

**University of West Hungary**  
**Faculty of Economics**

**DEVELOPMENT, IMPLEMENTATION AND CHARACTERISTICS OF  
INFORMATION SYSTEMS IN THE PRACTICE OF ENTERPRISES,  
FOCUSING ON SMALL AND MEDIUM-SIZED ENTERPRISES**

**Theses of doctoral (Ph.D.) dissertation**

**written by**  
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**Doctoral School:** Széchenyi István Theory and Practice of Economic Processes

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## 1. Proposed objects, hypotheses

**The dissertation deals with the problems of the development, implementation of the ERP systems in the Hungarian SME sector.** Considerable part of the researches that can be found in the literature analyses the ERP introductions by means of the financial indicators; they try to take into consideration the cost of the total lifetime and try to define the proceeds of the ERP systems numerically. **The important new result of the current dissertation is, that it makes an effort to approach the economical utility of the ERP systems through the aim of the system, it studies the questions arisen in the research through quantifying of the soft, difficultly measurable conceptions.** Statistical analyses based on extensive range are used for the evaluation.

**Anyway, it is not enough to pay attention only for the cost,** the proceeds considerably depend on the question, how the enterprise is able to make capital on the possibilities given by the ERP system. It can be required for this reason to **change the organizational processes, the organizational structure.** One of the main ideas of the dissertation is, that **a way of thinking beyond the operational level is needed to the long-term utilization of the advantages of the ERP systems, the new-modelled processes and structures have to be one of the bases of the ERP system, that suit to the business strategy on a better way, and so they help in the long-term maintenance of the efficiency.** The developers of the ERP systems try to cover the informatical support of an enterprise more deeply, and they are in possession of more and more modules, that based on integrated database help the managers to get real-time, namely quick, exact, relevant information that is aggregated against the required variables, the advantage of the system can appear on tactical and also on strategic level (if they allow).

After the impregnation of the market of the big enterprises the big companies dealing with software development turned to the SME sector, that served so long as the niche market of the smaller, mainly domestic developers. The competition

is really significant, while the SME's have got only few experiences about the field of ERP systems that would be available through lower costs for them, as well. Will they have problems similar to the big enterprise stratum; will they make the same errors? **There is significant difference between the big enterprises and the companies of the SME sector in informational aspect. Do the slimmer, more simple hardware and software systems** – that suit the requirements of the small and medium enterprises - **mean orgware plainness? Is it enough to concentrate only to the actuation**, or the external resource management has to be made to internal one even in the SME sector? **Will the informational developments combined with the steps of the organization development**, or will they be handled as a marginal question? **The literature does not give answers to these questions**; this field is not researched enough. This short description confirms the timeliness of the topic, the focus of the small and medium enterprises.

**One of the main ideas of the primer research is, that the introduction of an ERP system can be successful, if it affects the processes and the structure of the enterprise, with the activity of the top management.** This way the implantation affects even the upper decision levels, its aim is not only the achievement of the operative benefits. The research tries to explore, how the soft, non-financial aspects – that are in given cases mentioned even in the literature – can influence the success of the introduction of the ERP systems in the Hungarian SME sector. In opinion of the author, these factors are rather determinant, the financial questions are better results, but the researches connected to this topic are yet dominant. **The primary aim of the research is the examination, the confirmation of the following hypotheses.**

**H1.** The questions of the development, introduction of the ERP systems are handled really specific in the international and national literature, but the analyses concentrate on the sector of the big enterprises. **There is significant difference between the big enterprises and the companies**

**of the Hungarian SME sector in informatical aspect according to the hypothesis of the candidate.** For this reason it is absolutely worth to deal with the SME sector separately, as well.

