

Book Review: “ROI for Technology Projects: Measuring and Delivering Value.” By D. Brian Roulstone and Jack J. Phillips.

D. Brian Roulstone and Jack J. Phillips. “ROI for Technology Projects: Measuring and Delivering Value.” Publisher: Butterworth-Heinemann is an imprint of Elsevier Inc. xx + 343 pp. 2008. ISBN-10: 0750685883. ISBN-13: 978-0750685887.

Peter Andru

Ministry of Health and Long-Term Care,
Toronto, Ontario, Canada
peter.andru@ontario.ca

Alexei Botchkarev

Ministry of Health and Long-Term Care &
Ryerson University,
Toronto, Ontario, Canada
alexei.botchkarev@ontario.ca

Keywords: return on investment, ROI, ROI Methodology, technology, IT, evaluation, book review, performance measurement, business value.

Abstract

This article is an analytical review of the book “ROI for Technology Projects: Measuring and Delivering Value” by D. Brian Roulstone and Jack J. Phillips. The authors of the book effectively demystify a popular perception of the return on investment (ROI) metric as an ad hoc calculation based on a simple formula. They promote ROI assessment as a set of procedures that process data to provide an effective evaluation of a project. The book collects and arranges a large volume of material on ROI, and presents it with consistency, in plain English, and at a level which will be appreciated by an information technology (IT) professional. This review highlights several points to be kept in mind by readers of Roulstone and Phillips’ book to encourage unimpassioned expectations of the ROI metric and its implementation for information technology initiatives.

© 2012 IEEE. *Personal use of this material is permitted. Permission from IEEE must be obtained for all other uses, in any current or future media, including reprinting/republishing this material for advertising or promotional purposes, creating new collective works, for resale or redistribution to servers or lists, or reuse of any copyrighted component of this work in other works.*

Submitted April 2011.

Accepted May 2012.

Managerial Relevance Statement

Engineering management is challenged with a necessity of making prudent decisions on information systems acquisition. Return on investment (ROI) offers itself as a convenient metric for such decisions. However, practical use of the ROI is complicated by a number of uncertainties and controversies. The book, arguably the most popular book on the use of ROI for IT, presents a cohesive view on the ROI evaluation processes and could be used as a textbook by IT management. The review highlights the strong points of a logical methodology promoted by the authors, and, at the same time, reveals some inherent aspects of the ROI that limit its application.

Introduction

As Paul Strassmann, former CIO of the US Department of Defense and renowned IT economist, wrote in his article "The Value of Computers, Information and Knowledge" in 1996: "Asking for a direct tie-in between increased funding for computers and a commitment to deliver provable savings is an invitation to prepare figmental projections that demean both those who produce them as well as those that accept them" [2]. The irony is that this advice is more often cited than followed. A dialogue around the business value of information technology and methods of its evaluation has continued for over two decades in academic journals and executive boardrooms, and the return on investment (ROI) metric persists in the forefront of these discussions.

This book [1] deserves a review for engineering management for two key reasons:

- It is dedicated to a topic of vital and non-fading importance – return on investment. On the one hand, ROI is acknowledged to be a business-critical concept; on the other, ROI may be unsurpassed in the high level of business contradictions and controversies attributable to it. Also, the book is dealing with the information technology field, a domain that is arguably the most difficult and challenging for ROI application.
- Secondly, the book is written by true ROI professionals. Jack J. Phillips is a renowned expert on accountability, measurement, and evaluation, and has authored more than 50 books. Further, the book is written on the solid foundation of multi-year consulting and teaching of the subject to a variety of companies, with favourable feedback.

The review is appropriate since this book is one of the most recently published on the subject, and takes into account very current debates and discussions. At the same time, discussions around ROI are still very intensive, as a Google Scholar search recorded over 4,000 papers mentioning ROI in 2010 alone.

One last feature depicting the popularity and marketing of the ROI metric is demonstrated by the cover of the book: the ROI abbreviation/ acronym is used without spelling out or subtitling the words – which assumes that most readers know its meaning. Few abbreviations/ acronyms attain such glory, or at least recognition.

In this article, the term “book” refers to the book under review [1]. The term “authors” refers to the authors of the book, not to the authors of the review.

