MEASURING PERFORMANCE OF IT INVESTMENTS: IMPLEMENTING THE IT CONTRIBUTION MODEL

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ABSTRACT

The pressure to remain competitive in a dynamic, global economy forces organizations to consider the results-based approach when deciding on investments in information technology (IT). Senior IT managers are convinced that they do create value and believe that if measured properly and with adequate support, they would be significant profit centers for their organizations. However, without adequate performance evaluation systems they have difficulties proving the value-adding role of IT and find themselves continually fighting for and justifying the resources that are needed. The chapter provides a model and a methodology for evaluating performance in IT to help CIOs better justify and evaluate their initiatives and aid CEOs and CFOs in making better resource allocation decisions. The IT Contribution Model *and the subsequent IT Payoff Methodology is illustrated by and empirically tested in Istrabenz Group, an international group engaged in food, investments, tourism, and energy. The study shows that the methodology's requirement for active employee involvement in the identification of the critical drivers of success, the*

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expected outputs of the IT initiative, in particular, substantially facilitates the IT initiative implementation by increasing the level of understanding and acceptance.

INTRODUCTION

There have been significant discussions in both the managerial and academic literature concerning the payoffs of information technology (IT) investments. Many senior business managers have questioned IT's contribution to their bottom line (Leavitt, 1999; Schwartz, 1999; Carr, 2003, 2004). Indeed, cumulative results from the earlier studies, which examined the relationship between IT investment and firm performance, along with economics-based studies investigating IT productivity, were plagued with ambiguities and inconsistencies (Strassman, 1990; Weill, 1992; Loveman, 1994). Recent studies, however, examining the value of IT investment in two research streams, one using production economics and the other focusing on 'process-oriented' models, have been more encouraging (Barua & Mukhopadhyay, 2000). Research in both streams managed to mitigate the earlier skepticism on the IT payoffs (Barua & Lee, 1997; Mukhopadyay, Kekre, & Kalathur, 1995). In production economics, Brynjolfsson and Hitt (1996) reported positive returns on IT investment. Aral, Brynjolfsson, and Wu (2006) find evidence that the use of ERP causes performance increases rather than performance inspiring ERP purchases. But also, that success with ERP encourages adoption of extended enterprise systems, which in turn improve productivity and operational performance. Examples of similar positive results of process-oriented studies include Davies, Dehning, and Stratopoulous (2003), Love and Irani (2004), and Lee (2001). Lim, Richardson, and Roberts (2004) posit that contextual factors moderate the relationship between IT investment and firm performance. Byrd, Lewis, and Bryan (2006) indicate that there is a synergistic coupling between strategic alignment and IT investment with firm performance. Business process redesign and human capital also influence the impact of IT investment on firm performance (Davern & Kaufman, 2000). Brynjolfsson (2003), similarly, finds that the greatest IT benefits are realized when an IT investment is coupled with a specific set of complementary business investments.

Despite empirical evidence on tangible outcomes of investing in IT, so far, there has been little guidance of how to design or implement an appropriate IT performance evaluation system. On the one hand, there was a shortage

of relevant metrics. On the other hand, even approaches such as the balanced scorecard and shareholder value analysis that do provide overall frameworks for analysis and management, need additional specificity and definition. Increased specificity was necessary to model, measure, and manage the organizational links that operationalize these approaches. Therefore, even financial managers that have expertise in management control and performance measurement have not focused on the benefits of IT and have not developed the appropriate measures. Consequently, the payoffs of IT are not measured, ROI is not calculated, and IT investments are not evaluated with the same rigor as other corporate investments. Furthermore, CEOs and CFOs lacked information to make well-informed decisions on the payoffs of these investments and, as a consequence, corporate goals seem to focus on reduction of the costs of IT rather than maximizing the IT value creation activities. AU :2

As IT managers must show the payoffs of IT investment to convince key executives that they should be strong supporters of IT efforts, a framework for evaluation of IT performance is a significant need. Few things are more convincing to top executives than measurable results. We provide a model and a methodology for evaluating performance in IT in both for-profit and non-profit organizations to help CIOs better justify and evaluate their initiatives and aid CEOs and CFOs in making better resource allocation decisions. More specifically, we develop a model of key factors for organizational success in IT integration (*IT Contribution Model*) that includes four dimensions: the critical inputs and processes that lead to success in IT outputs and ultimately to overall organizational success (outcome). The methodology further articulates each of the key factors (antecedents and consequences of IT success) as objectives and outlines the specific drivers of IT success based on these objectives. It identifies the causal relationships between the drivers and develops performance measures for improved management control. Finally, it provides the IT ROI calculation formula following the cause-and-effect relationships between the drivers of IT success. The metrics can be used for both IT project's justification prior to its start (planning) as well as for evaluation after completion (performance measurement).

This comprehensive albeit pragmatic methodology is empirically tested in Istrabenz Group, a four-division holding company. The methodology was applied in the Tourism division, which was facing the challenge of justifying the introduction of a uniform information system for supporting the operation of all the hotels in the division. The selected case provides a suitable empirical context for testing since in 2005, the company adopted guidelines on the use of information and communication technology (ICT),

from which it follows that this area is one of the key factors of the Istrabenz Group for achieving its strategic business goals. The company leaders recognized the strategic role IT integration can play in the strategy implementation process, but required IT investments to be evaluated with the same rigor as other corporate investments.