- H2.** The own developed information systems are too expensive for the small and medium enterprises, moreover the available informatical staff is reduced, it is specialized for the actuation, but in many cases even the actuation (or part of it) organized outside. **The majority of the enterprises of the sector uses** the products offered from the ERP vendors, who are mainly specialized to the so called „off-the-shelf” ERP systems, above all they use mostly the modules belonging to the administrative module. **The integrated, informatical cover of the enterprises** – neither the breakthrough of the functional fields, nor the initiation of the management levels – **will not be realised in many cases.**
- H3.** **The support of the strategy of the enterprise, moreover the questions, connected to the change of the organization structure and the business processes of the enterprise do not play an important role during the selection of the system** – in contrast to the statements of the literature.
- H4.** **The slimmer, more simple hardware and software systems – that suit the requirements of the small and medium enterprises – do not mean orgware plainness.** The development, the implementation of the information systems in the Hungarian SME sector demands similar methodological phases, devices, raises similar problems, tasks, as the ones, that are mentioned in the bibliography in connection with the system-developments, implementations of the big enterprises.

**Based on the researches from the bibliography the following main elements will be highlighted, will be examined referring to the domestic SME sector connected to the hypothesis 4:**

**The more efficient preparation, planning will be helped by the criteria, demands connected to the systems, gradual targets in more steps, that are formulated in the starting period of the introductory project of the ERP system.** The well-structured aim-system makes the orientation of the business unambiguous, it details the implementation of the system to the realization of concrete business targets. One part of the arisen problems can be avoided with the help of this clear aim-system.

One main influential item of the introduction project of the ERP system is **the well-structured, carefully examined budget**. One big risk of the introduction project is that they get frittered away in the aspect of working time and resources, but only a fraction of the requested functionality is realized. On the one hand, the detailed budget helps the efficient preparation, the continuous valuation of the project, the decision about the staying on the way, on the other hand, in contrast to the global cost plan, it does not allow, that the transgression of one part of the budget lines causes a considerable reduction of other items, that could endanger the project. It can be stated, that the the ones, who prepare circumspect budget, have got success significantly bigger.

If **the enterprise has got a written strategy**, it is able to define the targets that it would like to reach with the help of the system to be introduced. The formulated aims get real better, they are available to higher degree along the ones, who have got a written strategy.

The **not suitable joining of the leadership** style to the introduction of the ERP system can considerably slow down the realization of the aims. One determining item of the success of the project is, how deeply the employees and the management are initiated into the project.

**The implementation can be successful, if the project is thoroughly planned, the management takes part actively in the work, it is fully aware from the beginning of, how the project influences the business processes, the**

**organizational structure of the enterprise, and it handles these changes constructively.** The change can reach even the top management, if it is necessary, the use of the system affects them, as well, the upper-level elements, modules of the system get introduced (even in a second step). **The employees get initiated into the project, they are properly motivated, educational possibilities are available, the management of the tensions and fears connected to the change works well.**

## **2. The subject, the method and the justification of the research**

**The dissertation consists of two parts, the first one means the research in the literature, the second one is primer, own research.** The candidate performed the expansion of the theoretical background and the contexts of the topic in the chapter containing the bibliographical overview through the systematization, processing and synthesis of the national and international literature. **During the presentation of the theoretical basis he tried to analyse the context between the information systems and the organizational structure, between the business processes and their management in more aspects,** somewhere through the implantation of models and ideas that have not appeared in the national bibliography so long. He strived for the plain, transparent and clear reasoning, for the step-by-step logical exploration of the complex topic.

**The researches cover more disciplines, the interdisciplinary approach was essential due to the topic.** To be able to introduce the economical characteristics of the SME's, to analyse the nature of the information, its appearance in the company, to the strategic approach of the information system development, to the problems of the introduction, to the valuation of the investments, etc., he referred to the diverse fields of the literature of the corporate economics, the information theory, the system theory, the microeconomics, the macroeconomics, the corporate finance, the controlling, the management (the change management, the strategic

management, the project management, etc.), moreover publications from many fields of the IT-technology. He used numerous secondary information, the database of different research institutes, for example Eurostat, KSH, GKI to support the formulated facts.