Reasons to Read the Book

The book covers a wide area of interest to the IT professional:

- “The term *information technology (IT)* is used throughout the book to refer to a company’s infrastructure focused (internal) technology organization” (p. 18).
- ROI methodology is designed to be applied to a wide range of technology projects. Examples are shown in Table 1- 1 (p. 5) and include a “full range of current technology-based applications” (p. 5): Enterprise resource planning (ERP), Customer relationship management (CRM), Expert systems, Process automation, etc.
- “The term *project* is used to reflect a software solution, hardware upgrade, enterprise system rollout, system upgrade, or any other project or initiative that is worthy of ROI analysis” (p. 18).

Within this material, the book is addressed to wide groups of primarily IT professionals: managers, executives, technology consultants, etc. (p. xii of Preface).

It should be noted that, with the pervasiveness of IT, the book is relevant to a very broad field of projects, and thus of potential interest to a wide range of business professionals involved in complex IT projects. This approach promises that almost any IT or business reader involved in IT projects will be able to associate at least some parts of the book with his/her professional interests, and gain value from the authors’ material. The book collects and arranges a large volume of material on ROI, and presents it with consistency, in plain English, and at a level which will be appreciated by these professionals.

The book uses a classic formula to calculate ROI, which is the net benefits (i.e. gross benefits minus costs) divided by costs and expressed in percent (p. 19). The use of a formula familiar from many publications makes it easier to comprehend the ROI-related concepts presented in the book. The use of a classic formula is an important point because some authors use the term ROI but create a new meaning for it either by using a different formula or even totally changing the concept. For example, in Mogollon and Raisinghani (2003), the numerator in the ROI formula equals the project gain (not gain minus cost) [11].

In some cases, 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, net present value, payback period, etc.), which are collectively called ROI. Finally, return on investment may be understood as any kind (financial or non-financial) of return / effect / result or general business impact/value. In the absence of a generally accepted standard for ROI calculations, any of the above approaches can be used (as long as the method is clearly defined and explained). However, an

established/classic formula should be given preference as a more generally accepted standard within business.

The authors demystify a popular perception of the ROI as an ad hoc calculation based on a simple formula. They promote ROI calculation as a set of procedures in the course of which data is processed to provide an effective evaluation of the project. The authors promote a systematic approach in which ROI is taken, not as a self-contained amount (which is typical to most ROI publications), but as a metric which should be acquired and used along with several other measures of the project.

ROI Methodology - the core of the book – is composed of several building blocks to ensure a “comprehensive measurement and evaluation process” (p. 29). The Methodology includes an evaluation framework, a process model, operating standards (12 guiding principles), application and practice, and implementation processes (pp. 29 – 30). Each of the components of the Methodology is detailed in the book.

The ROI model is described as a step-by-step procedure for developing ROI. It includes evaluation planning (data collection plan, ROI analysis plan, and project plan), data collection (during and after implementation), data analysis (based on conversion of data to monetary values and isolating effects of the project) and reporting (pp. 30 – 41). A variety of data collection methods are recommended and discussed (surveys, questionnaires, tests, interviews, focus groups, etc.) (pp. 41 – 42). In the conversion of data to monetary values, certain techniques are recommended to ensure consistency of the processes and credibility of the results (Chapter 6). Descriptions of the processes are illustrated with templates and samples from real life IT projects that provide clear examples of the topics.

When describing ROI calculations, many authors move directly to the point: here’s an ROI formula - just enter the amount of costs and returns attributable to the solution/project, and the job is done. The problem is that usually costs and returns are not readily available. Both amounts are the results of the summation of multiple terms. For example, common types will be costs of hardware, software, consultants’ fee, employee salary, etc. Yet there could be many subtypes within each type. Identification of all the terms and then collecting pertinent data is not a trivial process. In many companies, project teams are doing this work ad hoc – when it is needed, having no experience and not following any common practices. Obviously, results of this work are not comparable between the teams and even data collected for the same solution at two points in time may be inconsistent. Procedures recommended by the authors are designed to alleviate the deficiencies described above. These procedures are not complex and are based on common sense, and adhering to them may facilitate consistent and structured ROI calculations that could be relied on in the corporate decision-making process.

One of the important topics of the book is the issue of isolating the effects of IT projects, and attributing benefits. Due to controversy around this matter, few authors attempt to tackle it. The issue occurs when a project is completed and improvements are achieved, but performance changes may be linked not only to the project but also to other factors external to the project. For example, “in a consumer-lending automation project for a large bank, a significant increase in consumer volume was generated after Web-based applications were deployed...” (p. 154).

