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An Introduction to Return on Investment for Information Systems

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An Introduction to Return on Investment for Information Systems

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Abstract

Return on Investment (ROI) is an important financial metric used to evaluate existing information systems and justify investment decisions on new acquisitions. This presentation provides an introduction to the ROI. It helps to understand the concept, methods of gathering data and calculating assessments. Several types of ROI are described and compared.

Keywords: Return on Investment, ROI, information system, evaluation.

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An Introduction to Return on Investment (ROI) for Information Systems

January 17, 2011

Peter Andru
Alexei Botchkarev

Contents

- Purpose
- What is ROI?
- How it is calculated?
- What are the benefits of using ROI metric?
- What are the limitations of the ROI?
- What types of ROI exist?

Learning Objectives

- Understand ROI concept, ROI types and variations.
- Avoid common pitfalls and mistakes in calculating ROI.
- Know the limitations of the “power” of the ROI and keep your ROI-based recommendations meaningful.
- Understand the place of the ROI metric in a framework of the business value measures.

Views on ROI Vary



ROI analysis is a powerful tool for measuring the net financial benefits of an investment and is commonly used by business-oriented organizations when evaluating where to spend their resources.

Source: http://www.rti.org/pubs/issuebrief_3.pdf

ROI is arguably the most popular metric to use when comparing the attractiveness of one IT investment to another.

ROI is a key metric used by CIOs to help quantify the potential success of an IT or business project.

Source: <http://searchcio.techtarget.com/resources/Return-on-investment>

Forget ROI

“The best, most innovative IT improvements have no ROI. There was no decent ROI on installing the first Wang word processor in the 1970s or the first PC to run VisiCalc in the 1980s or the first Linux server for corporate Web sites in the 1990s.

... If we let the ROI Wormtongues rule the day, this decade will never see an analogue to the technological achievements of past decades.

...wisdom can't be reduced to an ROI calculation”.

Mark Hall *Computerworld*, 2003

<http://www.computerworld.com/action/article.do?command=viewArticleTOC&specialReportId=180&articleId=78516>



What is ROI?

- **ROI – Investopedia**

A performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. To calculate ROI, the benefit (return) of an investment is divided by the cost of the investment; the result is expressed as a percentage or a ratio.

The return on investment formula:

$$\text{ROI} = \frac{\text{Gain from Investment} - \text{Cost of Investment}}{\text{Cost of Investment}}$$

Source: <http://www.investopedia.com/terms/r/returnoninvestment.asp>

- **ROI – Wikipedia**

In finance, **rate of return (ROR)**, also known as **return on investment (ROI)**, **rate of profit** or sometimes just **return**, is the ratio of money gained or lost (whether realized or unrealized) on an investment relative to the amount of money invested. The amount of money gained or lost may be referred to as interest, profit/loss, gain/loss, or net income/loss. The money invested may be referred to as the asset, capital, principle, or the cost basis of the investment. ROI is usually expressed as a percentage.

Source: http://en.wikipedia.org/wiki/Rate_of_return

V0.11 (2011-01-17)

More ROI Definitions

- **Another definition**

ROI analysis is a form of cost-benefit analysis that measures the costs of a program (i.e., the investment) versus the financial return realized by that program.