In the first vice chapter the author give a picture about the nature of the information, after he analyses the context between the information systems and the organization, he points out strategic questions, the aspects of the information systems. He tries to specify the concepts, to introduce the problems behind the definitions. In the next vice chapter he strives to the critical presentation of the enterprise information systems, mainly the ERP systems, finally he examines the implementation problems of the ERP systems. **The bibliographical part tries to introduce the different problems and thoughts in logical steps, built onto each other.**

**The primer research consists of two parts: one is the qualitative part (interview), the other one is the quantitative part (questionnaire).** The two methods complete each other, the qualitative research is unstructured, it has exploring character that is used for the understanding of the problem. The quantitative research numerizes the datas, it examines them by statistical methods. Firstly, the candidate tried to support, complete, to reach and to specify the more important questions with the help of interviews with persons, who introduced systems. Based on the results of this **qualitative research** I formulated the questionnaire that became as a basis of the **quantitative research**. I tried to confirm or to reject with the evaluation of this questionnaire the above hypotheses. To the evaluation he used statistical analyses based on wide basis, not only descriptive statistics, but for example contingency table analysis, rank methods, hypothesis tests, variance analysis and factor analysis.

**The basic target of preparing interviews, as exploring research, was to define the presence of the stated problems, guidelines, their character and priority, to identify new guidelines, to make the arisen problem in its own complexity**

**easier to understand.** For this reason as the first step of the research interviews were prepared with employees who deal with system introduction. The advantage of the interview is that - because of its personal character - there is no pressure on the questioned person to adjust to the opinion of somebody else, and even the researcher can clear many misunderstandings, fears. It is definitely suitable to explore some problems deeper. The questionnaire, that became the basis of the quantitative research, has been defined based on the results of this qualitative research.

**The questionnaire was prepared** after the confirmation, the specifying of the arisen problems, **in a form of filling out in online way.** The LimeSurvey was used what is the best, open source, free currently available software for the editing of a questionnaire. The so called snowball technique was used, as sampling method. This procedure works, as follows: an initial group of the participants is aimed, and we try to reach other ones through them. The main advantage is that there is a relatively bigger chance to find the requested characteristics. In this research it means such employees and managers of small and medium enterprises – that already have got ERP system or plan to introduce it – who firstly see through the operation of their own enterprise, secondly they have got a view on the ERP project. There was no reliable database available about the population; it confirms the application of the snowball method, as well.

With the usage of this method, even if we calculate the low percentage of the return of the questionnaires, enough sample size can be reached. The basic condition of the success of researches according to this sampling is, that the starting sample has to be as heterogen as possible from the point of view of the target group. It was important because of this reason to start the research from more directions. The aim of the questionnaire was to work out and to define proposals, recommendations for the settlement of an initial research that can be continued to carry out a research that is based on the results of this survey, and initiates enterprises dealing with the introduction or using ERP systems.

**The time period of the survey lasted from the 27<sup>th</sup> of September 2008 to the 27<sup>th</sup> of October 2008. Altogether 421 independent entries happened to the site of the questionnaire in the month of the survey, 284 of them were without registration, 137 entries were confirmed by registration.** After reading the introductory page 282 people started to fill in the questionnaire, 167 of them changed their mind (for example after the introductory page they still thought, that they belong to the target group of research, but after a part of the questions they realized, that they can not help in the survey). **Altogether 115 finalised questionnaires have been stored in the database. More than 2/3 (77 pieces) of the filled in questionnaires have been confirmed by registration.** I put this big percentage to the fact that the registered people got possibility to point out their demand to get information about the result of the research.

### **3. Results of the research**

It can be stated according to the research in the literature that the most elements of the problems arisen at the introduction of the ERP systems refer to the insufficient, imperfect or bad management activities, to support the statement, that the management activities play an important role at the implementation of an ERP system. **So, the success of the introductory project is deeply connected to the related management activity. The project is not only an informatical, technological question, but there are always organizational and business decisions behind. The education, even already at the very beginning of the introduction, is essential** to get all the related people to understand the introduction. The related people can be expected this way, to be able to define the demands connected to the system exactly. If the project is prepared properly, there are already at the beginning exact ideas about the usability of the system, about the expected results and aims, these targets can be defined, that can be used as an alignment point during the project. **The hypotheses of the dissertation got confirmation according to the researches of the candidate.**