However, there could be another contributing factor – “falling interest rates which stimulated as increase in consumer loans”. Isolating the effects of the non-project factors (and hence identifying real project impact and ROI level) is an issue of credibility of the ROI evaluations. The authors propose and provide detailed descriptions of several techniques for isolating IT effects: use of control groups, trend time analysis, forecasting methods, participant, supervisor and management estimation of the impact of IT.

The book outlines techniques to convert the data characterizing business impact to monetary values. Their recommendations cover conversion of both hard data (e.g. units produced, processing time, error rates, overhead costs, etc.) and soft data (e.g. customer satisfaction, customer complaints, employee job satisfaction, etc.). A variety of techniques are described: converting output data to contribution, calculating the cost of quality, converting employee time, using historical costs, and using estimates from participants, supervisors and managers. An important point is made: “if the (conversion) process does not meet credibility test, the data should not be converted to monetary values and should be listed as an intangible benefit” (p. 176). Chapter 9 details intangible measures (e.g. job satisfaction, organizational commitment, innovation and creativity, etc.) and provides recommendations on their identification and presentation.

The largest section of the book is devoted to post-project evaluation and the authors’ recommendation is “to base ROI calculations strictly on the business impact data obtained after the project has been implemented” (p. 247). Also, Chapter 10 addresses the issue of ROI forecasting – “pre-project benefits/costs analysis (ROI) for selecting new projects” (p.249). The authors present several methods of forecasting ROI with different accuracy and credibility.

Two final chapters of the book provide practical advice on how to implement the ROI Methodology and how to communicate results.

There are many notable points in the book. However, the ones that are outlined below can be found throughout the authors’ work:

Do not try to use ROI on every project (p. 224);

Take a conservative approach when developing both benefits and costs (p. 223);

The ROI Methodology rests on the assumption that anything can be measured. The philosophy taken is that any data item can be converted to monetary value (p. 235). Certain exemptions apply.

Important Notions to be Aware of while Reading the Book

A very important point to keep in mind while reading the book is that it is dedicated to the description of the “ROI Methodology” – a specific approach and set of methods and processes selected and construed into a framework by the authors. “ROI Methodology” may be understood as a subset of the generally known techniques of ROI analysis.

The notion of the “ROI Methodology” (one of the keys in the book) and the way it is used require some comment. In several instances the Methodology is stated to be superior to the generally known ROI analysis processes. Unfortunately, little evidence is presented to bolster this assertion. At the same time, everything “good” about the generic ROI process is automatically attributed to the Methodology. For example: “The ROI Methodology represents the most promising way to show accountability in a logical, rational approach” (p. 3); “It is [about ROI Methodology] most accurate, credible, and widely used process to show the impact of IT projects” (p. 22). The authors suggest a set of detailed requirements for ROI calculations which must be met in order for the evaluation process to be effective. The requirements call for the process to be simple, economical, theoretically sound, flexible, etc. After stating eleven criteria for an effective ROI process, the authors come to the conclusion that, “The bad news is that most ROI processes do not meet these criteria but the good news is that the ROI Methodology does” (pp. 17 - 18). Unfortunately, the authors do not take on the burden of showing explicitly how their ROI Methodology meets all the criteria, and further identify and analyse the “bad news” ROI processes that do not meet their effectiveness criteria. The book would certainly benefit from a section comparing ROI Methodology with other ROI methods, e.g. those used by recognized consulting companies such as Forrester and Gartner.

Evaluation of technology initiatives is a well-established, broad and diverse discipline, which is (by far) not limited to ROI methods. A variety of measurement possibilities including economic value added, effectiveness, and balanced scorecard are mentioned only once in the picture (figure 1-2, p. 13) – without any comments or comparisons, stating that this variety created confusion for the potential user (p. 13). The book would benefit from at least a quick analysis of other methods and highlighting the advantages and differences of the ROI Methodology.

The notion of “levels of evaluation” (an evaluation framework) is a key to the ROI Methodology – actually, it is the main contributing factor in creating a methodology on top of “just ROI calculations”. The foundation of the ROI Methodology is Donald Kirkland’s [3] four-level evaluation framework, suggested in the late 1950s and published in a book in 1975 [4].

