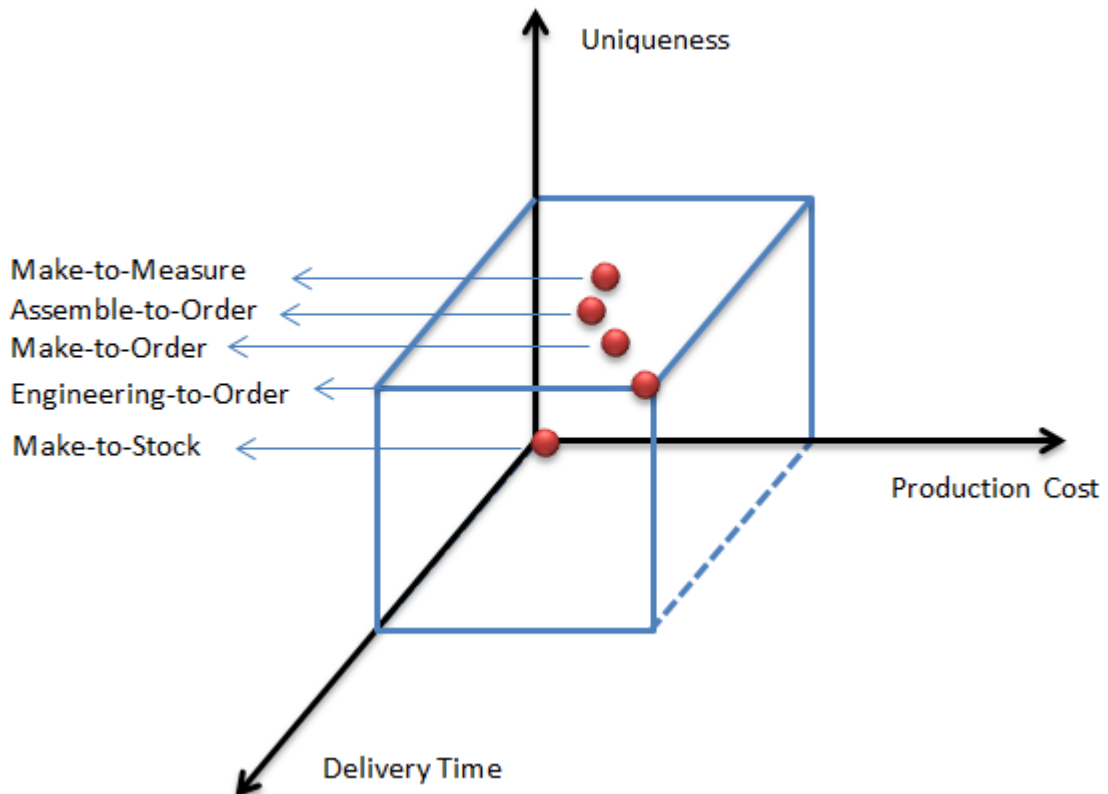

Fig. 3. Product uniqueness vs. production cost and delivery time

The answer is related to the ERP strategy and in particular to process engineering. If a company succeeds in implementing an ERP solution focused on production planning, customer relationship and supply chain management, it will be able to optimize the production process even if we consider the high level of product differentiation and personalization:

- **Production planning** is important since the company needs an ERP solution able to communicate to the shop floor systems and exchange relevant data in real time; it also needs a very good resources' allocation and resources' management;
- **Customer relationship** is also important since the customer is deeply involved in the production flow by projecting, designing and ordering differentiated and personalized products;
- **Supply chain management** is critical since this is not the case of a *make-to-stock* process where a company can buy in advanced form its suppliers, at convenient prices, with no time pressure; instead, in the *make-to-measure* flow, the company doesn't know from the beginning what to order or how much to order from its suppliers since the end-customer itself will influence this phase also; in this case the supply chain management will make the difference.

According to [7], the process engineering approach is one key criterion when choosing an ERP solution and it concludes that the ERP product must be perfectly adapted to the company's business model. We may add that not only a perfect fit is needed but also a certain level of flexibility since, a company may decide in the future to implement more than one production flow. Of course, all the others modules and process are important but in this particular case, the strategic processes are referring to production planning, customer relationship management and supply chain management. We strongly suggest the use of business process modelling instruments (BPM) and specialists that can help organizations in understanding better their processes.

