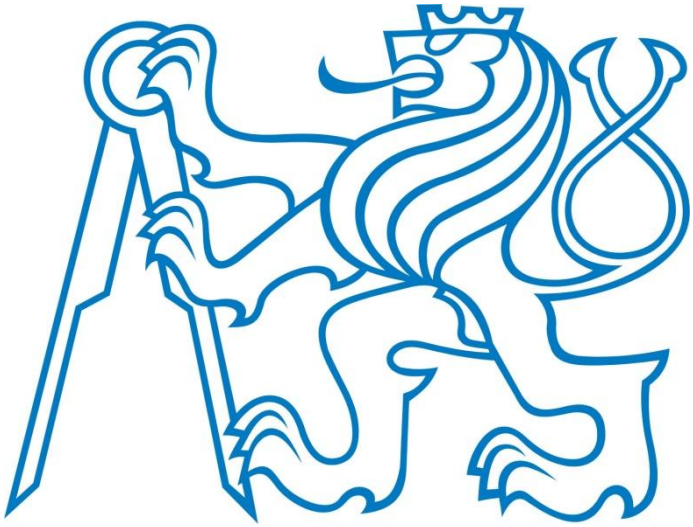
Czech Technical University in Prague

Faculty of Electrical Engineering



Doctoral Thesis Statement

June 2011

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Faculty of Electrical Engineering
Department of Economics, Management and Humanities

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IT Solution Efficiency Evaluation

Doctoral Thesis

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Doctoral thesis statement for obtaining the academic title of "Doctor", abbreviated to "Ph.D."

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The doctoral thesis was produced in *combined* **manner**

Ph.D. study at the department of *Economics, Management and Humanities* **of the Faculty of Electrical Engineering of the CTU in Prague**

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The defence of the doctoral thesis will be held on *(date)* **at** *(hour)* **a.m./p.m. before the Board for the Defence of the Doctoral Thesis in the branch of study** *(to be specified)* **in the meeting room No.** *(to be specified)* **of the Faculty of Electrical Engineering of the CTU in Prague.**

Those interested may get acquainted with the doctoral thesis concerned at the Dean Office of the Faculty of Electrical Engineering of the CTU in Prague, at the Department for Science and Research, Technická 2, Praha 6.

Name *– to be specified*

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*) *leave out as appropriate*

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1 CURRENT SITUATION OF THE STUDIED PROBLEM

The largest IT companies that offer IT solutions such as IBM, Oracle, Microsoft concentrate a lot on the topics of Return on Investment and Effectiveness of the IT solutions. It is due to the fact that they need to demonstrate the benefits of their IT solutions.

The experts concentrate on this topic only from general perspective. The biggest interest in this topic is coming from the private sector.

Private Sector – The biggest companies that concentrate on the efficiency evaluation of the IT projects are Nucleus Research, Alinean and ROI Institute. Each company deals with this theme a little bit differently. Some of them take into account tangible costs and tangible benefits, while some of them take into account time value of money. During the PHD study preparation phase, tens of different sources have been taken into account and analyzed.

ROI Institute – This is the most important company of IT efficiency evaluation. They have 30 years experience within ROI area and DR. Jack J. Phillips who is cofounder of the company is the most known person within this area. Their ROI methodology goes through the entire lifecycle of an IT project (the ROI is calculated even after the implementation and production status of the IT project and the results are revalidated). Their framework is very sophisticated and covers very wide area of the evaluation and the Return on Investment. There are hundreds of customers from which ROI Institute collected the data and used them once again as a feedback for the others. The entire process is quite long and costly as well. For many companies the cost for evaluation from 3 to 5 percent of the entire IT solution budget is unacceptable. The next problem comes with a very conservative approach. In many cases there is a very quick switch from intangible assets to intangible benefits instead of the monetary value.

Nucleus Research – is the leading provider of investigative information technology research and advisory services. Their simple ROI calculator has been downloaded 4 million times and is very popular. The popularity comes from the simplicity. There are only several inputs needed and after filling information, there is an output and the visualization of entire evaluation. There are many prepared case studies with ROI and payback calculations and estimations. The problem of Nucleus research is the simplicity of all processes, frameworks etc. They do not take into account time value of the money and the intangible benefits are skipped in many cases.

Alinean - is the leading developer of value-based online interactive tools - driving sales and marketing effectiveness by proving the value of the solutions to the economic prospects and customers. Alinean produces a huge number of specialized ROI calculators. They have developed very universal framework that allows simple configuration of their specialized ROI calculators. They have produced tens or hundreds of calculators for many IT vendors. These calculators have a big disadvantage due to the simplicity without a more complex method to establish intangible benefits and the transfer of intangible benefits to the monetary values. But these calculators are simple to understand with a very nice visualization without more complex methods to establish intangible benefits and the transfer of intangible benefits to the monetary values.

Universities, Departments – there are couple of universities that concentrate on the Return on Investment. Their focus is mainly on the evaluation of the benefits and costs from the general perspective. I did not find any end-to-end approach that could help with solving the entire complex issue. I used couple of general methods coming from universities within this thesis that helped me with the evaluation of the efficiency. I used as well couple of approaches during the evaluation process like the questionnaire preparation, increased efficiency evaluation, economic indicators evaluation etc.

Other evaluated companies – IBM, PricewaterhouseCoopers, APQC etc.

2 AIMS OF THE DOCTORAL THESIS

The doctoral thesis "IT Solution Efficiency Evaluation" focuses on the efficiency evaluation. If a company tries to decide whether or not to invest in an IT project, they have to go through the same evaluation process as with any other investment decision. I tried to investigate the entire market to recognize effective methods of measurements for any IT project. There are standard indicators that are used in the process of evaluation (i.e. Net Present Value, Return on Investment, Internal Rate of Return etc) that indicate the basic overview of the investment (Roulstone, et al., 2008). In addition to these indicators there are various calculations, scoring models, and key performance indicator evaluations that are often used to persuade a customer of the suitability of the proposed solution. There are rarely used methodologies and approaches to evaluate the tangible and intangible benefits of a project that can be suitable for further and detailed investigation.

Almost all methodologies and simple calculations of Return on Investment are concentrating only on costs and benefits that are tangible and simply understandable and are closely related to the IT solution. This is due to the fact that we need to be able to defend the results in front of the management (Chief Officers). In case we do not have the reliable information, data, indexes, benchmarks, we can lose the credibility very quickly. Therefore the IT and business consultants who are producing these general tools are concentrating on simplifications. Due to the ongoing financial crisis the management had and still has to dramatically decrease investments. Therefore in a case any IT company wants to win more opportunities and be more precise, more reliable than the competition has to change the approach of evaluation of the IT projects and therefore simple methodologies, frameworks, and calculators become less and less usable.