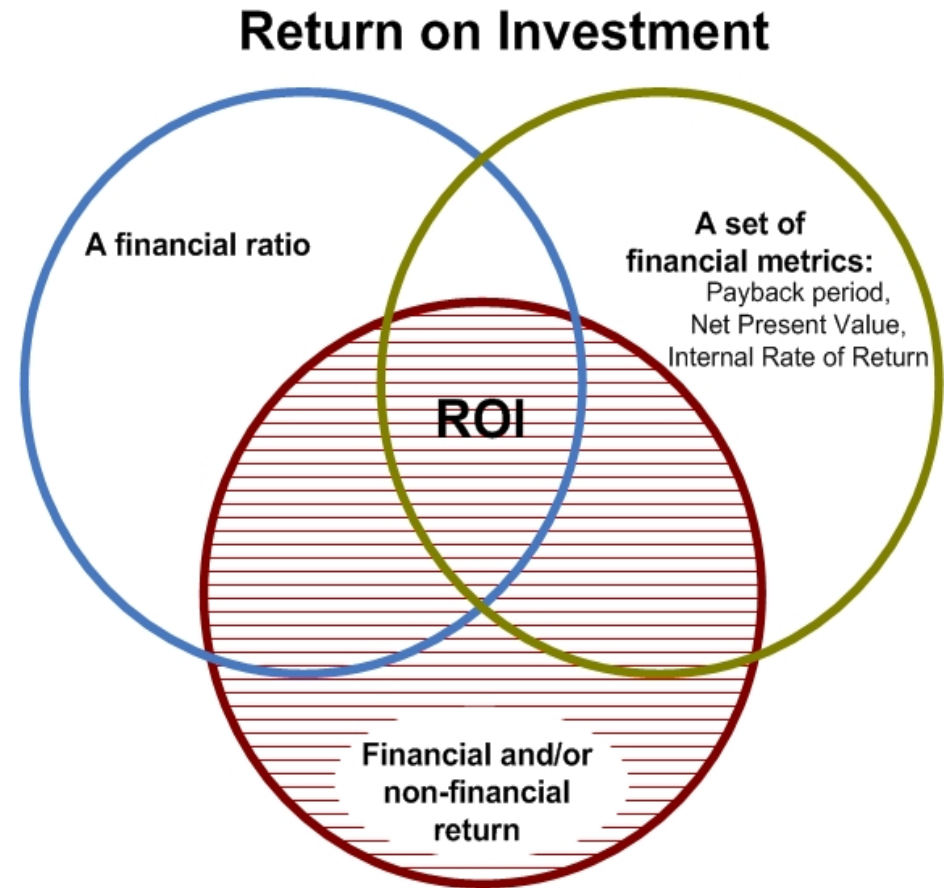
Source: <http://www.cdc.gov/leanworks/resources/glossary.html>

- **ROI** - “a bang for the buck”.

Source: wisdom of the crowd

Comment on the ROI Definition

- Definition on a previous slide from the Investopedia treats ROI as a measure / metric / ratio / number.
- At the same time, very often return on investment is understood as a “method” or “approach” – “ROI analysis”. In this meaning, ROI or “ROI Analysis” includes not only an “ROI ratio” but also several other financial measures (e.g. Internal Rate of Return - IRR, Net Present Value - NPV, payback period, etc.), which are collectively called “ROI”.
- Finally, in some cases return on investment is understood as any kind (financial or non-financial) of return / effect / result.
- This presentation is focused on the ROI as an individual measure. Other measures of the ROI analysis are referred to as ROI-related measures, and are not included in a prime scope.



Purpose of the ROI Use

- Provide rational for the future investments and acquisition decisions. Project prioritization/ justification.
 - To facilitate informed choices about which projects to pursue (which solutions to implement).
- Evaluate existing systems. Project post-implementation assessment.
 - To facilitate informed decisions within the process of evaluating existing projects/solutions.
- Performance management of the business units and evaluation of the individual managers in decentralized companies.
 - Often called Du Pont method – by the name of the company which first implemented it. Considered a default standard in the 1960s – 70s.
 - This type of use is out of scope for the presentation.

ROI - Many Types and Hundreds of Versions

- Information search on the ROI retrieved hundreds of academic and business publications describing many ROI types and hundreds of versions.
- Multiple interpretations of what ROI is, and how it should be calculated lead to arguments between the authors on what's right and wrong.
- Approach of this presentation is to avoid getting into this “right or wrong” discussion.
- This presentation is based on identifying some key attributes and grouping/classifying ROI versions/types by these attributes.

Traditional ROI

- Formula:

$$ROI[T] = \frac{\sum_i FinRet(i) - \sum_j Cost(j)}{\sum_j Cost(j)} \times 100\%$$

- Profitability based on “hard” dollars.
- Time frame. Retrospective.
- Accounting records (official financial documents or accounting systems) are used as sources of cost and return data. Full transparency and accountability.