We have seen situations where an approach based on BPMs instruments helped organizations eliminating redundancy from their processes and therefore reduce time inside the procurement department, optimizing the supply chain and the production planning flow accordingly. The business model presented in Figure 2 needs exactly this, a very efficient integration between CRM, SCM, the ERP system itself and the production lines. This is a clear case study of synergy between business strategy and IT strategy based on optimizing the strategic processes inside the organizations with the objective of offering differentiation and uniqueness at affordable prices and in acceptable time periods.

Once the ERP product or the ERP solution was identified according to the processes' scope, a valid system integrator is needed. Referring to the *make-to-measure* flow and according to [7], the system integrator must be very skilled and experienced when dealing with production planning processes and sales and distribution processes. We conclude by saying that the process engineering part of the ERP strategy refers to two elements:

- ❖ choosing an ERP system in the scope of the business process;
- ❖ choosing an ERP integrator with experience related to these processes.

2.3 Analysis and Design

Analysis and design phase, as part of the ERP application lifecycle and also as part of the ERP strategy deals with system analysis, system development, system architecture and system usability. According to [7] one key criterion when choosing an ERP system is represented by the benefits derived from the latest technological innovations. Once the company has a clear vision regarding the business model and the future development and once the strategic business processes were identified, the ERP beneficiary should concentrate on the technological solution. This means understanding the IT system as it is, analysing how it deals with the core business process and define ways of optimization. In this phase we deal with choosing the

right technology which, according to [7] means:

- choosing the database systems and the operating systems;
- designing the interfaces and choosing the technological platform;
- choosing the hardware platforms.

Regarding to the *make-to-measure* production process described earlier in this paper, we have noticed a strong demand of connecting, in e very efficient way, the buyers, the suppliers and the organization itself. This is because the buyer is interfering with the manufacturing process by projecting and designing the product and by ordering a personalized product. In order to do that, the end-customer will have access to 3D scanners in order to obtain some essential product's characteristics such as the exact size. The end-customer will order the product and will wait for the product to be delivered. Having a good integration between shop floor systems and the ERP system itself, the work in progress (WIP) can be monitored and therefore the buyer himself can see where his product is and when it will be delivered. This requires for fast, secure and interactive electronic communication, for friendly web-sites, for usage of Electronic Data Interchange (EDI) and Intermediate Document (IDOC in SAP), workflows, roles-based portals etc.

In Avram et al., 2011b: pp. 22-38 [9] a service-oriented architecture (SOA) able to manage the *make-to-measure* production process is presented. The architecture contains also open-source components because of the benefits offered, such as availability of the source code, the right to use the product in any way and redistribute the product together with any amendments, high stability, no information is hidden in the product, Avram et al., 2011b: pp. 22-38 [9]. Open-source components cost less and offer a good level of flexibility when discussing about integration.

Grid computing benefits should also be analysed and taken into consideration.

A very careful analysis should be done concerning the data base performance. In Ci-

oloca, Georgescu, 2011: pp. 13-23 [10], we find key considerations regarding data base performance using indexes.

According to Gartner 2011: pp. 1-9 [6] even if the entire ERP solution is sold by the same vendor and presented as a single, integrated platform, this is not necessary true or is not the best solution for a given business model. Gartner 2011: pp. 1-9 [6] has identified three kinds of application suites: vendor-branded, integrated and engineered. It seems that vendor-branded suites bring the fewest advantages, Gartner 2011: pp. 1-9 [6]. Since the entire ERP strategy starts with a deep analysis of the business requirements and a process engineering phase, it is easy to understand that an organization will find a better solution of integration than the one proposed by the vendor. Since the integration issue will affect the entire company's IT infrastructure, the analysis and design phase becomes part of the ERP strategy.