The chapter has both academic and managerial implications. From the academic perspective, the presented model and the methodology make a twofold contribution. Firstly, the model builds on the process-oriented studies examining the value of IT investment; it upgrades the existing literature by offering an integrated model of critical drivers of IT success. Secondly, the methodology represents a more complete analytical tool for evaluating the payoffs of investing in IT based on the proposed model. The methodology includes the identification of the antecedents and consequences of IT investments, develops the cause-and-effect relationships between the drivers and outcomes, helps identify and measure marginal costs and benefits of the IT initiative to calculate the IT ROI, and provides performance measures for managerial control of the IT initiative.

From the practical perspective, with the *IT Contribution Model*, managers can implement a performance measurement system to more effectively evaluate the effectiveness of IT investments, which can lead to dramatic improvements in decision-making, corporate resource allocations, and performance. More specifically, the new methodology will help the accounting and finance professionals that deal with the challenges of performance measurement and control in IT. CIOs, CTOs, and senior IT managers will better understand how IT contributes to higher levels of corporate performance, more easily evaluate the profitability of IT investments, and make better resource allocation decisions. CEOs, CFOs, and other decision makers will be able to identify, document, measure, and communicate the short-term results and long-term impacts of IT investments. This includes both cost savings and value creation, and thus provides arguments for additional IT resources when appropriate.

The chapter is organized as follows. The first section provides a review of the existing methodologies used to measure performance of IT investments. In the second section, we describe the *IT Contribution Model* and the methodology to calculate IT payoff. We apply the model to the case of Istrabenz Group, the Tourism division, in the third section in an empirical test of the proposed model. Finally, we discuss the practical implications of the proposed model and the empirical testing, address the study's limitations, and point to some critical performance measurement implementation issues.

AN OVERVIEW OF THE RECENTLY DEVELOPED *IT* PERFORMANCE MEASUREMENT METHODOLOGIES

With CEOs and CFOs demanding accountability for the tremendous investment in IT, IT managers are required to ensure accountability, calculate the return on investment, develop a value-added approach, and make a bottom-line contribution. Generally, however, there has been little guidance of how to design or implement an appropriate IT performance evaluation system, i.e., how to identify and document the contribution of IT to high-performance organizations.

Total Cost of Ownership (TCO) analysis (Gartner Group, 1997), sometimes referred to as total cost of operation, ideally offers a final statement reflecting not only the cost of purchase of software and hardware but all aspects in the further use and maintenance of the equipment, device, or system considered. This includes the costs of training support personnel and the users of the system, costs associated with failure or outage (planned and unplanned), diminished performance incidents (i.e., if users are kept waiting), costs of security breaches (in loss of reputation and recovery costs), costs of disaster preparedness and recovery, floor space, electricity, development expenses, testing infrastructure and expenses, quality assurance, boot image control, marginal incremental growth, decommissioning, e-waste handling, and more. When incorporated in any financial benefit analysis (e.g., ROI, IRR, EVA), TCO provides an excellent cost basis for determining the economic value of that investment. However, it is insufficient as it does not address the benefits arising from an IT investment. Also, most of what is measured in the TCO analysis is owned by the IT organization while real business benefits can only be determined and owned by the responsible parts of the organization.

Strassman developed a ratio called *Information Productivity* (IP), which is the ratio of the Economic Value-Added (EVA) to the total cost of information management (Strassman, 1999). With IT, being one of the fastest growing components of the costs of information management, this metric is designed to reflect an organization's success at converting the costs of information management into profit. As such, this approach cannot be used for determining an IT initiative payoff.

Another proposal is to expand conventional financial measurement like return on investment and payback period to an eBusiness context, which is a whole-view measurement of business performance across both internal and external constituents (Cameron, Meringer, Dawe, & Jastrzembski, 2000).

By setting weighted eBusiness objectives relating to end-customer success, hyper-partnering efficiency, and multi-organization financial performance and applying quantitative and qualitative impact metrics, organizations can track a project's impact on a given eBusiness objective.

In yet another approach, Intel has developed a *Business Value Index* (BVI) (Intel, 2003; Curley, 2004). BVI is a component index of factors that affect the value of an IT investment. It evaluates IT investments along three vectors: IT business value, impact on the IT efficiency, and the financial attractiveness of the investment. All three vectors use a predetermined set of defining criteria that includes customer need, business and technical risks, strategic fit, revenue potential, level of required investment, and the amount of innovation and learning generated. Each criterion is weighted, and project managers or program owners score their projects against these criteria to produce total scores for each of the three vectors. By graphically depicting the three indices for each project, BVI methodology provides some decision support to managers to compare and contrast investments, and then determine the investments that align best with their business priorities.

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Enterprise Resource Payback (IFS Resource Payback) (EAC Report, 2005) is considered a more complete analysis of an IT investment return that the ROI as it looks at the overall payback that enterprise software can offer to a company. It includes not only quantifiable improvements in bottom and top line functionality, but also more qualitative measures – such as new business opportunities, new customer and partner relations, and improved time to market – that contribute significantly to the success of a company's enterprise software implementation and use. Increased quest for accountability in IT, however, demands measurement rather than assessments and assigning monetary value to IT outputs.

IT Value Mapping (Hajela, 2005) is considered a holistic framework that quantifies and visually depicts it capabilities of an organization. It creates diagrams, or value maps, to depict the state of key business and IT components at any given point in time. It also depicts the impact of each component's 'state' on business value. This approach is used to maximize returns on IT investments by eliminating IT investments that are not in line with business imperatives (as seen from the value maps depicting organizational and IT capabilities) and managing the remaining investments to improve returns. It is not used for calculating IT returns per se.