Typical ROI Components - Costs

IT Infrastructure	<ul style="list-style-type: none"> • Software/Licenses - initial and annual maintenance. • Hardware - if IS run in-house (e.g. purchasing and installation of new servers). • Hosting - if IS provided as Software as a Service by the third party.
Labour	<ul style="list-style-type: none"> • Direct Operating Expenses (DOE). Salaries and Wages plus Benefits for FTEs – Journalled to I&IT Cluster. Include funds transferred to MGS Central Cluster. • Consultant Services (ODOE). FFS. – Installation, configuration, software customization, integration that requires skills not available within the I&IT Cluster.
Training	<ul style="list-style-type: none"> • IT personnel training by the third party. • Program area end-user training by the third party.

Typical ROI Components – Costs. Scenario 1

IT Infrastructure	<ul style="list-style-type: none"> • Software/Licenses - initial and annual maintenance. • Hardware - if IS run in-house (e.g. purchasing and installation of new servers). • Hosting - if IS provided as Software as a Service by the third party. 	<p>\$100,000</p> <p>-</p> <p>\$75,000</p>
Labour	<ul style="list-style-type: none"> • Direct Operating Expenses (DOE). Salaries and Wages plus Benefits for FTEs – Journalled to I&IT Cluster. Include funds transferred to MGS Central Cluster. • Consultant Services (ODOE). FFS. – Installation, configuration, software customization, integration that requires skills not available within the I&IT Cluster. 	<p>\$230,000</p> <p>\$150,000</p>
Training	<ul style="list-style-type: none"> • IT personnel training by the third party. • Program area end-user training by the third party. 	<p>\$10,000</p> <p>\$15,000</p>

Total: \$580,000

Typical ROI Components – Financial Benefits. Scenario 1

Cost Savings	<ul style="list-style-type: none"> • Three FTEs reduced – Salaries and Wages plus Benefits for 3 FTEs 	\$210,000
Cost Avoidance	<ul style="list-style-type: none"> • Hiring of Two FTEs (which was planned to operate the old system) was halted - Salaries and Wages plus Benefits for 2 FTEs 	\$140,000
Revenue enhancement	<ul style="list-style-type: none"> • Additional revenues were gained due to better targeted marketed and advertising 	\$300,000
Revenue protection	<ul style="list-style-type: none"> • Imminent fine was avoided (due to demonstrated compliance with regulatory requirements) 	\$20,000

Total: \$670,000

ROI Calculation Example – Scenario 1 (continued)

$$\text{ROI [T]} = \frac{\sum [\$240,000 + \$140,000 + \$300,000 + \$20,000] - \sum [\$175,000 + \$380,000 + \$25,000]}{\sum [\$175,000 + \$380,000 + \$25,000]} \times 100\% = \mathbf{15.5\%}$$

The numerator represents the net benefit, calculated as the sum of positive impacts (Cost savings, Cost Avoidance, Revenue enhancement, Revenue protection) minus the sum of negative impacts (IT Infrastructure, Labour, Training).

Why ROI is so Popular?

1. Objective Reasons for the Traditional ROI Popularity

- Anecdotal evidence of the successful use.
- Easy to understand and straightforward.
- Easy to compute.
- Encourages prudent detailed financial analysis.
- Encourages cost efficiency and focuses on one of the main corporate metrics – profitability.
- Being based on the accounting records, provides objective outputs.
- Data used is available in the accounting system or official documentation.
- Permits comparisons of profitability of dissimilar businesses/projects.
- Promotes accountability. Transparent collection and use of official financial data contributes to responsible behaviours of those involved in data collection and evaluations.
- Encourages project teams and finance/accounting practitioners to collaborate.

Why ROI is so Popular? (continued)

2. Subjective Reasons for the Traditional ROI Popularity

“Perception is Reality”

- Seems familiar from college textbooks.
- Feels familiar from personal investment experience.
- Seemingly easy to collect and process data.
- Use of data and math makes creates anticipation of an accurate and definitive result.
- Single number result – flattering to the mind.
- Provides quantifiable evidence of value.
- Single measure offers seemingly global evaluation of performance.