In Bakas, Romsdal, Alfnes, 2007: pp. 1-10, [11] we can find an ERP selection model that brings together strategy, IT infrastructure and processes, and ERP systems and vendors in order to identify the best ERP solution for an organization, as described in Figure 4. The model clearly states that the ERP selection is a strategic step and it proposes four phases of the selection process:

- preparation: during this phase the beneficiary is invited to go through three steps of the ERP lifecycle, as presented earlier in this paper in *figure 1*. The beneficiary needs to analyse and understand his strategy (business strategy and IT strategy), his processes but also some aspects of the technical solution (for instance the technological infrastructure, the level of integration) and needs to match these with existing ERP products; the result will be a long list of ERP products and vendors, [11];
- starting from the previous step, the beneficiary will analyse his current functional strategies and his AS-IS processes, skills and infrastructure and by combining this with a deep analysis of the ERP systems selected, will eliminate the vendors that do not meet the beneficiary's strategy,

[11];
- after a fine-tuning regarding the functional strategies and after defining the TO-BE processes, a shorter ERP product list will be obtained and this list will move to the request for proposal phase; as anticipated in the beginning of this paper, ERP costs (with licences, implementation and maintenance) are not excluded from the ERP strategy but they represent the last step of the selection methodology;
- during the last step the ERP system and vendor will be selected and the solution will be aligned with the organization strategy, with its processes, skills, and infra-

structure, [11].
There are lots of ERP selection methodologies but the reason we are mentioning the Bakas, Romsdal and Alfnes model is because it seems to us very efficient for the *make-to-measure* business model described earlier in this paper. ERP beneficiaries could choose one of the most common selection methodologies according to Wikipedia:
- SpecIT Independent Vendor Selection Management;
- Kuiper's funnel method;
- Dobrin's 3D decision support tool;
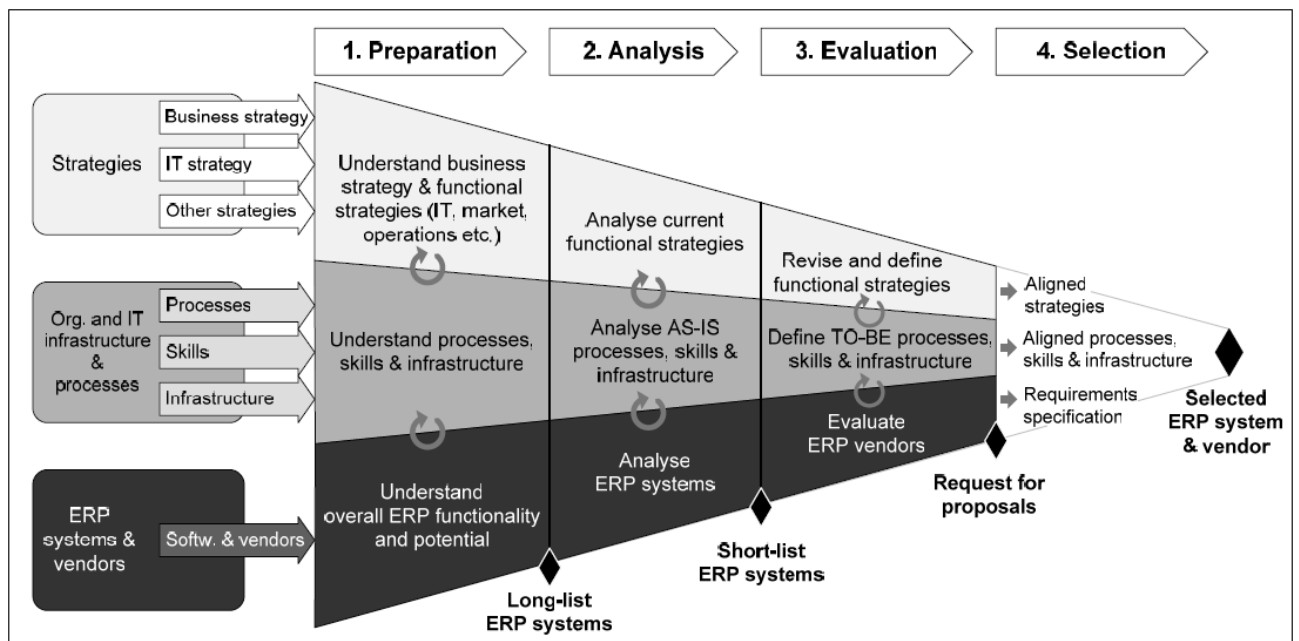- Clarkson Potomac method.