- T1.** In the vice chapter called „Small and Medium Enterprises in Hungary” it was found, that the Hungarian SME sector has got many differences both to the big enterprises and to the European SME sector. **According to the starting hypothesis of the dissertation there is a big difference between the Hungarian SME sector and the big enterprises in informatical aspect. It gets unambiguously confirmation in the vice chapter called „ERP systems in Hungary” based on wide range of bibliographical researches, and on the databases of Eurostat, KSH and GKI.** The enterprises of the SME sector have got easier hardware and software systems, at the same time the informatical capacities and competences are reduced, as well. **It can be declared, that it is worth to deal with the SME sector separately, narrowly,** to make independent researches from the point of view of the information systems.
- T2.** According to the hypothesis of the candidate the Hungarian SME sector mostly uses the products offered from the ERP vendors, who are mainly specialized to the so called „off-the-shelf” ERP systems, the own developed systems are not really typical. **It could be confirmed unambiguously based on the database of the survey and the answers given in the qualitative research, the use of the ready, standard-made ERP systems is characteristic of the hungarian SME sector, mainly their modules specialized for the administrative, operative level, and most of the enterprises think them to be the most useful in the aspect of their competition environment.** The communication, the education about the information systems has to move to their positive effect, that makes an impression on the business processes and the structure of the enterprise. The questions in connection with the development of the organization have to appear more stressed, in order to make the enterprises able to overview the advantages of these systems, to move towards to more sophisticated EPR

functions, so the development passing the whole organization can bring benefit in long run.

- T3.** The candidate suppose, that the joining to the strategy of the enterprise and the connecting structural changes do not play considerable role by the development of the information systems of the Hungarian SME sector, although the literature handles these questions stressed. **The descriptive statistics, the analyses connected to the rank methods, the definition of the resultant orders (according to the Kendall's coefficient of concordance, and by the method of the circle free directed graph) baked up unambiguously, that by the selection the emphasis is on the different costs, on the recommendation and on the functional requirements connected to the software and the questions related to the strategy of the enterprise do not appear sharply enough.** At this point it has to be stressed, that the communication, the education about the information systems has to move to the their positive effect, that makes an impression on the business processes and the structure of the enterprise in order to bring long-term competitive advantages for the enterprises through development of the information systems.
- T4.** According to hypothesis of the candidate the becoming simpler and more slender of the hardware and software systems does not mean orgware simplicity in connection with the SME sector. **He quantified and statistically confirmed according to the survey, that the main problems of the big enterprises – in the bibliography – are attending even at the enterprises of the Hungarian SME sector by the development of the information system.** There are big differences between the big enterprises and the enterprises of the SME sector in informatical aspect according to the statements formulated in the first thesis. But these problems connected to the development and the introduction of the system are mainly attached to the management activities, also according to the above mentioned states the

method connected to the introduction, the activity of the development of the software is not allowed to be made easier. **The easier software systems can not bring the method, the orgware parts becoming simpler; the soft factors have got outstanding importance during the introduction. The followings are necessary the same way: the deep consideration of the project at the beginning, the formulation of criteria at the starting period of the introduction project, the wording of requirements about the system and aims in more steps, the preparation of a deep and careful budget, existing written strategy, the fitting of the system to the strategy, suitable leadership style during the introduction.** It should have the meaning for the enterprises dealing with introduction that they are able to leave behind the competitors not in the dimension of the time connected to the introduction, but through the suitable communication of the tasks of the organization development connected to the introduction. Most of the exploitable advantages are hidden in connection with the system development not in the software, but in the orgware.

### **3.1. Scientific novelties of the research**

1. One important result of the research is, that **it gives an overall, up-to-date, relevant literature summary about the enterprise information systems, it deals stressed with the ERP systems.** The researches of the most modern specialists, who are well-known both in theoretical and in practical clubs, are presented with enough thoroughness over the extensive synthetization of the themes from the international and national literature. **It can be mentioned as a result of the dissertation, that it joins the practical questions, problems of the implementation and use of the ERP systems to the theory, integrated the models, that are less known in the Hungarian bibliography, taken the theoretical questions of the information systems as a starting-point.**