Total Value of Opportunity Approach (Apfel, 2002) is a methodology that measures business performance of an IT initiative by including the important factors of risk, time, and an assessment of the organization's

ability to convert projected value into actual business benefit. The methodology is based on the cost/benefit analysis where the costs are done on the basis of the TCO principles, whereas benefits are modeled against all of the controllable activities of the company. The metrics are monitored before, during, and after implementation to determine how the projected value is being delivered.

The so called emerging IT valuation measures also include applied information economics that uses scientific and mathematical methods to evaluate the IT investment process, EVA, economic value sourced that quantifies the dollar value of risk and time and adds these in the valuation equation, portfolio management that manages IT assets from an investment perspective by calculating risks, yields, and benefits, and real option valuation that tracks 'assets in place' and 'growth options' to present the widest array of future possibilities (Davies et al., 2003). Not only are they difficult to apply, they also fail to shed light on how the IT value is generated.

Other approaches can be found in Tardugno, DiPasquale, and Matthews (2000), Remenyi, Money, and Sherwood-Smith (2000), Murphy (2002), Devaraj and Kohli (2002), Lutchen (2004), Weill and Ross (2004), and Schubert (2004).

Though all of these approaches are helpful, they have critical limitations as discussed above. Various approaches and methodologies fall short on providing information on how to make better IT decisions based upon the analysis. Also, in many organizations, after the business initiative was launched, the project was not monitored or benchmarked against the original projected benefits. Performance measures were not specified for subsequent managerial control. Specific tools for the identification and measurement are necessary. In this chapter, we attempt to provide a useful model and a methodology that will help organizations measure an IT initiative's payoff in a more comprehensive way and execute efficient management control.

THE IT CONTRIBUTION MODEL AND THE IT PAYOFF METHODOLOGY

To properly assess the payoffs of investments in IT, organizations must implement comprehensive systems to evaluate impacts of IT initiatives on financial performance. In Fig. 1, we provide the *IT Contribution Model*

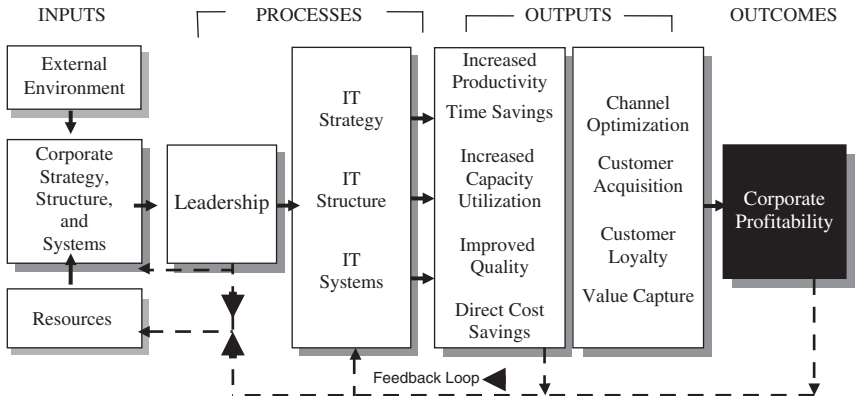

Fig. 1. IT Contribution Model: Antecedents and Consequences of IT Success.

(Epstein & Rejc, 2005), which describes the key factors for corporate success in IT integration. One of the basic premises of the model is that the impact of IT is realized mainly in combination with other organizational factors (Barua & Mukhopadhyay, 2000; Lim et al., 2004; Byrd et al., 2006). The model includes the critical inputs and specific processes that organizations need, which will lead to success in IT outputs (internal and external). However, as IT success ultimately must be measured by its contribution to overall organizational success (such as profitability or shareholder value) that is the ultimate outcome and measure of success, it includes outcomes as well.

The model implies that an organization's IT success is dependent on various *inputs*. This includes its existing corporate strategy, structure, and systems that provide both opportunities and constraints on IT initiatives. These, along with available resources and the external environment, are critical inputs that affect choices in the formulation and implementation of IT strategies (initiatives). Other factors, such as leadership and IT strategy, IT structure, and IT systems (*processes*) also significantly impact the performance and success of IT initiatives. Both the inputs and processes impact on various IT *outputs* that can be classified as either *internal outputs* such as improvement in productivity, time savings, increased utilization of capacities, improved quality, overall cost reduction, as well as *external outputs* such as channel optimization, customer acquisition, satisfaction, and loyalty, and overall value capture. If the IT strategy (initiative) formulation and implementation is successful, these outputs should ultimately be realized in improved overall corporate profitability (*outcomes*).

The viability of any IT initiative must therefore be estimated through proper evaluation of external environment and inputs available in an organization. Managers responsible for planning and developing IT initiatives must also consider the processes necessary to drive superior IT performance. Leadership of the organization, for example, must be knowledgeable about IT, committed to the IT initiatives, and aware of the impacts of existing organizational culture and behavioral patterns that may act as impediments to effective implementation of new IT initiatives. Top management involvement is an important factor in IT success (Armstrong & Sambamurthy, 1999). Similarly, it is essential that IT systems such as specialized HR practices for IT departments, IT training, performance measurement, and management control are part of the processes pertinent to IT. In many organizations, the gap between the rate of technology innovation and employees' skills and knowledge to use these innovations productively is growing preventing IT efforts to realize its full potential. Also critical is the alignment of the IT strategy with the corporate strategy and the establishment of appropriate IT structure.