Fig. 4. ERP selection process model: Source Bakas, Romsdal, Alfnes, 2007 [11]

However, the model presented in Figure 4 is more oriented on the synergy between business strategy and IT strategy and is promising the identification of an ERP product focused on the scope of the business process and functional integration. It appears that before discussing about ERP selection, an organization should identify first the selection methodology. We believe this to be part of the ERP strategy since a company can implement several ERP products, integrate them at different levels and obtain an ERP solution. A company can have a central, strategic ERP product to manage the core business processes and different software appli-

cations for the management of adjacent processes. Since there is this kind of separations regarding the main purpose of an application, the ERP strategy can use different ERP selection methodologies.

2.4 Software development and implementation
During implementation and/or development phase, the ERP strategy should consider, first of all, the level of ERP customization, [6] and the level of personalization. Personalizing an ERP product, starting from the standard solution, and according to an ERP strategy, means:

- a gap analysis phase where the organization identifies needed functionalities that are not managed default by the system in place;
- creating the functional requirements for those functionalities;
- creating the technical requirements based on the functional specifications;
- developing the missing functionalities;
- maintain the new custom functionalities together with the rest of the system.

An ERP strategy should prevent the customer from having to develop too much custom functionalities since the product was selected thinking at two scenarios:

- the core business functionalities and processes inside the organizations are managed in a native way by the ERP solution, with its standard version; instead of personalization, the ERP system should allow a good level of customization in order to handle the client's core business processes;
- the adjacent functionalities and processes inside the organizations will be adapted as much as possible in order to fit the standard behaviour of the system, meaning that the organization is flexible enough and willing to change some internal processes.

For the remaining custom functionalities, to be developed, according to our experience the trend is to use different system integrators with different specializations. A big implementation process can have several teams of business analysts and functional consultants and more teams of software developers. The ERP strategy should consider the creation of an efficient working environment:

- clear roles and responsibilities;
- clear and efficient development methodology;
- good communication process between different teams;
- very efficient project managements;
- quality assurance;
- efficient risk management.

If these requirements are not treated well and considering that several teams from different systems integrators, with different specializations, are working together in order to deliver a single ERP solution, the outcome will consist in budget and periods overruns and a bad implementation overall. From our experience, a common situation is that of a very powerful beneficiary that changes the requirement during the developing process. Just because there are many teams involved, each team will do its best to handle the difficult situation generated by the client itself. The system integrators act like that because they feel in competition with each other, and this is actually true. What happens is that each single team will try to do its best to deliver and will forward the problem, in a hidden way, to the next team. This happens especially because one team needs the results of another team in order to deliver. Going back to the client saying that his uncertainties are generating problems, is the right thing to do, but no system integrator will do it. The problems will be hidden and forwarded to the next team. Each team will inherit the problem and deal with it, if possible. What actually happens is that the problem increases in complexity, creating loops and unnecessary extra work, like in Figure 5.
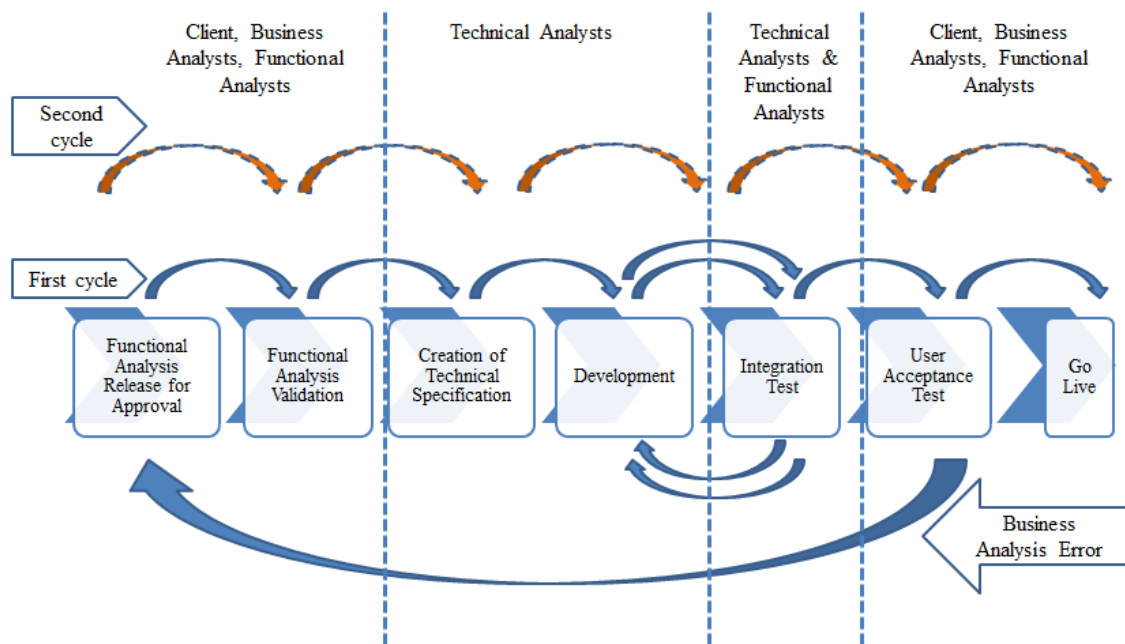
Fig. 5. Error propagation during the application life cycle