The main goal of this thesis is to research and develop a methodology or a framework that will help to better integrate business and IT world together and will be able to include evaluation and estimation of the most valuable benefits. The most challenging issue is to take into account intangible costs and benefits that will be accepted in the same way as the tangible costs and tangible benefits.

3 WORKING METHOD – PREROI Framework

PREROI Framework methodologies (name of the proposed solution efficiency evaluation framework) of IT solutions efficiency evaluation combine methods from areas like:

- Economy – This area covers the evaluation of the customer situation. It is about questionnaire preparation, estimation of the costs and benefits, KPIs selection etc.
- IT – The entire framework concentrates on IT sector and the knowledge of the IT is required if we want to divide IT solution to smaller issues and to be able to describe them, so we can evaluate the costs and benefits within the framework

If we want to evaluate efficiency or non-efficiency of any solution in any industry, we need to focus on evaluating of couple different indicators.

In my thesis I used these indicators that helped in the evaluation:

- NPV – Net Present Value
- ROI – Return on Investment
- Payback Period
- EVA – Economic Value Added
- TCO – Total Cost of Ownership

These indicators must be evaluated at once because there is a correlation among these indicators and all of them influence the final decision whether or not to invest into the project.

What does the PREROI framework include?

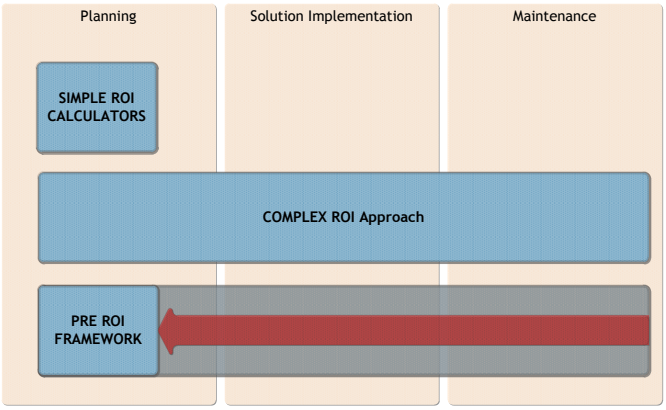
- Framework – it is the mixture of the methodology, setup and a step by step process that is usable during any IT solution evaluation period
- PREROI – it means that it is usable before any decision is made about realizing an IT project or not
- It consists of couple of excel calculators that are usable during the process of the evaluation – some parts are available, some of them are owned by IBM company and only the output from the tool is available
- This thesis works as a “cookbook” – in case you would like to do the IT solution evaluation than this thesis works as a step by step process that navigates knowledge worker (someone who is interested in the evaluation) through the entire framework and process
- The goal was to prepare a methodology that will be independent on any tools, excel sheets etc. You can use your own tools but the inputs, outputs, questionnaires, equations and interpretations of the results should reflect all the recommendations from the PREROI framework.

Why do we talk about the PREROI and what does it mean?

The right way how to measure the Return on Investment (that represents the IT Solution Efficiency Evaluation) in the IT projects is to measure the ROI before the project starts, during the implementation phases and after the project goes in the production. The final phase helps a lot to have the ROI calculation more accurate and more reliable due to the post processing. Retrospective measurements will adjust the benefits estimation. This is a very important step within the standard ROI process. Once again, I would like to mention that we are talking about the ROI but in the background there is a group of variables that are behind the ROI (payback period, NPV, IRR etc) used as well.

Where is the biggest issue when I tried to develop the PREROI Framework? See the picture below.

Picture - ROI Evaluation



The entire process of the PRE ROI framework has been divided into several major verticals and minor substeps. Each of them will be described into the detail. The entire process of the preparation of the PRE ROI Framework took me several years of adopting complex ROIs, simple ROIs, consulting with people who are responsible for Business Value Assessment, and leveraging feedbacks from the customers. The PRE ROI Framework methodology is a never ending approach and the process can still change in the future. For instance, new IT industries and solutions can occur; a new type of costs can occur in the IT ROI process, we can expect new forms of benefits as well. Therefore all of mentioned factors would have impact on the process.

Please see the most recent evaluation process of the PREROI framework that has been many times changed, upgraded and improved - the latest version is described below. The entire process now consists of 12 steps that are divided to several logical sections.

ROI Selection

1. Industry Selection – this step is important because IT solutions are industry agnostic and division IT solutions according to the industry is essential.

2. IT Solution Selection – This is a second dimension and according to this dimension we will be able to define KPIs, software, hardware, and services.
3. KPI Selection – This is the last step within the ROI selection part. According to the Industry and IT Solution, we should be able to define appropriate KPIs.

Data Collection/Validation

4. Questionnaire Preparation – Questionnaires are dependent on the ROI Selection phase. We cannot expect that there are all questionnaires prepared according to all combinations of IT solution and Industry. Therefore we must be prepared to define questionnaires for any combination of Industry and IT solution.
5. Data Collection – there are many methods of data collection (phone, web, face to face meetings). We need to accommodate to the customer and evaluation needs.
6. Data Validation – This is a very important step when we need to validate the data input according to our experience, according to the industry standards, or market data. The best output we can achieve is when we are able to validate the data correctly.

Benefit Analysis

7. Benchmarking – According to the KPI selection, industry and IT solution, we can investigate whether there are available data of benchmarking of these indicators. If yes, we can compare information of our measured company with top performers and find out whether there is a potential to improvement. It can generate new benefits.
8. Business Benefits Estimation – Here we need to apply couple of methods like Activity Based Costing, Benchmarking and transformation from Intangible to Tangible Benefits etc.

Cost Analysis

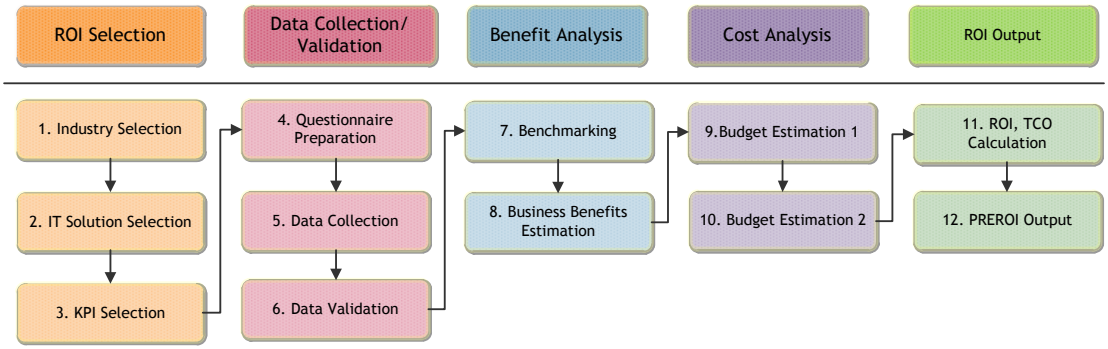
9. Budget Estimation 1 – Cost Analysis was divided to two steps. Here in the first step we prepare the budget estimation without taking into account any optimizations. We need to estimate costs for hardware, software, services, and maintenance.
10. Budget Estimation 2 – This step was added because there is a chance to optimize costs. If you understand how software licenses are calculated, what the maintenance means, what service level agreements with response time means, this can lead to optimization and savings in amount of tens percent of costs.