If the IT initiatives are well designed and executed, the identified inputs and processes should lead to improved performance in outputs, and ultimately to increased corporate financial performance. The overall outputs of IT initiatives can be divided into two categories. Internal outputs relate to increased productivity, time savings, increased capacity utilization, improved quality, and direct cost savings. Increased productivity, for example, is one of the expected immediate benefits of new IT programs and projects. Improvements in IT infrastructure, for example, in terms of fully integrated application systems allow for better access to databases, faster exchange of information, reduced operating cycles, and so forth. In addition, the standardization of IT work processes, segmentation of the work, and global dispersion for greatest efficiency permit numerous improvements. These include reuse of applications and technical architectures, automation of much of the delivery process, and codification of methodologies so that they can be repeated, which all greatly increases productivity. IT can reduce the firm's fixed overhead costs, or reduce the variable costs of designing, developing, or manufacturing a product (Thatcher & Oliver, 2001). The financial consequences of improvements in internal outputs are all reflected in cost savings or, potentially, in increased sales. The external outputs, on the other hand, relate to achievements realized in the market and cover a broad array of results with respect to channel optimization, customer acquisition, loyalty, and retention, and overall value capture. Customer acquisition, for example, can significantly

be increased by creating and using new channels of providing customers with products and services. Organizations, for example, that move more commerce to the web can accomplish expanded global coverage and exposure with a relatively minimal investment. For a more detailed description of all internal and external outputs, see Epstein and Rejc (2005).

For IT initiatives to be of value, the intermediate outputs must eventually payoff in increased organizational success (corporate profits). Viewed simply, increased profitability can only be achieved through reduced costs or improved revenues. Thus, in order to prove that IT investments in programs and projects were financially sound, the ultimate effect on corporate financial profitability must be determined and the payoffs clearly documented.

Following the *IT Contribution Model*, we propose a 6-step methodology that identifies critical drivers of an IT initiative success and creates causal relationships among these drivers. The visual presentation of the causality of drivers helps better understand how the inputs, processes, outputs, and outcomes of an IT initiative are interrelated. The methodology thus enables precise identification and measurement of all present and future marginal costs and benefits of IT initiatives fundamental for a comprehensive and objective calculation of IT initiative payoff. Finally, it also develops performance measures for the drivers that can be used for managerial control after an IT initiative is launched (see Fig. 2).

STEP 1: IT Initiative Overall Purpose and Goals

The IT Payoff Methodology starts by an overall description of an IT initiative purpose – Why should an IT initiative be implemented? What are the overall business outcomes of the project? – and goals – What are the expected direct results of an IT initiative? The overall purpose and goals can be stated as narratives but must clearly reflect the alignment of the IT initiative (solution) with the business. This will ensure project alignment with business imperatives and accountability for stated purpose and goals.

STEP 2: The IT Contribution Model*: Identify Relevant Inputs, Processes, Outputs, and Outcomes*

Step 2 introduces the *IT Contribution Model* that helps identify all required inputs and processes of an IT initiative, as well as expected outputs, and outcomes. Critical drivers specify more precisely the keys to IT success and

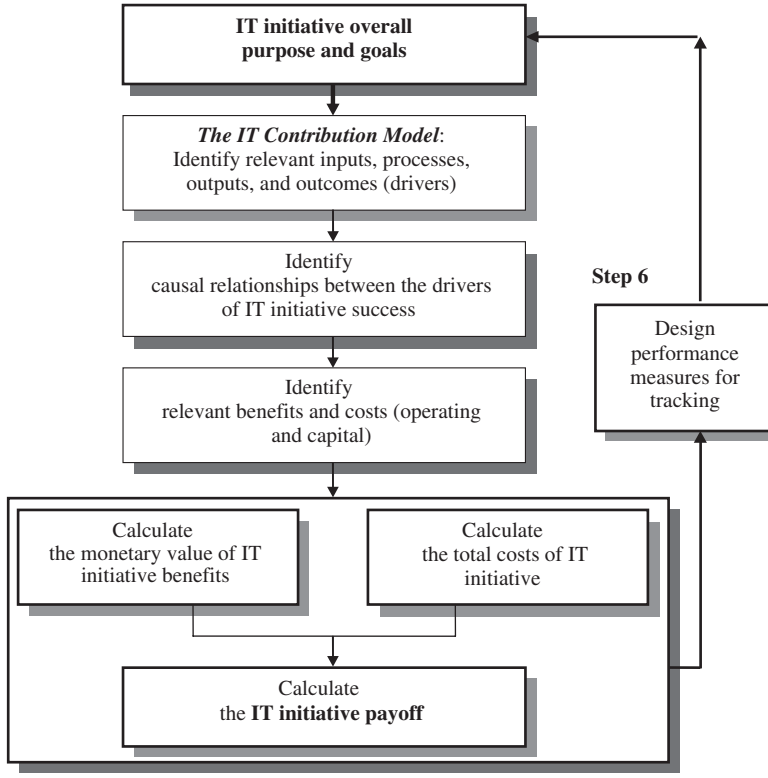

Fig. 2. The IT Payoff Methodology.

the actions that managers must take to improve the success of the IT activities that will ultimately impact on overall organizational success. With the *IT Contribution Model*, an IT initiative antecedents and consequences can be determined more comprehensively which is needed for a visual presentation of the causality of drivers, the designing of performance measures, identification of relevant benefits and cost, and the calculation of an IT payoff.