ROI Speaks for Itself. Case 1

Project	ROI	Net Return	Investment
Project A ✓	70%	\$7,000	\$10,000
Project B	30%	\$30,000	\$100,000



- What's ROI analysis recommendation for the projects in the table?
- ROI for Project A is more than two times higher than for Project B. ROI verdict is clear – *invest in Project A.*
- However, look at the actual numbers of the return and investment. The amount of profit from the Project B is more than four times higher.
- **Diagnosis 1:** ROI focuses on maximizing the return-investment ratio. ROI fails to guide towards the profit maximization.

ROI Speaks for Itself. Case 2

Project	ROI	Net Return	Investment
Project A	7%	\$7,000	\$100,000
Project B ✓	70%	\$700,000	\$1,000,000



- What will be ROI analysis recommendation for the projects in the table?
- ROI for Project B is ten times higher than for Project A. ROI verdict is clear – *invest in Project B*.
- However, Project B requires \$1,000,000 investment. Is it available?
- **Diagnosis 2:** ROI analysis doesn't incorporate means to evaluate projects based on the viability of the gross investments needed (estimate availability of funds).

ROI Speaks for Itself. Case 3

Project	ROI	Net Return	Investment	Project Risk (probability of success)
Project A	7%	\$7,000	\$100,000	0.9
Project B ✓	70%	\$700,000	\$1,000,000	0.1



- What's ROI analysis recommendation for the projects in the table?
- ROI for Project B is ten times higher than for Project A. Also, required funding (\$1M) is available. ROI verdict is clear – *invest in Project B.*
- However, Project B has very low probability of success, and Project A is almost guaranteed.
- **Diagnosis 3:** ROI analysis doesn't incorporate means to evaluate projects based on the delivery risks.

ROI Speaks for Itself. Case 4

Project	ROI	Net Return	Investment	Project Risk (probability of success)	Project Payback Period
Project A	7%	\$7,000	\$100,000	0.75	3 months
Project B ✓	70%	\$700,000	\$1,000,000	0.75	97 months



- What's ROI analysis recommendation for the projects in the table?
- ROI for Project B is ten times higher than for Project A. Also, required funding (\$1M) is available. Risks are the same for both projects.
- ROI verdict is clear – *invest in Project B.*
- **Diagnosis 4:** ROI analysis doesn't incorporate means to evaluate projects based on the payback period.

ROI Speaks for Itself. Case 5

Project	ROI	Net Return	Investment	Project Risk (probability of success)	Project Payback Period	Strategic priority and Regulatory Requirement
Project A	7%	\$7,000	\$100,000	0.75	10 months	#1, Yes
Project B ✓	70%	\$700,000	\$1,000,000	0.75	10 months	#10, No

- What's ROI analysis recommendation for the projects in the table?
- ROI for Project B is ten times higher than for Project A. Also, required funding (\$1M) is available. Risks and payback periods are the same for both projects.
- ROI verdict is clear – *invest in Project B.*
- **Diagnosis 5:** ROI analysis has no means to align to strategy and regulatory compliance.

The Biggest Myth About ROI

- It has been demonstrated in the previous slides that ROI being presented as a single number has many uncertainties which make the number actually meaningless...
- To provide a meaningful context for business decisions, ROI number **MUST** be accompanied with a detailed description of the terms, conditions and assumptions under which the ROI calculations were conducted and at least 5 – 10 additional numeric characteristics of the ROI business case.
 - Note: When ROI is provided as a single number, it doesn't mean that those who perform analysis don't know about other factors. They just “assume” that all other factors are the same for the compared projects.

No Generally Accepted Rules

- There are no standard rules for calculating ROI. Generic direction is to include all costs and all related benefits.
- As a result:
 - Any case has its own specifics.
 - Comparison of the ROI calculations gained in different projects and by different teams/consultants is not possible (even if the same technology solution was implemented in similar environments).
 - For the ROI be considered meaningful, it must be accompanied by a detailed description of all components of costs and benefits that were used for calculations and how values of these components were derived.
 - Lack of the ROI standard and rules makes selection of the ROI costs and benefits components subjective and the result prone to human error or pure judgment.
 - If ROI inputs may be to a certain extent subjective, then the accuracy of result of the calculations is also questionable. The implied rigor of the whole ROI process is inappropriate.