According to Figure 5, there is first cycle of developing custom functionalities that takes place in a sequentially way with almost no rework. There is some rework during integration test but that is normal. During user acceptance test, the end-customer discovers that the new functionality developed is not solving the problem and asks for modifications. Only that at this point, each modification needs to repeat the entire process from the beginning. This will create a second cycle of development and the process can repeat again and again in a trial and error loop, generating overruns. Even worth, a dispute starts between client, business analysts and technical consultants, trying to understand who generated the error, since nobody wants to work for free. It might even happen that the client won't pay extra but this doesn't means he is in a convenient situation. This is because the delays will affect business. Also, the system integrators having seen the approach will be tempted to declare more time effort from the beginning, making the client pay more. What we think is that the end-customer should be mature enough to understand that a bad business analyses generated by him, will always affect him directly. A strategic approach would be to spend more time during the functional analysis approval and to get involved more seriously so that he

becomes the first actor to create an efficient working environment.

3. ERP Catalogue
It is clear that companies are becoming less tolerant to expensive and never-ending projects. In order to control costs and implementation's results, special attention needs to be paid during ERP selection phase. In Table 3 we are presenting an enumeration of Romanian ERP products focusing especially on large organizations. According to (Focus, 2010: pp. 1-5), [13], ERP projects are becoming more targeted which, in our opinion, means that organizations are focusing more on product's functionalities. This is why we consider that an ERP characteristic that needs to be taken into consideration is the main industry the ERP is addressing to. Since the cost of implementation has become more critical than ever, the catalogue is also presenting the average implementation period and the average training period per user. Another characteristic is the number of users supported which is useful both for understanding the product dimension and the cost of end-users trainings. Since we discovered that organizations are interesting to amortize their investment in less time, another important characteristic of an ERP product is the life expectancy.

Table 3. Romanian ERP Catalogue: Source: www.comunitateaerp.ro [6]