The four-level framework was designed for training evaluation and included the following levels [3]:

- Level 1: Reaction - To what degree participants react favourably to the training.
- Level 2: Learning - To what degree participants acquire the intended knowledge, skills, attitudes, confidence, and commitment based on their participation in a training event.
- Level 3: Behaviour - To what degree participants apply what they learned during training when they are back on the job.
- Level 4: Results - To what degree targeted outcomes occur as a result of the training event and subsequent reinforcement.

The framework’s clear and concise structure made it very popular (or even classic) among the course evaluators around the world. An important feature is its universal nature – it can be applied in almost any post-training evaluation environment. However, certain criticisms of the framework are known [5], e.g. incompleteness, assumption of causal linkages, assumption of incremental importance of information, etc.

In the 1990s ([6 - 8]) J.J. Phillips proposed an extension to Kirkland's framework by adding the fifth level of evaluation, namely, ROI. Although noted by researchers [9], the 5-level framework did not get recognition similar to its predecessor. One of the arguments was that ROI is not an additional level of evaluation, but actually one of the measures of impact/results and belongs to level four. It should be noted that the 5-level framework (as its predecessor) was initially designed for post-course evaluation.

This book represents an effort to apply the 5-level framework to the area of technology initiatives. The transfer of the model and evaluation processes from training to technology is not as easy and seamless as it may appear from the book. Several key aspects need to be mentioned. An important issue is that from a point of applicability of the evaluation framework, training courses are a more homogeneous area compared to technology projects. Course participants are the subjects and, obviously, they are an inherent component of any training initiative. The first three levels of the framework are focussed on the participants and "measuring" their reaction, learning and application of knowledge and skills received from the training course. (Note: The definition of the term "participant" in the book is rather vague: "The term *participant* is used to refer to the individual involved in the IT project or technology development initiative" (p.18). This definition does not differentiate between the IT staff that is delivering a project, and business end-users who will be using a new system/technology. (Although, it's clear from the text that the term refers to the latter group.)

The authors want to project a vision of the levels of evaluation as an integrated framework, emphasizing "it is also important to evaluate the other levels" – below ROI (p. 33). "A chain of impact should occur through the levels as the skills and knowledge learned (Level 2 are applied on the job (Level 3) to produce business impact (Level 4)." (p. 33). This chain of impact is understandable for training projects (for which the framework was originally developed [3]). For IT projects, limiting the evaluation to measuring the impact of "the skills and knowledge learned" does not look very convincing.

Further, not all technology projects directly involve end-users or impact business through the participants' knowledge and skills. For example, consider a server virtualization project replacing several physical servers with a single one converted into multiple virtual machines. For the end-users, virtualization is supposed to be a seamless process: no training will be required and no additional skills are needed or will be acquired by the participants. So, evaluation at levels from one to three is inapplicable for such projects. Note, though, there will be business impacts, which could be measured at level four, and a corresponding ROI can be measured at level five.

Another large group of technology projects, implementation of enterprise resource planning (ERP) systems or customer relationship management (CRM) systems, is showcased in the book. For this group, measuring the impact of the skills and knowledge learned by the participants is very important. However, it constitutes only one of the three major interrelated components of such systems: people/participants, processes, technology. Focusing evaluation on only one of the three components (in levels one to three) does not appear to be a balanced approach.

The points mentioned above need to be kept in mind while assessing feasibility of the ROI Methodology implementation in an organization. The main conclusion is that applicability of the 5-level framework for technology projects may have significantly lower relevance than for training evaluation. Note that the most recent book by J. Phillips and P. Phillips applies the 5-level framework to consulting initiatives [10].

This book is targeted toward IT professionals and may show bias as the authors state:

- “Almost all IT professionals share the concern that they must eventually show a return on their IT investments. Otherwise, IT funds may be reduced, or the IT department may not be able to maintain or enhance its present status and influence within the organization” (p. 2).
- “The primary objective of an ROI calculation is not only to convince the IT staff that the process works but to show others (usually senior management) that IT makes a difference to the bottom line” (p. 27).

Such an approach contains a risk of isolating IT from other departments or business functions. In the context of ERP or CRM projects, only truly integrated efforts of IT and business departments can lead to a successful result. Further, in some publications such projects are classified not as IT projects, but as complex business projects with a significant IT component. An attempt to identify only one department making a “difference to the bottom line” in such projects can not be productive, as it may over-simplify the analysis.