2. **During the primer research of the dissertation it has been supported, that the bibliographical statements connected to the introduction problems of the ERP systems mostly have to be taken into consideration regarding to the domestic SME sector,** it is worth to pay attention for them during the system-introduction. The followings **have been confirmed: the critical role of the management activities,** the serious effect of the leadership styles, the effect of the formulation of the enterprise strategy and the competition environment to the implementation of the ERP system. The active participation of the top management, the initiation of the employees, the education, the efficient planning of the project, the initial, essential formulation of the targets, the budget-preparation and the necessity of the more efficient preparation are by far the important on behalf of the successful arrangement of the project.
3. **It can be stated and it has been confirmed based on the thesis 3. and 4., that the enterprises of the Hungarian SME sector do not lay enough emphasis on the questions of the organization development by the development of the information systems,** neither the support of the achievement of the strategic targets, nor the questions of the organizational structure and the change of the enterprise processes play an important role. Moreover the connection between the advantages of the implementation of the ERP system and the conversation, the change of the organizational structure, of the business processes of the enterprise has been confirmed. The research demonstrated that real the strength of the implementation of an ERP system lies in the organizational changes; this connection has been supported by the primer research, as well.
4. **The candidate suggests accepting the method of the dissertation as a scientific result.** An important new result of the dissertation is that it makes an effort to approach the economical utility of the ERP systems through the aim of the system; it studies the questions arisen in the research through the

quantification of the soft, difficultly measurable conceptions. Statistical analyses based on extensive range are used for the evaluation.

5. The developers of the ERP systems try to cover more and more enterprises through their systems, so it can be expected, that the number of the ERP systems in the SME sector is growing dinamically in the near future. **Consequently, the dissertation can be a perfect basis for the experts who deal with the introduction of the systems to be able to think over again the methods of the implementation based on the definded critical points.** As a logical continuation of this research the target has been defined, that a practice-oriented, easily useable checklist should be made up, as a collective work together with the developers of the system and with managers, who have already experienced the implementation. With the help of this work the managers, who are before the implementation can define their own critical points.
6. **The elements, the statements of the dissertation can be used perfectly in the education,** as well, both the bibliographycal overview and the elements of the primer research can be planted in the subjects dealing with the information systems, in detail with the ERP systems (this work has already been started).

#### **4. Conclusions and suggestions**

**It has been confirmed during the research, that it is worth to deal separately with the informatical developments of the Hungarian SME sector and with the potential implied in it.** The market is growing continuously, and moreover it was confirmed, that the SME sector moved in majority towards the development of the „off-the-shelf” software systems, so even the practical benefits of these researches are significant.

**The research had a discovering character.** The elements of the list, that are mentioned before and have been prepared **according to international and national bibliographical summary, have been confirmed referring to the domestic SME sector, as well. It became unambiguous, that the management factors are the most critical points by the implementation, the development of the enterprise information systems of the national SME sector.**

**The following suggestions can be made to the domestic SME sector based on the dissertation:**

- 1. It was unambiguously confirmed by the research, that the management activities connected to the organization-development, to the introduction of the system have stressed importance; the methodical recommendations of the introductions of the big enterprises can be used as an instruction by the Hungarian SME sector, as well.**
- 2. The continuous education already from the very beginning has got high importance. The education can be necessary already in the opening period to the formulation of the problems.** Course material development was carried out connected to the research, as well. Students from correspondence school, who already have got work-experience, were initiated into the research. It was established during the work together, that **a very important element is to get to know the system overall besides the education concentrating on the details. While the ERP system gets over the functional limits, the employees get to know the operation, the functions of the system only within their own limited area. They can not see, how their work effects other activities of the enterprise, but it is a tool of the motivation, and moreover it could be a basis to the right ranking of the tasks to do, for example. Perhaps, the education has got a more important role in the SME sector, than in case of the big enterprises, as in many cases the ERP system has not got precedent.**

3. **The communication, the education about the information systems has to move to their positive effect, that makes an impression on the business processes and the structure of the enterprise. The questions in connection with the development of the organization have to appear more stressed, in order to make the enterprises able to overview the advantages of these systems, to move towards to more sophisticated ERP systems, so the development passing the whole organization can bring benefit in long run.**
4. **The enterprises dealing with the system introduction are able to leave behind the competitors not in the dimension of the time connected to the introduction, but through the suitable communication of the tasks of the organization development connected to the introduction. Most of the exploitable advantages are hidden in connection with the system development not in the software, but in the orgware.**