ROI Output

11. ROI, TCO Calculation – This is the final step when we collect all the data, evaluate the data and optimize the cost and benefits.
12. PREROI Output – This last step is important for interpretation purposes. We have all the required data and need to prepare for the final presentation of the results.

The process map of the PRE ROI framework is displayed in the next picture.

Picture - PRE ROI Evaluation Framework



As it has been described sooner, the PREROI Framework tries to combine simple "before implementation" methodologies together with complex methodologies that run before, during, and after the IT solution implementation. The most important advantages of combination of several approaches are:

- Better decisions before IT solution implementation –applied know how from complex long running ROI estimations
- Bottom Up approach – from IT to business – most of other approaches are Top Down
- Usable in top down approaches as well – from a business to the IT
- Independent on the ROI calculator – current versions can be used
- Possibility to use it before a project starts
- Usable for estimations that allow the management to decide whether to go or not to go into the project
- Precise intangible benefits estimation – usage of benchmarking, activity based costing. and other methods within the PRE ROI Framework

4 RESULTS

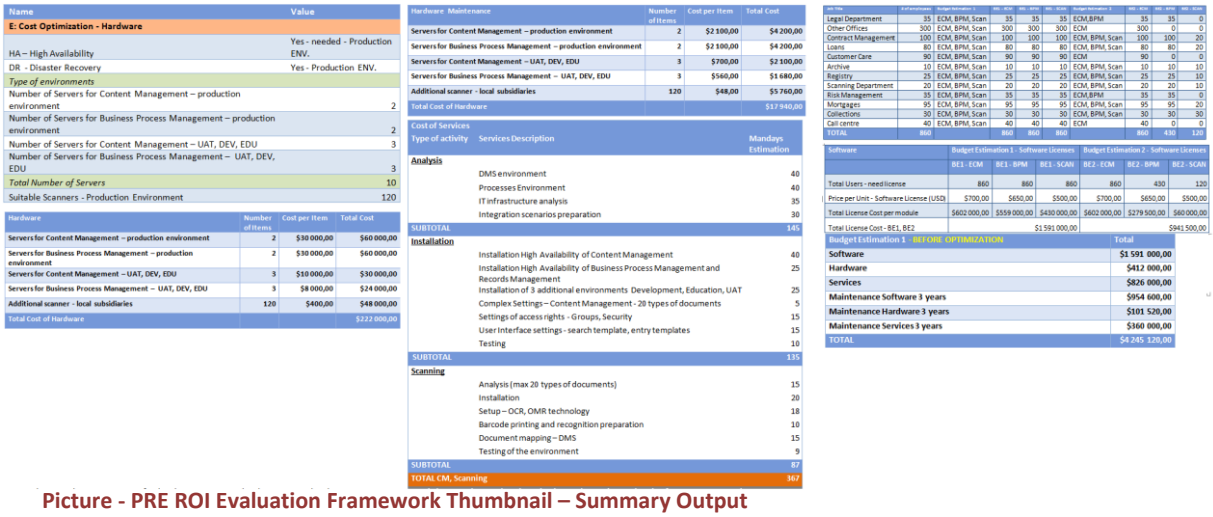
This chapter summarizes the outputs from the PHD thesis developed framework. We should divide results into two groups.

First of all there are outputs of the PREROI Framework. The PREROI framework has been used in couple cases (in real situations when customer wanted to decide whether to invest into the IT solution or not.

In the following pictures, there are only a few thumbnails how the real output looks like.

The output of the framework shows many indicators as for instance Payback Period, NPV, ROI, TCO etc. The visualization is important as well, therefore there are couple charts that demonstrate the costs against benefits.

Picture - PRE ROI Evaluation Framework Thumbnail – Some of the Input parameters



Name	Value
E: Cost Optimization - Hardware	
HA – High Availability	Yes - needed - Production ENV.
DR - Disaster Recovery	Yes - Production ENV.
Type of environments	
Number of Servers for Content Management – production environment	2
Number of Servers for Business Process Management – production environment	2
Number of Servers for Content Management – UAT, DEV, EDU	3
Number of Servers for Business Process Management – UAT, DEV, EDU	3
Total Number of Servers	10
Suitable Scanners - Production Environment	120

Hardware	Number of Items	Cost per Item	Total Cost
Servers for Content Management – production environment	2	$30 000,00	$60 000,00
Servers for Business Process Management – production environment	2	$30 000,00	$60 000,00
Servers for Content Management – UAT, DEV, EDU	3	$10 000,00	$30 000,00
Servers for Business Process Management – UAT, DEV, EDU	3	$8 000,00	$24 000,00
Additional scanner - local subsidiaries	120	$400,00	$48 000,00
Total Cost of Hardware			$222 000,00

Hardware Maintenance	Number of Items	Cost per Item	Total Cost
Servers for Content Management – production environment	2	$2 100,00	$4 200,00
Servers for Business Process Management – production environment	2	$2 100,00	$4 200,00
Servers for Content Management – UAT, DEV, EDU	3	$700,00	$2 100,00
Servers for Business Process Management – UAT, DEV, EDU	3	$560,00	$1 680,00
Additional scanner - local subsidiaries	120	$48,00	$5 760,00
Total Cost of Hardware			$17 940,00

Cost of Services Type of activity	Services Description	Mandays Estimation
Analysis		
	DMS environment	40
	Processes Environment	40
	IT infrastructure analysis	35
	Integration scenarios preparation	30
SUBTOTAL		145
Installation		
	Installation High Availability of Content Management	40
	Installation High Availability of Business Process Management and Records Management	25
	Installation of 3 additional environments Development, Education, UAT	25
	Complex Settings – Content Management - 20 types of documents	5
	Settings of access rights - Groups, Security	15
	User Interface settings - search template, entry templates	15
	Testing	10
SUBTOTAL		135
Scanning		
	Analysis (max 20 types of documents)	15
	Installation	20
	Setup – OCR, OMR technology	18
	Barcode printing and recognition preparation	10
	Document mapping – DMS	15
	Testing of the environment	9
SUBTOTAL		87
TOTAL CM, Scanning		367