STEP 3: Identify Causal Relationships between the Drivers of IT Initiative Success

After having identified specific drivers of IT success, their causal relationships must be developed (see Fig. 3).

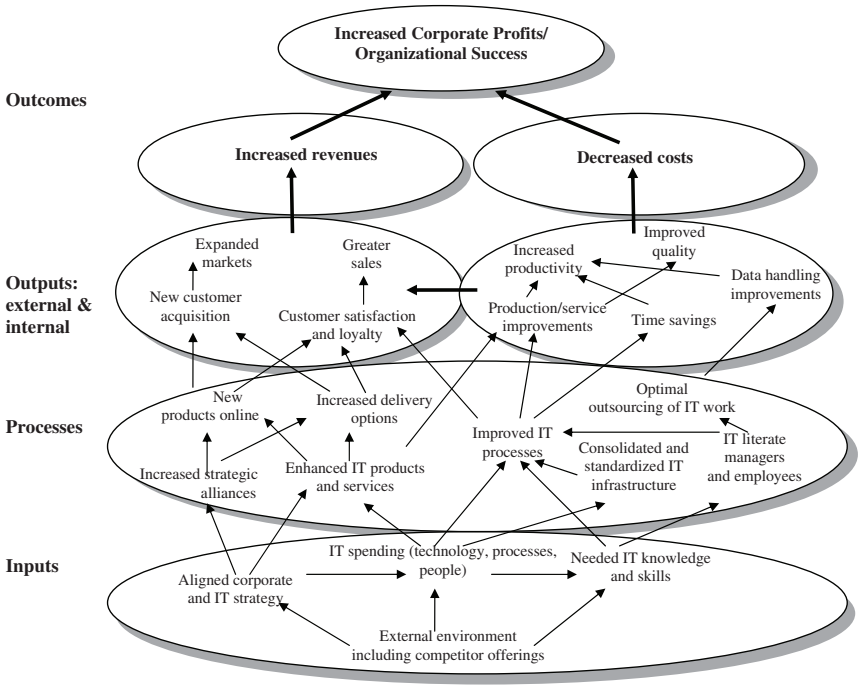

Fig. 3. Causality of IT Performance Drivers.

A clear understanding of the cause-and-effect relationships underlying the primary drivers of value in an IT initiative is one of the most important determinants of its success. In practice, there are numerous drivers of IT success and the ones outlined in Fig. 3 do not attempt to cover all choices. On the other hand, the illustrated example is comprehensive. In practice, there should be fewer critical IT performance drivers and the illustration of the causality of IT performance drivers less complex.

Fig. 3 shows, for example, that if organizations align the corporate and IT strategy, then they will potentially obtain more resources to spend on IT technology. More resources spent on IT technology can enable them to consolidate and standardize IT infrastructure leading to improved IT processes, increased productivity and quality, and decreased costs. Similarly, if organizations devote more resources to enhance IT products and services, they can increase delivery options leading to higher customer satisfaction, sales, and revenues.

Causal relationships between drivers within each of the four dimensions as well as between drivers in different dimensions are based on hypothetical assumptions of causes and effects, i.e., leading and lagging elements. In practice, the notion of leading versus lagging elements should be thought of as a continuum, as, for example, improved IT processes leads to time savings, but at the same time lags the IT spending. These hypothesized relationships need to be continuously tested and revised.

STEP 4: Identify Relevant Benefits and Costs (Operating and Capital)

Step 4 requires an exact specification of all benefits arising from the IT initiative and the capital and operational costs. The identified causal relationships between the critical drivers of an IT initiative will help determine both the costs and expected benefits of the initiative. Although benefits do not always clearly translate into short-term profits, they should ultimately lead to either cost savings or increased revenues. Sometimes, the direct relationship between a specific action or process, such as better and faster information, and the business value creation is not clear enough to provide an easy calculation of the benefit's monetary value. In such cases, additional inquiry in terms of 'How does this improvement specifically help you in your work?' should be undertaken. It may be that the system supports increased throughput per employee (increased productivity), saves time (time savings), helps optimizing the use of existing resources (increased capacity utilization), or allows fewer mistakes (improved quality). As shown in Fig. 4, the new methodology specifically recognizes the importance of measuring both the total costs of an IT initiative – including a range of different disruption costs – as well as the benefits, and additionally considers the risks associated with IT investments. It is important to note, that a precise identification and measurement of the present and future marginal costs and benefits of IT initiatives is fundamental for a comprehensive and objective calculation of IT initiative ROI. In particular, disruption costs associated with the adoption of IT initiatives require a thorough evaluation as they are typically significant.

STEP 5: Calculate the IT Payoff

In Step 5, the benefits are assigned monetary value and the costs are calculated. Finally, the IT payoff is calculated (see Fig. 4).

1 **Calculate the Monetary Value of IT Initiative Benefits**

Outputs	Benefits	Monetary Value
Increased Productivity	Increase in output (units produced, services offered)	$.....
Time Savings	Labor hours saved, machine hours saved, increased on-time deliveries reducing cost of grievances etc.	$.....
Increased Capacity Utilization	Increase in output (units produced, services offered)	$.....
Improved Quality	Labor hours saved, machine hours saved, cost of quality reduced, increased on-time deliveries reducing cost of grievances etc.	$..... $.....
Direct Cost Savings	Reduced IT expenses, reduced direct administrative and operating costs, reduced fraud incidence, reduced hours of IS downtime	$..... $.....
Channel Optimization, Customer Acquisition and Loyalty, Value Creation	Increased sales from existing and new customers	$..... $.....