ERP	Vendor in Romania	Implementation period	Training period/user	Life expectancy	Main Industries	Dimension of beneficiary organization	No. of Users
ASiSplus ERP	Alfa Software S.A.	3-5 months	5-10 days	5-10 years	Manufacturing, retail & services	Large & medium	No limit
ASKI SFA	Wizrom Software	3-5 months	3-5 days	1-2 years	Marketing, sales & distribution	Large, medium & small	11-50
bcManager Professional	Berg Computers srl	3-5 months	1 day	5-10 years	Manufacturing, retail, sales & distribution, services	Large & medium	No limit
B-ORG ERP	Transart srl	1-2 months	1-2 days	>10 years	Commerce, retail, distribution, manufacturing, automotive, services	Large & medium	1-400
Charisma Enterprise	TotalSoft SA	3-5 months	3-5 days	5-10 years	Financial, banking, services, retails, distribution, health, manufacturing, construction, public sector	Large	No limit
ERPi Collection	BITCRAFT srl	< 1 month	1-2 days	5-10 years	Classic industries and functionalities plus debt management	Large, medium & small	51-100
Hermes Logistic WMS	Transart srl	1-2 months	1-2 days	> 10 years	Manufacturing, distribution	Large & medium	1-25
Hermes SFA	Trasart srl	3-5 months	3-5 days	> 10 years	Sales force automation, Merchandising, Marketing	Large, medium & small	1-300
Kazier	Zero Paper	3-5 months	3-5 days	3-5 years	All industries	Large, medium & small	500-1000
Manager Financiar	Soft Expert srl	1-2 months	3-5 days	1-2 years	Management and accounting for all industries	Large, medium & small	51-100
Manager Financiar CRM	Soft Expert srl	1-2 months	3-5 days	1-2 years	CRM for public administration, agriculture, food industry, automotive, wholesale, retail, manufacturing, transportation, services, distribution	Large & medium	51-100
Mediacore CRM	Misoft systems	1-2 months	1-2 days	1-2 years	Wholesale, retail, distribution, manufacturing, services	Large, medium & small	51-100
Panorama	Wizrom software	< 1 month	3-5 days	1-2 years	BI for insurance, retail, wholesale, leasing, distribution, manufacturing, services, transportation	Large & medium	11-50
Roadnet	Wizrom software	< 1 month	3-5 days	1-2 years	Distribution, transportation	Large & medium	11-50
SFA Festino	Set Mobile	< 1 month	1-2 days	5-10 years	Distribution	Large, medium & small	101-200
SeniorERP	Senior Software	< 1 month	5-10 days	5-10 years	Distribution, Manufacturing, Services	Large & medium	1-200
SeniorCRM	Senior Software	< 1 month	1-12 days	5-10 years	Wholesales, distribution, services	Large & medium	51-100
WinMENTOR Enterprise	SC TH Junior srl	2-3 months	10-30 days	5-10 years	Public sector, automotive, medical, wholesale, retail, distribution, financial, services, transportation, manufacturing	Large & medium	10-100
WizPro	Wizrom software	3-5 months	3-5 days	3-5 years	Retail, wholesale, manufacturing	Large & medium	1-50
WizSalary	Wizrom software	< 1 month	3-5 days	1-2 years	Salary applications for all industries	Large, medium & small	51-100
WizTime	Wizrom software	< 1 month	< 1 day	1-2 years	Timesheet applications for all industries	Large, medium & small	201-500

Of course, when discussing large organizations, there is also the international offer of ERP products where we should mention at least the products from Table 4.

Table 4. ERP Catalog: Source: www.comunitateaerp.ro [6]

ERP	Vendor in Romania	Implementation period	Training period/user	Life expectancy	Main Industries	Dimension of beneficiary organization	No. of Users
Oracle Suite	Oracle Romania	6-12 months	10-30 days	> 10 years	All	Large & medium	> 1.000
SAP Business Suite	SAP Romania	12-24 months	10-30 days	> 10 years	All	Large & medium	> 1.000
Microsoft Dynamics NAV	Microsoft Romania	3-5 months	5-10 days	3-5 years	Manufacturing, public administration, insurance, food industry, wholesale, retail, services	Large, medium & small	101-200
Microsoft Dynamics AX	Microsoft Romania	3-5 months	10-30 days	3-5 years	Manufacturing, public administration, insurance, food industry, wholesale, retail, services, logistics, distribution, financial	Large & medium	10-1000

4 Conclusions

Enterprise Resource Planning systems are no longer nice to have tools inside organizations. Instead they represent a fundamental asset in times of economic growths but especially during economic crisis. They represent an irreplaceable instrument for tactical and operational decisions but most of all they are the best partner an organization can have by supporting strategic business objectives and goals.

Companies should be very attentive to the budget reduction. A very important milestone is the ERP selection. Trying to reduce costs, companies decide to skip this phase and choose an ERP system just because it is very popular. This is of course wrong. Several methodologies can be used such as Spec IT Independent Vendor Selection Management, Kuiper's funnel method, Dobrin's 3D decision support tool or Clarkson Potomac method. In Bakas, Romsdal, Alfnes, 2007: pp. 1-10, [11] a more holistic ERP selection methodology is presented. This method is focused on the alignment between the ERP selection process and the organization's strategy and processes and business and IT infrastructure. Since the total cost of ownership has become really critical in the last three years, we think that companies should concentrate more on how appropriate the ERP is in terms of functionalities, how synchronous with the company's business model and strategies and how affordable it is in terms of costs and implementation period.

The current catalogue will be extended with a more complete list of ERP products, taken into consideration also medium and small sized products. Based on a complete catalogue of ERP products and solutions, and based on the current market requirements, an updated and more appropriate ERP selection criterion will be presented in future related papers.