The developers of the ERP systems try to cover more and more enterprises with their systems. The implemetations, and together with this the experiences are growing at a rapid pace. **It is worth to go on with the research and the candidate plans to do this.** Firtsly, the **experiences and the ideas of the introducing enterprises can be interested**, secondly their comparison with the opinion of the companies, who are dealing with the introduction, moreover a **comparison** done in **international** cooperation could be useful. It would be worth to prepare a list with the managers, who have already done the introduction, containing, what they did well and what would they do on another way. A **practice-oriented checklist** could be prepared based on the collective experiences. The managers, who are before the introduction, could define their own critical points in the aspect of risk with the help of this list. **After the defence of his dissertation the candidate would like to go on with these researches, and he would like to plant the results continuously into the education.**

## 5. Publications connected to the Doctoral School

### Publicaton in edited study-volume:

KOLOSZÁR, László [2006]: Az orosz külpolitika és az olaj. In: KISS, Éva (szerk.) *A népességtől a természeti erőforrásokig*. NYME KTK, Sopron  
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KOLOSZÁR, László [2001]: A polgárság és a parlamentarizmus fejlődéstörténetének összefüggései a nyugati kultúrában. In: *A Nevelés, Oktatás, Kutatás szolgálatában*. NYME KTK, Sopron  
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### Co-author of study books:

HERCZEG, János (szerk.) [2008]: Marketingkutatás módszertan, NYME KTK, Sopron, *A kutatási folyamat informatikai támogatása alfejezet*  
ISBN 978-963-88242-0-2 Ö; ISBN 978-963-88242-1-9  
Lektorálta: Prof. Dr. Székely Csaba DSc, egyetemi tanár

### Contribution published on foreign language:

CZEGLÉDY, Tamás - KOLOSZÁR, László - SZÓKA, Károly [2003]: Eine vergleichende Analyse der Bankenregulierungen in der Europäischen Union und in Ungarn, *A Bécsi Kereskedelmi Kamara féléves Walter Nettiig kutatási ösztöndíja*, 2003. febr.-júl.

### Conference lectures, published essays:

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KOLOSZÁR, László - SZÜTS, István [2008]: Einführungsprobleme der Systeme ERP im Sektor der kleinen und mittleren Unternehmen. *6<sup>th</sup> International Conference on Management, Enterprise and Benchmarking*. 2008. máj. 30-31., Budapest (BMF)  
ISBN 978-963-7154-73-7

KOLOSZÁR, László - BÁTORI, Zoltán [2008]: ERP Systems on the Market of Small and Medium-sized Enterprises. *4th Annual International Bata Conference*. 2008. ápr. 10., Zlin  
ISBN 978-80-7318-663-0 (978-80-7318-664-7)  
Lektorálta: Ing. Michal Pilík PhD

TÓTH, Zsolt - KOLOSZÁR, László [2008]: Moodle as a tool of knowledge management and social constructionism. *4th Annual International Bata Conference*. 2008. ápr. 10., Zlín

ISBN 978-80-7318-663-0 (978-80-7318-664-7)

Lektorálta: doc. Ing. Roman Bobák PhD

KOLOSZÁR, László [2007]: ERP rendszerek a kis- és középvállalkozások piacán. „*Versenyszellem és piactudomány: attitűdök és értékek a gazdasági hatásmechanizmusokban*” – *Kutatási Fórum*. 2007. nov. 23., Szeged

KOLOSZÁR, László [2007]: Kis- és középvállalkozások és az ERP rendszerek. *Vállalati Növekedés - Változó Menedzsment / Marketing Konferencia*. 2007. nov. 22., Győr

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Lektorálta: Dr. Csath Magdolna, egyetemi tanár (et. al.)

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Lektorálta: Prof. Dr. Vincze Mária DSc (BBTU)

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Lektorálta: Dr. Constantinovits Milán PhD (SZIE)

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