2 **Calculate the Total Costs of IT Initiative**

Costs		Value
Front-end Direct Costs of IT initiative	Hardware, software, installation and configuration costs, overhead, training costs	$..... $.....
Disruption Costs Related to Human Factors	Decline in labor productivity, hours lost because of IT training, decline in product and service quality, absenteeism, revenues lost	$..... $.....
Disruption Costs Related to Organizational Factors	Technical disruptions, breakdowns in service, costs of system support from vendors, organizational restructuring	$..... $.....
Costs of Risk Mitigation	Development and implementation of IT performance framework	$.....
	Total Capital Costs	$.....
Operating Costs of IT Initiative	Direct IT operation costs, maintenance costs	$.....
	Total Operating Costs	$.....

3 **Calculate the IT Initiative ROI**

$$\text{ROI} = \frac{\text{Total Benefits} - \text{Operating Costs}}{\text{Capital Costs (Investment)}} * 100$$

Fig. 4. Calculation of an IT Initiative Payoff.

IT ROI but also other financial performance indicators can be calculated such as the anticipated net present value of investment cash flows, the internal rate of return, and the period of investment payback; a flexibility analysis can also be carried out to determine the most critical factors of an IT initiative success. The IT payoff methodology can be used for both IT project justification prior to its start (planning) as well as for evaluation after completion (performance measurement).

STEP 6: Design Performance Measures for Tracking

To successfully attain the IT payoff goals, the cause-and-effect relationships in the causality map need to be monitored closely. For that purpose, appropriate metrics must be developed, consistent with and supporting the drivers of success, and milestones determined. Metrics should be used to foster an understanding the IT initiative purpose and goals and performance AU :5 drivers that will enhance cooperation between business units and stimulate a forward-thinking approach to achieving relevant objectives. The role of performance measures in motivating and coordinating employee behavior is fundamental as they – when properly designed and communicated – focus employee attention to the critical drivers of success. Performance measures and their targeted values also enable efficient managerial control of the IT initiative overall success.

The starting point for developing the appropriate metrics is the causal relationships of the IT initiative drivers. Attempts should be made to measure as many drivers as possible with monetary values. For example, improvements in quality may well be measured by the percentage of high-quality products, but it is more important to measure the dollars saved on less rework. Both the non-financial and financial measures, as long as they are expressed quantitatively, i.e., either in absolute or percentage terms, are useful, allow comparability, and target setting. However, financial measurement is especially important as managers want to calculate ROI and demonstrate IT payoff. Table 1 presents examples of performance measures that can be used for tracking an IT initiative progress and success.

It is important to focus on the key indicators rather than introducing indicators for everything that can be measured. Prior to the implementation of an IT initiative, baseline indicators for the specified performance measures need to be established. A lack of information of the initial status of the critical drivers of IT success prevents drawing conclusions about the actual benefits from IT initiatives after their completion. Even more

Table 1. Examples of Performance Measures for Tracking an IT Initiative.

Inputs	*Performance Measures*
Corporate strategy	% of planned change in annual IT budget
Corporate structure	Level of empowerment to SBU and functional managers
Corporate systems	% of employees compensated based on individual or group performance
Resources	Growth rate of IT spend per growth rate of direct total spend
External Environment	Assessment of competitor IT investments Assessment of customer and supplier needs and capabilities
Processes	*Performance Measures*
Leadership	% of CIO's and IT managers' bonus linked to IT profitability
Create and execute appropriate IT strategies	% of discretionary spending decisions aligned with corporate and business unit strategy Planned costs, benefits, and profitability of IT projects
Design and institute proper IT structure	% of systems developed/maintained outside the organization % of standardized hardware, databases, communications and applications systems
Develop and implement appropriate IT systems	% of IT employee turnover % of IT staff with pay for performance compensation Break/fix maintenance response/resolution time
Internal Outputs	*Performance Measures*
Increased productivity	% increase in production output per employee Dollar increase in sales based on productivity improvements
Time savings	Reduction in on-line response time Dollars saved based on time savings
Increased capacity utilization	% increase in capacity utilization % of utilization of databases
Improved quality	Dollars saved on prevention and appraisal cost of quality
Direct cost savings	% reduction in IT mandatory expenses Time saved on disaster recovery/business continuity
External Outputs	*Performance Measures*
Channel optimization	Dollar value of activities completed through web sites Hours of web site downtime (in a year)
Customer acquisition	% of customers using web sites exclusively % of visitors to web site who are also buyers (reach)
Customer loyalty	Sales from retained customers versus new customers % of customer attrition

Table 1. (*Continued*)

Value capture	Profitability of IT projects
	Number of new IT products and services introduced
Outcomes	*Performance Measures*
Long-term corporate profitability/ organizational success	% change in stock price attributable to IT initiatives
	EVA, ROI, ROA
	Earnings growth
Short-term corporate profitability/ organizational success	Cash flow growth
	Revenue growth
	% in overall cost reduction

importantly, target values (milestones) must be set for performance measures to establish benchmarks and to motivate.