Job Title	# of Employees	Budget Estimation 1	BE1 - ECM	BE1 - BPM	BE1 - SCAN	Budget Estimation 2	BE2 - ECM	BE2 - BPM	BE2 - SCAN
Legal Department	35	ECM, BPM, Scan	35	35	35	ECM,BPM	35	35	0
Other Offices	300	ECM, BPM, Scan	300	300	300	ECM	300	0	0
Contract Management	100	ECM, BPM, Scan	100	100	100	ECM, BPM, Scan	100	100	20
Loans	80	ECM, BPM, Scan	80	80	80	ECM, BPM, Scan	80	80	20
Customer Care	90	ECM, BPM, Scan	90	90	90	ECM	90	0	0
Archive	10	ECM, BPM, Scan	10	10	10	ECM, BPM, Scan	10	10	10
Registry	25	ECM, BPM, Scan	25	25	25	ECM, BPM, Scan	25	25	10
Scanning Department	20	ECM, BPM, Scan	20	20	20	ECM, BPM, Scan	20	20	10
Risk Management	35	ECM, BPM, Scan	35	35	35	ECM,BPM	35	35	0
Mortgages	95	ECM, BPM, Scan	95	95	95	ECM, BPM, Scan	95	95	20
Collections	30	ECM, BPM, Scan	30	30	30	ECM, BPM, Scan	30	30	30
Call centre	40	ECM, BPM, Scan	40	40	40	ECM	40	0	0
TOTAL	860		860	860	860		860	430	120

Software	Budget Estimation 1 - Software Licenses			Budget Estimation 2 - Software Licenses		
	BE1 - ECM	BE1 - BPM	BE1 - SCAN	BE2 - ECM	BE2 - BPM	BE2 - SCAN
Total Users - need license	860	860	860	860	430	120
Price per Unit - Software License (USD)	$700,00	$650,00	$500,00	$700,00	$650,00	$500,00
Total License Cost per module	$602 000,00	$559 000,00	$430 000,00	$602 000,00	$279 500,00	$60 000,00
Total License Cost - BE1, BE2			$1 591 000,00			$941 500,00

Budget Estimation 1 - BEFORE OPTIMIZATION	Total
Software	$1 591 000,00
Hardware	$412 000,00
Services	$826 000,00
Maintenance Software 3 years	$954 600,00
Maintenance Hardware 3 years	$101 520,00
Maintenance Services 3 years	$360 000,00
TOTAL	$4 245 120,00

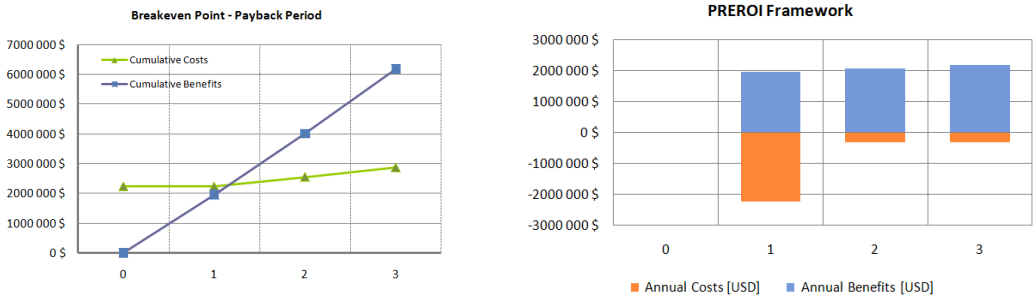
Picture - PRE ROI Evaluation Framework Thumbnail – Summary Output

FINAL RESULTS Amounts in USD	Year 1	Year 2	Year 3	Total
Software Costs	-$941 500,00			-$941 500,00
Software Support	-$188 300,00	-$188 300,00	-$188 300,00	-$564 900,00
Hardware Costs	-$222 000,00			-$222 000,00
Hardware Support	-$17 940,00	-$17 940,00	-$17 940,00	-$53 820,00
Incremental Personnel Costs				
Incremental Transactional Costs				
Professional Services / Training Costs	-$859 000,00	-$120 000,00	-$120 000,00	-$1 099 000,00
Other Costs				
Annual Costs	-$2 228 740,00	-$326 240,00	-$326 240,00	-$2 881 220,00
FTEs Savings	$1 214 101,40	$1 263 029,69	$1 313 929,79	$3 791 060,88
Transactional Savings	$743 194,28	$794 970,71	$852 336,69	$2 390 501,68
Other Direct Savings				
Annual Savings	$1 957 295,68	$2 058 000,40	$2 166 266,48	$6 181 562,57
Annual Net Value Derived	-$271 444,32	$1 731 760,40	$1 840 026,48	$3 300 342,57
Cumulative Net Value Derived	-$271 444,32	$1 460 316,08	$3 300 342,57	$3 300 342,57
Economic Value Added (EVA)	$213 383,81	$793 306,64	$858 266,29	$1 864 956,74
Internal Rate of Return (IRR)	-12,2%	42,4%	65,1%	
3-Year ROI	49,36%			
Payback Period in Months	13,9 months			
Net Present Value (NPV)	$2 890 161,76			

Investment Risk Ratio:	%	Ratio
3-Year Risk Calculation	65,14%	16,3
Company's Cost of Capital	4,00%	

3-Year TCO	$2 881 220,00

Picture - PRE ROI Evaluation Framework Thumbnail – Visual Output



The application of PREROI Framework on several customers showed that it is usable in several industries and couple of IT solutions as well. The results were fully accepted and helped with final decision.

The comparison of the PREROI framework against other methodologies and calculators is important as well.

Evaluated calculators:

- No Paper Weight – Simple calculator that concentrates on the benefit evaluation when trying to implement paperless communication within the company.
- NR Quick Calc – Nucleus Research Quick Calc – Simple calculator that is able to estimate benefits for any IT project in general.
- NR MS CMS – Nucleus Research Microsoft Content Management System Calculator – This calculator is very sophisticated and complicated at once and expects a lot of input values.
- PREROI Framework – This is a collection of calculators, temporary quotations, and a framework as well. The biggest advantage is in the adoption to the customer needs.

Within the next table, you can see the final comparison of all used calculators. There has been prepared a list of attributes and parameters that are important for any methodology of evaluation of the IT solution efficiency.