Still, despite a particular bias toward IT professionals, the book has value for any project team members representing business functions. Use of the terms “project benefits” and “project costs” highlights this value where ROI is most likely to be realized when the project is over. So it is more correct to talk about an “initiative” which includes development, implementation (i.e. the project itself) and operations when the solution is used in production and major benefits are realized. These benefits will most often be derived from business areas enabled or transformed by IT. This is not an easy effort, as the IT project manager may not be aware about the details of the business processes during early project stages (when ROI is calculated to justify the project).

The timeframe for the ROI calculations is always an important factor because it defines which benefits and costs will be included. There is no consensus on this point in the literature, and the authors suggest: “The benefits are usually expressed as annual benefits, representing the amount saved or gained for a complete year after project completion. Although the benefits may continue after the first year if the project has long-term effects, the impact usually diminishes and is omitted from calculations” (p. 19). Taking this approach, the authors escaped another question and contentious point in ROI analysis - How to calculate ROI for a multi-period or multi-year initiative? Their comment is that “Given the pace of the evolving technologies, the payback period should be less than one year” (p.20). It would be certainly nice to have payback within a year, but we leave it to readers to assess the feasibility of regaining a multi-million dollar investment of a large-scale ERP implementation in one year. Still, the authors do admit to more than one year effects for long-term projects (p. 204).

To “ROI or not to ROI”: How should the company determine an appropriate level of the number of projects subject to ROI evaluation? There are mixed messages on this issue in the book. On the one hand, it seems that due to the expected benefits of such evaluation, as many projects as possible should be covered. Also, it seems the authors indicate 4% to 5% of the project budget would be a reasonable price of doing “a comprehensive measurement and evaluation process, including ROI calculation” (p. 4). On yet another hand, the authors share an observation that due to limited resources a practical approach would be “to settle on evaluating one or two of the most significant technology initiatives” (p. 26). In Table 1-5 (p. 25), only 5% of the total number of projects of a large telecommunications company is targeted for evaluation to the ROI level. No practical process of selecting projects from such a portfolio for the evaluation is suggested, although, it is stated that the selection process should be based on statistically sound sampling.

The diversity of the targeted audience of the book, and the wide field of information technology projects covered, make the authors present material at a high level which would be understandable to all. So, perhaps, some readers who expect more specific examples about their areas (e.g. software development projects) will not be pleased about the lack of detail.

In some sample cases, the amount of the ROI calculations exceeds several hundred or even one thousand percent (e.g. ROI of a call center automation project – 195% (p. 19); first-year ROI of the CRM implementation – 1,150% (p. 181); ROI of another IT project – 1,092% (p. 116). This magnitude of ROI estimates testifies that this measure has little, if anything, in common with traditional ROI. In many publications on information systems, excessive ROI results are attributed to the use of intangible benefits (or soft benefits as they are named in the book). The authors are aware of this distinction. However, they do not explain it and merely recommend to “use caution when comparing the ROI in IT and technology development with other financial returns” (p.223), and “do not boast about a high return” (p. 224).

The authors seem to be passionate and possibly overly optimistic about ROI Methodology. While admitting a great deal of controversy surrounding ROI exists, they go on to detail fifteen arguments that are used by ROI critics/opponents to plant a seed of doubt about ROI (or to reject it outright). The arguments include such contentious points as: ROI is too complex, expensive and rarely used by organizations, etc. (pp. 225 – 227); and “ROI is not a credible process; it is too subjective” (p. 227). Nevertheless, the authors present all 15 concerns as “myths” based on misunderstanding and incorrect application of ROI.

Yet, ROI has some significant inherent limitations that should be clearly examined and addressed [12]. The following limitations pertain to the ROI as a ratio (the result of the ROI calculation using the final formula, or level five in the ROI evaluation methodology).

- ROI is a ratio. ROI focuses on maximizing the return-investment ratio and fails to guide towards profit maximization.

- ROI is a financial measure focused on profitability. Prudent financial analysis requires many other metrics (that's the reason many other financial measures are used in accounting practice).
- ROI is calculated on a project by project basis. The authors admit: "ROI evaluation should be considered as a micro-level activity that usually focuses on a single project or a few tightly integrated projects", and "Attempting to evaluate a group of projects conducted over a long period becomes difficult" (p. 25). ROI has no facilities for an integrated look at the projects' or systems' interdependencies.
- ROI does not reveal anything about a system's effectiveness (how good is the system at what it is supposed to be doing), or about a system's efficiency (what the system is doing per dollar).