Inherent ROI Limitations

- In the preceding cases, it was demonstrated that even in rather simple situations ROI analysis may lead to questionable if not completely wrong results and recommendations.
- ROI is a ratio:
 - ROI focuses on maximizing the return-investment ratio. ROI fails to guide towards the profit maximization.
 - ROI analysis doesn't incorporate means to evaluate projects based on the viability of the gross investments needed (estimate availability of funds).
- ROI analysis has no means to align to organization's business strategy and regulatory compliance.
- ROI is a financial measure, it has been designed for a certain purpose – assess the profitability or financial efficiency.

ROI Extensions

- Profitability based on dollar estimates. Although “hard” dollars also can be included.
- Time frame. Retrospective and Predictive.
- Certain level of accountability may be preserved, if cost and return estimates are included in the planning financial documents and periodically reviewed. Limited transparency due to the subjectivity of predictions.

Estimating Costs

- Cost estimates are predictions/approximations of the monetary resources needed to complete the initiative.
- Accuracy of estimates depends on the phase of the life cycle of the initiative. May vary depending on cost type.
 - Initiation phase – rough order of magnitude (ROM) – range of +/-50%.
 - Later could narrow - range of +/-10%.
- Tools and Techniques (PMBOK):
 - Expert judgment
 - Analogous estimating
 - Parametric estimating
 - Bottom-up estimating
 - Three-point estimates, etc.

Estimating Financial Returns

- Estimates of financial returns are predictions/approximations of the monetary returns expected to be generated by the initiative.
- Accuracy of estimates vary.
- Same tools and techniques as used to estimate costs.
- Estimating financial returns is usually a more complex and less accurate process compared to costs estimation.
- Often, due to human nature, costs tend to be underestimated and returns tend to be overestimated.
- The only way to keep these “natural” things under control is to document the process and results and keep “estimators” accountable for the numbers. Incorporating ROI numbers in the planning financial documents and periodic review/auditing of the actual data.

Effect of Time: Time Value of Money

- Time value of money is based on the notion that future dollars are worth less than current dollars.

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Future Value (FV)	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
Present Value (PV)	\$1,000	\$962	\$925	\$889	\$855	\$822

Formula to calculate Present Value:

$$PV = FV / (1 + \text{Rate})^n$$

- Rate – discount rate (the same as interest rate)
- n – number of periods.

Risk-Adjusted ROI

- Risk probability and impact assessment

- E.g. there is a risk of 2-month overrun of the activity with probability 0.5.
Risk-Adjusted Cost = Initial estimate + 0.5 x (2-month labour cost)

- Scenarios method

- PERT approach:

(best case + worst case + 4 x most likely case estimates) / 6

- Forrester approach:

E.g. Value of initial estimate 4.0 FTEs (or corresponding dollar value) - used as “most likely” or expected value.

Forrester uses a risk factor of 125% (5.0 FTEs) on the high end, 100% (4.0 FTEs) as the most likely, and 75% of 3.5 FTEs on the low end.

Risk-adjusted value is 4.167 FTEs as the mean.

Jeffrey North “The Total Economic Impact Of Salesforce CRM Customer Service & Support” Forrester Consulting, 2009.

https://www.salesforce.com/assets/pdf/misc/WP_Forrester_Eco_Impact.pdf

ROI Virtualizations

- Profitability based on a mix of “hard” dollars, dollar estimates and “dollarized” assessments of intangibles.
- Time frame. Retrospective and Predictive.
- Data used in calculations (especially Returns) is not recorded in the official accounting systems. Prone to uncontrolled subjectivity.

Intangible Benefits - Examples

- “Better information” – Information systems are intended to provide relevant information for decision-making contributing to better decisions and therefore enhancing the return on investment.
- Improved effectiveness of decision-making processes.
- Increased productivity and time savings.
- Increased intellectual capital.
- Enhanced employee goodwill.
- Increased job satisfaction.
- Higher customer satisfaction.
- Better corporate image.