Table – Evaluation of the ROI Calculators

Parameter	No Paper Weight	NR - Quick CALC	NR - MS CMS	PREROI FRAMEWORK
Easy to use				
Complex				
Cost of Capital				
Avg Annual Personnel Growth Rate				
Avg Annual Salary Increase %				
Takes into account taxes				
Takes into account fluctuation				
Tangible Costs				
Tangible Benefits				
Intangible Costs				
Intangible Benefits				
Software Cost Optimization				
Hardware Cost Optimization				
Maintenance Cost Optimization				
Services Cost Optimization				
Activity Based Costing				
KPIs				
Benchmarking				
Top down approach				
Bottom up approach				
Software Costs				
Hardware Costs				
Services Costs				
Maintenance Costs				
Direct Savings				
Indirect Savings				
TCO				
NPV				
ROI				
Payback Period				
EVA				
Easy Report				
Complex Report				
TOTAL POINTS	7	10	23	32

- This color means that the parameter/function **is not** included

- This color means that the parameter/function **is** included

Within the previous table, there is the final evaluation. We can simply say that easy and simple ROI calculators do not have such an added value which can help with final decision making whether to go with the IT project or not. They are very easy to use but the results are very unreliable. If we use complex ROI calculators, as for example Nucleus Research – Microsoft Content Management Server – Cost Information, the quality of the information is much higher. The final problem is that even when using complex calculators, the intangible benefits, intangible costs, Activity Based Costing, KPIs, and other things that have highly added value are very often missing.

PREROI Framework Real Example Application – The PREROI Framework has been used in several companies (banking, insurance, utility). In one example Nucleus Research MS ROI Calculator was used and according to the previous described limitations the business case was not so positive and according to not acceptable results the banking company decided to do the estimation once again before final decision. The most important output from the measurements was that the payback period after using PREROI Framework was approximately one year with reliable data and usage tangible and intangible benefits and cost estimation. The payback period was around three years with previous ROI calculator. Now, in the very complicated economic situation, this is not acceptable and a customer is not able to decide whether to invest or not if not having reliable outputs from the evaluations. In the simplest calculator No Paper Weight, the payback period is almost one year as well but after a very simple investigation you can see that there is a lot of information missing and the calculation has been based on very week assumptions and estimations. The customer could not accept the simple calculator output.

The PRE ROI framework demonstrated its reliability in this case. It uses intangible benefits, intangible costs, Activity Based Costing, or KPIs to find the added value. There is still a lot of potential for improvements of the PREROI Framework in the future. According to the comparison with other ROI methodologies and calculators (previous table), the results are much better for the PREROI framework with significant business case estimation improvements.

5 CONCLUSION

The way to finalize the doctoral thesis was very prickly. I was a little bit wondering why several professors from the university are smiling at me in the phase of selection of the thesis when I was presenting a dare plan for calculating the Return on Investment within the IT sector. Everybody knew that the intangible benefits and other issues can cause a lot of troubles and sleepless nights when trying to find the way how to evaluate the benefits and be able to calculate ROI.

First of all, I would like to say that there is a very limited number of highly valuable information on the market about this topic. But there is a lot of information coming from the companies that try to persuade customers to buy some solution and therefore prepare some simple automated calculators to be able to demonstrate highly added value to their solution and very often against the others. The academy sphere concentrates on many other problems than the IT solution efficiency evaluation. Due to the fact that within the USA the ROI is very often part of the projects, they are very skilled and experienced in this topic. They use complex methods that calculate ROI through the entire implementation of a project.

I recognized the biggest added value for the PREROI framework estimation in the communication with people from the biggest companies in the area of the business consultancy and the IT sector. I appreciate the communication with consultants from companies like PricewaterhouseCoopers, IBM, SAP, FileNet, Lotus, Siemens, Microsoft, Oracle, and many others. Most of them are doctors and their contribution to this area where they work is essential.

Secondly, a lot of information is not public and most people are not allowed to obtain the information. In the benchmarking area (part of PREROI framework) that concentrates on the process of comparing one's business processes and performance metrics to industry bests and/or best practices from other industries, the database with much information inside is very often the only know-how of the companies that concentrate on the benchmarking. Any form of access to their database can harm their business.

Before I started with my thesis, I had done a worldwide analysis in the ROI area of all possible sources - commercial, noncommercial from various industries and at different times. On the other hand, what helps me a lot is the fact that I have been working for IBM for almost four years and I concentrate on the area of presales phases. This type of efficiency evaluation is a part of my work. I had a chance to cooperate with many worldwide experts on this topic as well and I have received many valuable feedbacks on my work from them.

After the analysis and studying a lot of materials and books related to the ROI, I started to work on the investigation, optimization and tuning of the “PREROI framework” that should come with a new approach of evaluating the ROI (and other indicators) in the shorten way. I was looking for a method that can be applicable in the early phase of any IT project. As we know, a standard process of the ROI estimation goes through all the phases of the project – analysis, implementation, production, and maintenance etc (from the beginning to the end of the project). In my job as a Technical presale, we need to prepare the estimation before the project starts and

estimate and evaluate benefits of the projects. After that, these results are demonstrated to the management and according to the "quality" of the estimation and the evaluation they will decide about the next step (go or no-go with the project). In the following text there is a list of added values of the "PREROI framework" against other ROI calculators, setups, or methods.

Where is the added value and uniqueness of the PRE ROI Framework?

- It works on general principles of efficiency evaluations
- The framework works not only with tangible information as other tools but with intangible as well
- The activity based costing method is used for improvement of employee efficiency
- This framework concentrates on the effectiveness of the cost as well
    - Precise sizing setup for hardware estimation and optimization
    - Optimization of Software costs
    - Optimization of Maintenance costs
- Usage of the KPIs is unique in this area
    - Calculation of added benefits in the form of difference between top performers` KPI and customer's KPI
- Usage of the bottom up approach of evaluation of a business case – this is very rarely used approach for the ROI estimation
- Possibility to use the framework in the IT -> Business (searching a business case) and also Business -> IT direction as well (top down and bottom up approaches)
- PRE ROI Framework has been applied to several customers with positive feedbacks
- The results have been accepted by the management of tested companies
- There is a future potential to continue with the development of the framework:
    - Prepare real valuable database of KPIs within the IT area
    - Gather data from companies to establish a tight relation between the KPI and the benchmarking
    - Prepare assets, questionnaires for all IT solutions
    - Standardize – KPI sets for industry/solution, questionnaires, benchmark measurements of the KPIs

The PRE ROI Framework is a set of methodologies, approaches, processes, tools, and know-how that evaluates the IT solution efficiency (the entire process has been described within the thesis). Tests of the framework have been applied to the IT area of the Enterprise Content Management with the specialization on the banking industry. For the estimation and evaluation, many standard methods like NPV, ROI, IRR, and payback period are used.