The authors refer to ROI as "the ultimate level of evaluation" (p. 33). That may be understandable in terms of the ROI Methodology where ROI is given the highest (sixth) level. However, giving this rank to ROI seems to be an exaggeration in the context of the book, where ROI is not compared to other evaluation approaches.

Conclusion

This book can serve as an excellent resource for setting up ROI evaluation processes for information technology initiatives. The review highlights several points to help readers of the book to recognize the limits of the ROI Methodology and inform their use of ROI as an evaluation tool.

Acknowledgements

The views, opinions, and conclusions expressed in this article are those of the review 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.

References

[1] D. Brian Roulstone and Jack J. Phillips. "ROI for Technology Projects: Measuring and Delivering Value." Publisher: Butterworth-Heinemann is an imprint of Elsevier Inc. xx + 343 pp. 2008. ISBN-10: 0750685883. ISBN-13: 978-0750685887.

Some parts of the book are available at Google books:

http://books.google.ca/books?id=CAK0tAkF3DUC&printsec=frontcover&dq=%22ROI+for+Technology+Projects%22&source=bl&ots=XB_HRScWME&sig=6OoleUdSRhHAwo_r4vONLEllmw&hl=en&ei=lwGeTYPyDu6C0QHljoy6BA&sa=X&oi=book_result&ct=result&resnum=1&ved=0CBoQ6AEwAA#v=onepage&q&f=false

[2] Strassmann, P. "The Value of Computers, Information and Knowledge" January 1996. <http://www.strassmann.com/index.php?tab=articles>

[3] Donald Kirkland's website. <http://www.kirkpatrickpartners.com>

[4] Kirkpatrick, D.L. "Techniques for Evaluating Training Projects," *Evaluating Training Projects*. Alexandria, VA: American Society for Training and Development, 1975, pp. 1 – 17.

[5] Bates R. "A critical analysis of evaluation practice: the Kirkpatrick model and the principle of beneficence." *Evaluation and Program Planning* 27 (2004) 341–347.

[6] Phillips, J.J. "Measuring ROI: The Fifth Level of Evaluation." *Technical & Skills Training*, April 1996, pp. 11- 13.

[7] Phillips J.J. "Return on Investment in Training and Performance Improvement Programs", *Butterworth Heinemann Publishers, Inc*, Woburn, MA 1997.

[8] Phillips, J.J., Stone, R.D. "How to Measure Training Results: A Practical Guide to Tracking the Six Key Indicators." *McGraw-Hill*. 2000.

[9] Donald Kirkpatrick. Wikipedia. http://en.wikipedia.org/wiki/Donald_Kirkpatrick

[10] Phillips J., Phillips, P. "The Consultant's Scorecard, Second Edition: Tracking ROI and Bottom-Line Impact of Consulting Projects" *McGraw-Hill Companies*, 2010.

[11] Mogollon, M. and Raisinghani, M. "Measuring ROI in E-Business: A Practical Approach". *Information Systems Management*, 1934-8703, Volume 20, Issue 2, 2003, pp. 63 – 81.

[12] Botchkarev, A., Andru, P. "A Return on Investment as a Metric for Evaluating Information Systems: Taxonomy and Application" *Interdisciplinary Journal of Information, Knowledge, and Management*, 2011, V. 6, pp. 245 - 269. <http://www.ijikm.org/Volume6/IJIKMv6p245-269Botchkarev566.pdf>

Biographies



Peter Andru is a Manager with the Health Data Branch, Ministry of Health and Long-Term Care (Government of Ontario). He has 20 years of experience in healthcare and government programs, project management, decision support, and information systems. He holds a Master of Science from the University of British Columbia.



Alexei Botchkarev is a Senior Information Management Advisor with the Health Data Branch, Ministry of Health and Long-Term Care (Government of Ontario), and an Adjunct Professor at Ryerson University, Department of Computer Science. He is an information and knowledge management professional, consultant and researcher (www.gsrc.ca). He has over 30 years of experience in project management, systems analysis, modelling and simulation, business processes analysis, information systems solutions, and requirements analysis. He holds B.Eng. 5-year degree from the Kiev Aviation Engineering Academy, Ukraine and Ph.D. from the aerospace R&D Institute. Dr. Botchkarev is active with IEEE and several other professional organizations.