A Sample Case with Intangible Benefits

- Microsoft Corporation commissioned Forrester Consulting to evaluate potential return on investment (ROI) that enterprises may realize by deploying Microsoft Unified Communications (UC) products and services (UC products). Forrester conducted in-depth interviews with 15 Microsoft customers and compiled their results into a composite case study of a 4,000-person digital marketing services company. 2007.
- Microsoft's UC products include:
 - Microsoft Office Communications Server 2007.
 - Microsoft Exchange Server 2007.
 - Microsoft Exchange Hosted Services.
 - Microsoft Office Live Meeting 2007.
 - Microsoft Office Communicator 2007.
 - Microsoft Office Outlook 2007.
 - Microsoft RoundTable.
- Evaluation time frame 3 years. Calculations adjusted for time value of money and risk.

<http://www.microsoft.com/downloads/en/details.aspx?FamilyID=4f93880c-4667-4fbc-bea5-e510b3b95c4e&displaylang=en>

A Sample Case with Intangible Benefits (continued)

Benefits by Type	Calculation	Intang/ Tang.	Present Value (Million)
1) Increased productivity by communicating more efficiently and faster.	Multiply: Number of workers; Hourly rate per worker; Adoption rate; Number of hours (saved) - 40 to 100 per year based on the user group ; Percent captured.	Intangible	\$13.4
2) Reduced time to complete projects.	Multiply: Net revenue of project; Gross margin %; Project per year; Percent of project time reduced due to improved collaboration - 10% ; Percent of time saved that could be applied to other projects; Adoption rate.	Intangible	\$10.3
3) Shortened sales cycle.	Multiply several parameters, including: Percent of time saved through more effective internal communication, reducing delays in the proposal process - 20% .	Intangible	\$3.4
4) Travel cost reductions.		Tangible	\$11.1
5) Reduced costs of dialing pay-per-minute telephone conferencing.		Tangible	\$0.5
6) Reduced long-distance telephone charges.		Tangible	\$0.8
Subtotal Intangible			\$27.1
Subtotal Tangible			\$12.4
Total			\$39.5

- Costs \$6 M
- ROI 563%
- ROI 108% (with tangible benefits only)

ROI Virtualizations Wrap-Up

- The use of intangibles is not an “internal” ROI issue.
- Intangibles is a separate area of research. Nothing against attempts to quantify anything ... as a research exercise ... This area is far from being completed and the results being ready for use in regular business (accounting).
 - Evidence: Intangibles are not included in the accounting records, with some exceptional cases.
- Until financial people recognize and use intangibles for the accounting purposes, any ROI calculations and results should explicitly provide not only overall ROI but ROI for “hard” dollars and anything else.

ROI Imitations

- ROI Imitations can be classified into two subcategories:
 - Subcategory 1. Use the ROI term for the measures which have little or nothing to do with ROI. The purpose is to cash in on the seemingly positive credibility of the ROI term.
 - Typical for these group of measures is understanding of the ROI as “any benefit”.
 - Imitations are taking the ROI even further from the traditional financial understanding of it than the Virtualizations.

`When I use a word,' Humpty Dumpty said...

`it means just what I choose it to mean

-- neither more nor less.'

“Through the Looking Glass” by Lewis Carroll

- Subcategory 2. Paradoxically enough, this group attempts NOT to use the ROI term (at least in the titles). They actually use ROI method (or very similar) under different names claiming that they’ve overcome the ROI deficiencies/limitations (e.g. their measures are multi-dimensional).

Observations and Considerations

- ROI is a metric designed for a certain purpose – evaluate the profitability or financial efficiency.
- To provide a meaningful context for business decisions, ROI number **MUST** be accompanied with a detailed description of the terms, conditions and assumptions under which the ROI calculations were conducted and at least 5 – 10 additional numeric characteristics of the ROI business case.
- The implied rigor of the whole ROI process and results is inappropriate. Lack of a standard, estimation errors, possible subjective perceptions.
- Evaluation of the information systems is a multi-dimensional and multi-criteria task. ROI is a financial measure and does not provide information about efficiency or effectiveness of the information systems.



The views, opinions and conclusions expressed in this document are those of the authors alone, and do not necessarily represent the views of the Ontario Ministry of Health and Long-Term Care or any of its individual departments.

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