Acknowledgement

References

[1] Panorama Consulting Group, "2011 ERP Report", pp.1-15, 2011. Available: http://panorama-consulting.com/ re-

source-center/2011-erp-report/

[2] P. Audoin Consultants, "ERP Romania 2011. Analysis and trends of the ERP software products and related services", 2011

[3] C. D. Avram, "ERP inside Large Organizations", Economy Informatics Journal, No. 4(14), pp. 196-208, 2010

[4] E. Yourdon, "Death March Projects in today's Hard Times", Boston Spin Conference, pp. 1-21, 2010

[5] G. Rizescu, "Analysis of the Romanian Offer of ERP Solutions", Economy Informatics Journal, No. 1(45), pp. 131-139, 2008

[6] N. Rayner and J. Woods, "ERP Strategy: Why Do You Need One and Key Considerations for Defining One", Gartner RAS Core Research, pp. 1-9, 2011

[7] www.comunitateaerp.ro

[8] C. D. Avram, L. Ciovica and R. D. Zota, "Communication Mechanisms inside Virtual Software Architectures", The 17th International Conference: The Knowledge – Based Organization, Sibiu, Romania, pp. 211-215, 2011a;

[9] C. D. Avram, C. Cioloca, L. Ciovica, M. Curteanu and M. Georgescu, "The Management of Manufacturing-Oriented Systems using Efficient and Flexible Architectures", Economy Informatics Journal, No. 4(15), pp. 22-38, 2011b;

[10] C. Cioloca and M. Georgescu, "Increasing Database Performance using Indexes", Database Systems Journal, No. 2(2), pp. 13-23, 2011

[11] O. Bakas, A. Romsdal and E. Alfnes, "Holistic ERP Selection Methodology", The 14th International EurOMA Conference, "Managing Operations in an Expanding Europe", Ankara, Turkey, pp. 1-10, 2007

[12] A. Uta, I. Intorsureanu and R. Mihalca, "Criteria for the Selection of ERP Software", Economy Informatics Journal, No. 2(42), pp. 63-66, 2007

[13] Focus Research, "2011 Trends Report: Enterprise Resource Planning (ERP)", http://www.focus.com/questions/operations/erp-trends-what-top-erp-trends-watch-2011/., pp. 1-5, 2010.

Constantin Daniel AVRAM has graduated the Faculty of Economic Cybernetics, Statistics and Informatics in 2005. He holds a master degree in Computerized Project Management. He is the author of several journal articles in the field of ERP implementation, risk management, software development quality assurance, software architectures. He is currently attending a PhD Program in Economic Informatics. He has more than seven years of experience in ERP implementations. He was involved in large and very large international ERP projects, assisting in the entire application lifecycle, from defining IT strategies to support and maintenance.

Răzvan Daniel ZOTA is full professor in the Department of Economic Informatics and Cybernetics from Academy of Economic Studies, Bucharest, Romania**.** He graduated the Faculty of Mathematics, Computer Science Section and FABBv Faculty from Academy of Economic Studies, Bucharest. His fields of interest include Information Technology Fundamentals, Operating Systems, Computer Networks, eLearning, eBusiness, Cisco CCNA.

Vasile Laurenţiu CIOVICĂ has graduated the Faculty of Science, in 2008 gaining a Bachelor of Science degree in Information Technology with a thesis on Translators and Interpreters for Code Generation and Software Optimization. In 2010 he gained a Master of Management degree in the field of Cybernetics, Statistics and Economic Informatics with a thesis on Intelligent Agents. He is currently a PhD student at Academy of Economic Studies in

Bucharest. Between 2006 and 2010 he worked as a programmer at a company from Sibiu. Since January 2010 he works as an Independent Consultant. He is the author and co-author of more than 12 scientific articles in the field of software quality and optimization, code generation techniques, collaborative systems, data bases, programming environments and techniques, mobile platforms and economic informatics systems. Besides the scientific activity he is also an active software developer, being the author of few applications. Some of the created applications were presented to different student's scientific conferences where he was distinguished with 1 excellence award, 6 first awards, 1 second award and 2 third awards. His area of interests includes among others: software quality, optimization techniques and algorithms, code generation techniques, economic informatics systems, intelligent and collaborative systems, mobile platforms.