Where is the PREROI name coming from? The standard ROI estimation and calculation (sophisticated and reliable) is very expensive and costs from 3-5 percent of IT budget (the results are not always accepted by the management nor are adapted to the management needs). Due to the very complicated situation on the market (financial and economic crisis) companies are not able to pay for such a complex process and they are requesting very quick, highly effective evaluation of potential business cases. The PRE means that this methodology concentrates on evaluation before RFI (Request of Information) and RFP (Request of Proposal) phase of the IT

project. The RFI and RFP are standard ways how to prepare the selection procedure for potential implementation vendors. The ROI should be a part of any IT project (should be a part of any project but we are concentrating on the IT and its specifics). PRE ROI should be the one that helps with the evaluation before any decision of starting or not starting the project is made. This was the second approach. Not only to concentrate on the ROI methodology that is expensive and is accepted only in a limited number of cases but also to be able to use it in any situation. We need to take into account that if we are talking about the ROI, it always depends on the quality of the inputs. Due to the fact we are working with estimations, best practices, and a lot of uncertainty input, the output is very dependent on these values. So in case we will use the PREROI framework we need to recalculate the PREROI framework results according to the input for the complex method – to have the same input and to be able to compare two evaluations based on the same input. The framework will estimate and evaluate the results on the before start project values and compare it with the methodology that is complex and uses values from the beginning, during the project and after the project is in production state.

Due to the fact that the PREROI framework invention and preparation is very complex and consists of solving many problems at once (IT, economy, questionnaires, activity base costing, KPIs, HW, SW, services, SLAs etc) the thesis has been divided into many parts according to the logical parts.

The entire thesis is divided into eight main parts:

Chapter 1 – Topic

This part is concentrating on the IT Solution Efficiency Evaluation selection. Due to the fact that the IT sector is one of the biggest influencers of all human beings in the 21st century and is the first in the biggest danger because of the financial and economy crisis, the efficiency evaluation becomes very important when calculating Return on Investment in these types of projects. This topic is very young and there is not enough information within this area and needs a lot of new approaches, new ideas etc.

Chapter 2 – Goal of the Thesis

The main goal of this thesis is to research, investigate, and develop a process, a methodology, or a framework that will try to answer directly to the topic of this thesis. The IT Solution Efficiency Evaluation process or framework should be the answer and the output. The methodology should help a customer with the business case estimation and with calculating the return of investment.

Chapter 3 – Investment Decisions

An introduction and a definition of standard indicators is a main goal of this Chapter. There is information from the market that says which indicators are used for the solution efficiency evaluation. These standard indicators are defined together with the quantification and the equation of the indicators. It helps to unify the definitions and the usage of the indicators.

Chapter 4 – Important Steps in Efficiency Evaluation

Within this chapter, the most important steps of the entire framework of the efficiency evaluation solution are defined and described into the detail. The entire process consists of many steps. Here you can see how complex the problem of the efficiency evaluation is.

The main steps are:

- **Industry Sector Selection** – This is one dimension of selection criteria before going through the PRE ROI Framework process. For instance, we try to implement some IT solution within the banking sector. This is the main "variable" that determines the behavior of the framework.
- **IT Solution Selection** – This is the second dimension of selection criteria before going through PRE ROI Framework process. The IT Solution areas are so different that it makes sense to select one of them – encapsulate the problem and try to evaluate the efficiency on this part. From the best practice perspective, this dimension is the one that determines the project. For instance, Enterprise Content Management area is one of the IT Solutions. At the end, we try to evaluate Enterprise Content Management IT Solution within the banking sector. This selection determines next steps such as – KPI selection, Questionnaire preparation, Activity Based Costing, Looking for a business case
- **KPI Selection** – This is a unique method that improves the performance of the PRE ROI Framework. Two dimensions – the industry and the IT solution determine the selection of Key Performance Indicators. According to the KPIs and their measurement, we can apply the benchmarking and compare the performance of the measured company with others on the market. In case a KPI is a precise value of some activity, cost, or benefit, we can use the top performers on the market and compare them against the measured customer. It generates the added value that is used as the benefit later on.
- **Benchmarking** – This method was originally used for a different purpose. The original idea was to give customer the final recommendation where the company should improve and what are the results of the best competitors on the market. It makes sense for our purposes to use specific benchmarks in cooperation with KPIs. We can achieve the best results when combining benchmarking with KPIs. We will measure KPIs within the industry for many customers. The result will show us if we can improve and how. After that we can specify the not achieved top performer values and the difference of the values between the measured company and the top performer. This difference means unrealized benefit that can be added to the benefits side (we need to take into account more complex information) but it counts.
- **Questionnaire Preparation** – According to the Industry, IT solution, and the KPI set selection, the questionnaires can be prepared. The industry and IT dimensions determine even activities that are measured according to the questionnaire.
- **IT Projects Costs** – Neither the methodology nor the tool is concentrating on the costs optimization at the early stages of the project. Here I have applied optimization methods in the Software, Hardware, Services, and Maintenance area to be able to lower the costs as the main indicator within the IT solution efficiency evaluation.

- **IT Projects Benefits** – The key factor for a success of any project is to generate enough benefits to be able to persuade the management to approve the project and start with the implementation. I am using the reverse process of generating benefits – the bottom up approach (a standard way is the top down approach – a request going from the business to the IT). This opposite direction helps to optimize the entire process. We can optimize costs (understand the technology and apply to the business needs) and understand even more the benefits (we know exactly what benefits the IT solution generates and we are mapping them once again to the business requirements). This method is applied to the employees as well. I use Activity Based Costing method that measures the efficiency and the productivity by employees in the AS IS state in the influenced part of the company by the requested IT solution (the current status – manual processes instead of automatic, the paper work instead of automated, manually generated reports instead of automatic). I am able to estimate the productivity increase according to the IT solution deep knowledge, best practices and reports from the other companies from the evaluated sector.

Chapter 5 – Worldwide IT Efficiency Solutions

This chapter concentrates on a large worldwide analysis of the current status of the IT solution efficiency evaluation. This very long and extensive investigation helped me a lot in the development of the PRE ROI Framework. All institutes, universities, companies etc. are using different approaches in the evaluation method and as you will see there is no standardization in it.

Chapter 6 – PREROI Evaluation Framework

This is the key output of the entire thesis. After researching the entire market, reading tens of books, investigating many internet sources, after the communication with many people worldwide who concentrate on ROI calculations, doing benchmarking, preparing KPIs, implementing IT solutions, working as a consultant, doing presales activities, working in the management, I had enough inputs to be able to research and prepare the new methodology (framework) that will connect all industries, solutions, methodologies, approaches, assets together. Within this chapter the entire process of the IT Solution Efficiency Evaluation is described into the detail.

The biggest advantages of the PREROI framework are in putting many methodologies, assets, approaches, and ideas together. Only this framework uses two dimensional encapsulation of the problem at once (Industry, IT Solution), uses KPI indicators, benchmarking, Activity Based Costing, and the bottom up approach in generating benefits altogether.