The IT Payoff Methodology with its underlying *IT Contribution Model* has several advantages over other IT performance measurement approaches and IT valuation metrics. Firstly, the *IT Contribution Model* incorporates all important drivers of IT success as identified in various empirical and case studies. The model specifically underlines the role of strategic alignment and leadership in realizing the full potential of IT investment. The alignment of IT strategy with business strategy has been touted as a critical element in IT management and as a moderator between IT investment and firm performance (Byrd et al., 2006). Along with other impacts, the alignment of these two strategies increases the involvement of business managers in IT activities. The inclusion of senior IT managers in top management teams and their informal interactions, in particular, enhance IT managers' business knowledge (Armstrong & Sambamurthy, 1999). These, in turn, are better able to utilize their IT investment. The model also assumes the critical role of structural alignment (corporate structures aligned with IT structures) and, even more importantly, the alignment of corporate systems with IT systems. Brynjolfsson (2003) specifically points to the role of redesigned incentive systems and decentralized decision-making to achieve productivity gains. The model is thus based on valid assumptions and contributes to the existing literature by integrating the critical antecedents and consequences of IT success.

Secondly, the IT Payoff Methodology requires a careful consideration of all critical inputs and processes. When planning an IT investment, it is not only financial, human, and material resources that are considered, strategic alignment, potentially changed organizational structures and systems, as well as committed and knowledgeable leadership is also taken into account. When an evaluation of an IT investment's outputs and outcomes takes

place, they are not analyzed in isolation but judged in the light of the model's antecedents' status. This is an important managerial contribution that distinguishes this methodology from extant ones.

Also, the visual presentation of performance drivers' causality helps better understand the cause-and-effect relationships among the various drivers of success. It points to the many areas that need improvement today in order to reap benefits in the output and outcome areas later. As such, it provides managers with timely information to make better IT decisions.

Further, the methodology requires a specification of performance measures and their target values along the time horizon to monitor the drivers' progress and to benchmark the final results against the initially projected net benefits. IT managers can thus execute effective managerial control over the milestones and the ultimate outcomes. Performance metrics is particularly important as it focuses attention on the critical drivers and stimulates a forward-thinking approach to achieving relevant objectives.

Finally, the methodology provides practical guidance on how to calculate the monetary value of IT benefits, which is often one of the major concerns of those responsible for calculating an IT ROI. The formula for IT ROI is provided along with the specification of all relevant capital and operational costs. None of the existing IT performance measurement methodologies incorporates all these characteristics.

APPLICATION OF THE IT PAYOFF METHODOLOGY IN ISTRABENZ GROUP

The Istrabenz Group is an international group of affiliated companies managed by the Istrabenz Holding Company. Its activity is organized into four divisions comprising energy, tourism, investments, and food, as well as IT support as an accompanying activity. In 2005, the company prepared guidelines on the use of ICT, from which it follows that this area is one of the key factors of the Istrabenz Group for achieving its strategic business goals; this is why the ICT strategy must be in line with business goals. Among other things, the guidelines regulate information system operation and the exploitation of synergies in ICT. This primarily involves the method of performing IT services and the efficient use of common resources such as the use of technological solutions that make possible the long-term stable operation and development of the Istrabenz Group (Istrabenz Group, 2005, Guidelines on the Use of Information and Communication Technology).

In 2005, the Istrabenz Holding Company was considering the introduction of the ROS information system as a uniform information system for supporting the operation of all the hotels in the Istrabenz Group tourism division. For the Morje Hotels, this would replace the FIDELIO information system, whereas for the Palace Hotels, the ROS information system had already been introduced in 2001. The company top management required exact calculations of the investment payoff. The *IT Contribution Model* and the IT Payoff Methodology have been selected as analytical tools and permission was granted for empirical testing of the model. As researchers, we were able to observe the effects of the implementation and the effectiveness of the model.

The company initiated its own project group for the IT initiative valuation. It included representatives of the Istrabenz Group tourism division and the ROS Company. The group comprised a project council (composed of the representatives of the tourism division and ROS), the project head, working group coordinators, the module head, key information system users, and advisers to ROS. The role of the key information system users was especially important as they are the ones that know best how the existing business operations function and what changes the new system is intended to yield. Key information system users were determined by the IT head at the Istrabenz Hotels; they included the managing director of the Morje Hotels, the managing director of the Palace Hotels, the representatives of the invoice and material accounting departments, the head of Food Supervision, and the sales manager at the Istrabenz Hotels.

The project group used the IT Payoff Methodology to determine the expected benefits from the information system unification and to set up the tools for subsequent managerial control if the project is approved. With the help of structured interviews, data were gathered on how the information system would change the operations. Starting points for discussions were prepared and sent to each interviewee in advance. The purpose was to determine the business process before and after the introduction of ROS and, on the basis of this, to determine the potential effects with the help of key users. In evaluating the effects of the ROS information system, secondary data from the Istrabenz Hotels were also used.

The subject of the research project is the IT initiative to introduce the ROS information system as a uniform information system for supporting the operation of the Morje and Palace Hotels. The study relates to one part of the tourism division of Istrabenz only but the project could be easily expanded to other parts of the company. The practical example of the IT Payoff Methodology application presented below demonstrates how methodology

can be used for project justification prior to its start and for subsequent managerial control of the project and its applicability to other companies.

STEP 1: IT Initiative Purpose and Goals – The ROS Information System

The ROS information system comprises various modules specified for various business areas. It includes ROS HIS, an information system for hotel and convention services; ROS GIS, an information system for catering services; ROS ZIS, a health resort information system; ROS Wellness, a wellness information system; ROS FRS, a financial and accounting system; and ROS WEB extras, an online hotel reservation system with an integrated payment system (ROS company internal publication, 2003). During the project to introduce the ROS information system, the HIS, GIS, ZIS, and WELLNESS modules were implemented.