The PREROI means that in a relatively short period of time we are able to evaluate the main indicators and are able to discuss the results with the management and IT as well. IT shortens the time and PREROI Framework is usable in decision making at the beginning of the project whether to approve or decline the project. We do not need to wait with the estimation and the evaluation until the end of the project (although some inputs are precise only after the project is finished and

re-measured) as in the case of complex calculators (most of them do not take into account intangible benefits as it is in the case of the PRE ROI Framework).

Chapter 7 – PREROI Framework – Example

After the development of the framework the application on the real example is a key attribute of the success. The methodology is applied to several customers (enterprise banking, insurance and utility). One of the applications is being presented within this study. The results have been presented to the management and the feedback was very positive. In some cases we had a chance to calculate ROI with limited inputs from the customer. I have used statistical data instead of internal values and used it as an input to the PRE ROI Framework. The results were positively accepted.

Chapter 8 – Comparison of PREROI Framework with the other Calculators

The comparison of the PREROI Framework with the other calculators and methods is very important. Here you can see that it is very critical to use the right approach to be able to persuade a customer. In my example, standard approaches (calculators, framework) failed. It means that customer would not continue with the proposed IT project because of the business case results. The payback period was too long for the customer and the inputs and outputs were very unreliable. Therefore the customer needed to find the acceptable business case or accept the results and stop the project. The PREROI framework was fully accepted and generated more real outputs and optimized cost of the solution as well. It helped to the customer to decide to implement the IT project at the end of the investigation.

Chapter 9 – Conclusion

This is the final chapter in which I try to summarize the entire process of the research of the framework together with the future potential. After finalizing the doctoral thesis, I see a great potential of the proposed PRE ROI Framework. There is a chance to continue with the research of the methodology and the standardization. Now the PRE ROI Framework covers the entire IT sector in general (the details about each IT industry has to be developed – within this thesis the Enterprise Content Management and Business Process Management areas have been described into detail). There is a chance to continue researching and developing the methodology not only for IT but for all other industries as well. For instance, there are new areas as the KPI measurement and benchmarking that are still rapidly developing. They fully influence the efficiency evaluation methodology.

Very important was also the comparison of the framework with other approaches and calculators on the market (the details are in chapter 4 – Results). In conclusion, I want to say that the best feedback from my research was the usage of the PREROI Framework in practice for several international companies from various sectors. The output of the Framework has been accepted with the entire management (it gave me a lot of feedback and added value and according to that I have refined and optimized some steps of the PREROI framework) and it gave

me a clear signal to continue with the research and the improvements of the entire area of efficiency evaluation.

I would like to thank once again to all people that were constantly supporting me in a very long journey of my investigations and writing of this thesis.

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List of Candidate's Works Relating to the Doctoral Thesis

Theme Related Works

Impact Journal Works (Impaktované časopisy)

Švík, M.
IBM nabízí vše pro správu obsahu (IBM covers all functionalities for the ECM platform)
In: The Blue Rose, 2008, roč. 2008, č. 2, s. 22-23. ISSN 1211-2151

Peer-Reviewed Journal (Recenzované časopisy)

Švík, M.
Nová forma reklamních kampaní na obzoru (New Upcoming Marketing Campaigns)
In: Marketing & komunikace, 2007, roč. 17, č. 1, s. 12. ISSN 1211-5622

Švík, M.
Nové komunikační kanály (New Communication Channels)
In: Marketing & komunikace, 2006, roč. XVI., č. 4, s. 27-29. ISSN 1211-5622

Patents (Patenty)

No patent

Excerpted Publications (Excerpované časopisy)

Švík, M.
Návratnost investic v oblasti IT (Return on investment in IT) ***(will be issued, approved)***
In: Moderní řízení, 2011, roč. 2011, č. 9-10, ISSN 0026-8720

Smolíková, E. (50% participation) - Švík, M. (50% participation)
Celopodnikové vyhledávání aneb vyhledávání informací nejen v ECM (Enterprise Search or Search of information not only in ECM)
In: ComputerWorld, 2009, roč. 2009, č. 6, s. 29. ISSN 1210-9924

Švík, M.
Návratnost investic v oblasti ECM (Return on Investment within ECM area)
In: Moderní řízení, 2009, roč. 2009, č. 9, s. 46-47. ISSN 0026-8720

Švík, M.
ROI, TCO a NPV: Svatá trojice (ROI, TCO and NPV: Holy trinity)
In: CIO Business World, 2009, roč. 2009, č. 4, s. 16-17. ISSN 1803-7321

Švík, M.
Efektivní správa obsahu - kvalitní systém ECM musí poskytovat řadu různých služeb (Effective Content Management – high quality ECM solution must provide many services)

In: ComputerWorld, 2008, roč. 2008, č. 7, s. 3. ISSN 1210-9924

Švík, M.
CMIS: Nová éra ECM (CMIS: New era in ECM)
In: Svět obchodu, 2008, roč. 2008, č. 12, s. 27. ISSN 1213-1709

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In: Professional Computing, 2008, roč. 9, č. 2, s. 40. ISSN 1214-5335

Švík, M.
Jak řídit procesy (How to manage processes)
In: ComputerWorld, 2008, roč. 2008, č. 7, s. 4, ISSN 1210-9924

Other works (Ostatní publikace)

Švík, M.
How to Manage and Govern Information or IBM ECM Solution
[Published Lecture], VSE CSSI, Czech, 2010-02

Švík, M.
Business Value Assessment
[Published Lecture], VSE University, Czech, 2010-04

Švík, M.
Maximum Usage of Information
[Published Lecture], Virtual IBM Conference, Internet, 2010-09

Švík, M.
Advanced Case Management Enablement (Business Value)
[Unpublished Lecture], Public Sector, Turkey, 2011-03

Švík, M.
Content Analytics – University – Business Added Value
[Unpublished Lecture], University Day, Slovakia, 2011-05

Švík, M.
Enterprise Search/Content Analytics – Business Added Value
[Unpublished Lecture], Istanbul Technical University, Turkey, 2011-04

Švík, M.
Kunstová Renáta - Efektivní správa dokumentů (Effective Document Management)
[Citation], 2010, ISBN 978-80-247-3257-2

Švík, M.
Return on Investment of the ECM solution within Insurance Company
[Unpublished Lecture], Insurance Company, Romania, 2010-03-02

Švík, M.
Návratnost investic v oblasti IT (Return on Investment in IT sector)
[Unpublished Lecture], Banking Sector Customer, 2009-10-07

Other Works (Out of the Theme)

Impact Journal Works (Impaktované časopisy)

No Impact journal Works

Peer-Reviewed Journal (Recenzované časopisy)

No Peer-Reviewed Journal

Patents (Patenty)

No Patents

Excerpted Publications (Excerpované časopisy)

Švík, M.
ECM v praxi (ECM in practice)
In: ComputerWorld, 2008, roč. XIX, č. 19, s. 23-25, ISSN 1210-9924

Švík, M.
Nalezněte jehlu v kupce sena (Find a needle in a haystack)
In: ComputerWorld. 2008, roč. 2008, č. 7, s. 5., ISSN 1210-9924

Švík, M.
Nasazování řešení v oblasti Enterprise Content Managementu
In: Svět obchodu. 2008, roč. 2008, č. 5, s. 44., ISSN 1213-1709

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Švík, M.
Spisová služba jako součást ECM řešení (Records Management as a part of ECM solution)
[Published Lecture], ISSS Conference, Czech, 2010-03

Švík, M.
ECM/ICA/Search Enablement
[Unpublished Lecture], Business Partner Enablement, Romania, 2011-03

Švík, M. (50% participation) - Beneš, D.B. (50% participation)
Oblast komplexního vyhledávání informací napříč celou organizací (Enterprise Search cross the entire organization)
[Unpublished Lecture], IBM Česká republika, 2008-11-04

Švík, M. (50% participation) – Mikolášek, J. (50% participation)
BP Univerzita - Enteprise Content Management
[Unpublished Lecture], IBM Česká Republika, 2008-03-13

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SUMMARY

The main goal of the PHD study "IT Solution Efficiency Evaluation" is to develop a method or a framework of the efficiency evaluation that will be generally acceptable not only for the professional public but with the top management of the companies that would possibly use this methodology for their evaluations as well.

On the worldwide level, the main focus on the topics Return on Investment and Effectiveness of IT solutions come from the largest IT companies that offer IT solutions such as IBM, Oracle, and Microsoft. It is because of the need to demonstrate the benefits of the proposed IT solutions.

The professional public concentrates on this topic only from a general perspective. The biggest interest in this topic is coming from the private sector. The biggest companies that concentrate on the efficiency evaluation of IT projects are Nucleus Research, Alinean and ROI Institute. Each company deals with this theme a little bit differently. Some of them take into account tangible costs and tangible benefits, while some of them take into account time value of money. During the PHD study preparation phase, tens of different sources have been taken into account.

The biggest issue during the IT solution efficiency evaluation is the backward evaluation after the solution is implemented and is in the production state for some period of time. This is not acceptable duration of the evaluation. The decision needs to be done before implementation of the solution. Next issue is the fact that many companies do not accept any intangible benefits inside the evaluation.

The main goal of the PHD study is the preparation of the methodology, which can be useful before implementation of the IT solution to be able to decide whether implement a project or not. An equally important factor is the finding of such a methodology where the most intangible costs and benefits would be acceptable. It is important to find enough positive benefits to have acceptable IT solution from the payback period perspective.

Thanks to the cooperation with leading global experts (PWC, IBM Global Business Services), I also managed to use the method of benchmarking which is primarily used for performance comparison. In our case we can use the difference between the top performer and the measured company to use the difference as unrealized profit, savings, or revenue (the most important is the understanding what is the output of the benchmarking and how we can use it). Last but not least usable methodology is KPI establishment that can encapsulate the benefits of the IT solution from the other positive or negative point of view that influence company business.

Finally, I would like to mention that PREROI framework is applicable before final decision making whether invest to the IT solution or not and it has been used in couple cases in big companies within Central and Eastern Europe in areas such as banking, insurance, and utilities.

The outputs from the framework were fully accepted by the top management of several companies. The output from the framework and interpretation helped in few cases with decision of investing into the IT solution.

RÉSUMÉ

Doktorská práce "IT Solution Efficiency Evaluation" neboli "Vyhodnocování efektivnosti IT řešení" si klade za cíl najít takovou metodu vyhodnocování IT řešení a projektů, která bude obecně uznána nejen odbornou veřejností, ale i vrcholovým managementem firem. Pro tuto inovativní metodu je v rámci doktorské práce použito označení PREROI framework.

V akademické sféře je téma návratnosti investic zkoumáno dosud velice obecně. V rámci IT specializace se této problematice primárně věnují tři společnosti, které ovšem pochází z komerční sféry. Jedná se o společnost Nucleus Research, Alinean a ROI Institute. Každá z těchto společností přistupuje k tomuto tématu trochu odlišně. Některé společnosti zohledňují při odhadech a kalkulacích přímé náklady a přímé benefity. Jiné zvažují i časovou hodnotu peněz. Velké IT korporace jako například IBM, Oracle či Microsoft využívají výstupů těchto specializovaných firem k demonstraci výhod nabízených IT řešení.

Největším úskalím vyhodnocování efektivnosti je zpětné stanovení návratnosti investice – tj. v okamžiku, kdy je dané IT řešení naimplementováno a nachází se již určitou dobu v produkčním stavu. Dalším problémem je, že mnoho firem nezohledňuje nepřímé benefity v rámci vyhodnocování efektivnosti IT řešení. Cílem doktorské práce je navrhnout metodu vyhodnocování IT projektů, která bude aplikovatelná ještě před implementací konkrétního IT řešení, a na základě jejíž výsledků bude možno kvalifikovaně rozhodnout, zda projekt realizovat. Současně se doktorská práce soustředí na nalezení způsobu, jak zohlednit co nejvíce přímých i nepřímých benefitů, což ve výsledku přispěje k pozitivnímu hodnocení daného obchodního případu a jeho pravděpodobnému schválení.

Výsledná metoda, kterou doktorská studie navrhuje - PREROI framework, se inspiruje řadou oborů (služby, energetika aj.). Současně využívá již existující nástroje – např. ABC metodu pro kalkulace nákladů na činnosti (Activity Based Costing) nebo benchmarking. ABC metoda dokáže při správné aplikaci dodat vrcholovému vedení podniku podstatné informace o spotřebě podnikových zdrojů a probíhajících procesech. Benchmarking primárně slouží k porovnání výkonností firem, ale v případě doktorské studie pracuje s rozdílem mezi nejlepší firmou na trhu a měřenou společností (rozdíl mezi těmito společnostmi znamená nerealizovaný zisk, úsporu či obrat). Benchmarkingu bylo v rámci studie využito v několika případech díky možnosti spolupráce autora s předními celosvětovými odborníky (PWC, IBM Global Business Services). Dalším nástrojem, s nímž studie pracuje, je stanovení takzvaných klíčových indikátorů (Key Performance Indicators), které mohou velice efektivně separovat přínos samotného IT řešení od ostatních pozitivních či negativních faktorů, které mají vliv na chod společnosti.

Metoda PREROI framework byla již několikrát v praxi aplikována v rámci významných společností v regionu Střední a Východní Evropy (zejména v oblasti bankovnictví, pojišťovnictví a služeb) a byla vrcholovým managementem těchto společností plně akceptována. Na základě výstupů z PREROI framework bylo také již několikrát rozhodnuto o investicích do významných IT řešení.