The main goals of introducing the ROS system as a uniform information system were the restructuring and unification of information solutions and processes in the tourism division of the Istrabenz Group with the purpose to ensure timely information for the needs of the companies' management, and information solutions that enable high-quality support for implementing tourism business processes. In reality, the introduction of the ROS information system was expected to have dual effects. On the one hand, these involve the effects of the replacement of the FIDELIO information system for the Morje Hotels and, on the other, the effects of the unification of both systems into a uniform information system.

STEP 2: The IT Contribution Model*: Inputs, Processes, Outputs, and Outcomes for the ROS Information System Implementation*

In accordance with the methodology, individual elements in the *IT Contribution Model* were defined in terms of their content (inputs, processes, outputs, and outcomes). Each element was carefully described by the project members, particularly by the selected main users of the ROS information system. In terms of the needed inputs, for example, all required resources were determined. The cost of the needed capital investment was calculated; there was no need to hire additional employees; the ROS Company offered IT training for employees that would be using the new information system with costs being incorporated in the capital investments numbers. The IT support and system maintenance costs were considered as operational

costs. Corporate strategy was found to be supportive of the ICT strategy. Similarly, other inputs and required processes were determined. After the conversation with the managing directors of the Morje and Palace Hotels, the dimensions of the effects (outputs) of the ROS information system were divided in the following areas for the needs of investment evaluation: sales, reception office, catering and wellness, support staff, material accounting, invoices, and general effects.

Some of the expected results of introducing the ROS information system were not completely definitive. In the evaluation of results, various hypotheses about cause-and-effect relations between the ROS and operations were used, which were defined on the basis of key users' experiences. In defining the hypotheses, there was a certain extent of uncertainty regarding their accuracy. The project group tried to eliminate this with the help of sensitivity analysis. Another possibility is the probability theory, where several scenarios are created for a specific fuzzy hypothesis and then probability is attributed to them (Anandarajan & Wen, 1999, p. 329).

STEP 3: Identify Causal Relationships Between the Drivers of IT Initiative Success

Causal relationships between inputs, processes, outputs, and outcomes must be result of a unified understanding of how the project is expected to evolve towards its goals and purposes. The visual presentation of the cause-and-effect relationships between antecedents and consequences of the ROS information system implementation is shown in Fig. 5. The most interesting areas in the figure are the processes and outputs area with descriptions of critical changes in the hotel operations and subsequent effects on the customers. As can be seen, the final outcomes are manifested as lower operating expenses or as an increase in sales revenues, which results in an increase in the company's profit.

The project group used the comprehensive causal relationships scheme as the basis for laying out the processes expected to change and for describing all the expected cost and benefits.

STEP 4: Relevant Costs (Operating and Capital) and Benefits of the ROS Information System Implementation

The changes caused by the ROS information system and the subsequent costs and benefits will be presented in more detail in the area of catering and

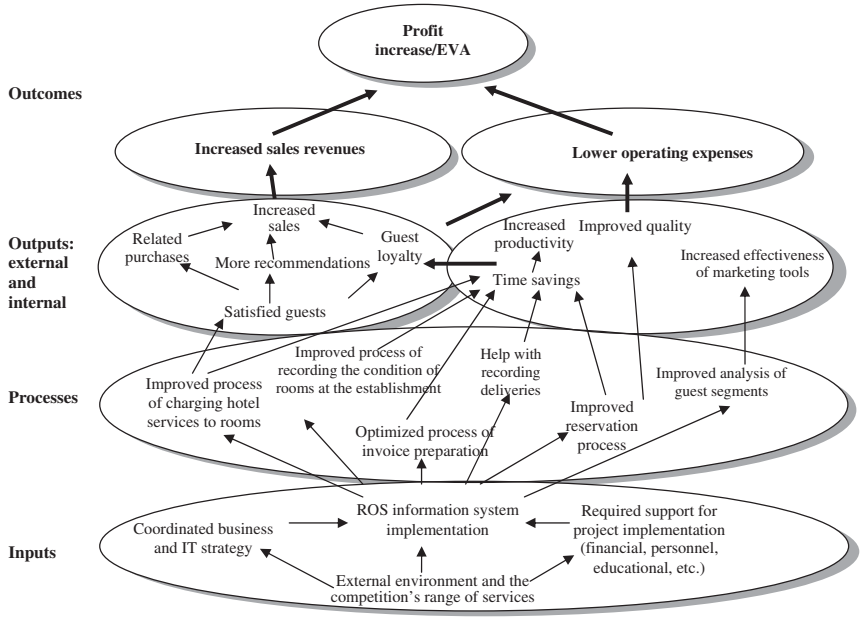

Fig. 5. Causal Relationships between the Drivers of Implementing the ROS Information System. *Source:* Moze (2006).

wellness; other areas were analyzed in the same way. Catering at Istrabenz Hotels includes service on all the premises, both in bars and restaurants. In service, the ROS information system helped mitigate the process of calculating hotel credit or the charging of guests' hotel services to their rooms. In wellness, the process is similar, with the only exception that time savings are a little different.

Fig. 6 shows the process of charging services to rooms before and after the introduction of the ROS information system at the Morje Hotels.

Prior the introduction of the ROS, the process starts with the guest's order, for which the waiter prepares a check. The guest signs it, by which he confirms that he has used the service. The waiter has to enter the check into the account book and then take it to the reception office, where the receptionist checks if the guest is really staying in the room he has stated. Then he confirms the copy of the check, in which he assumes responsibility for any potential non-payment. The waiter takes the check back to the reception office, while the receptionist has to put the data on the guest's room and insert the original check in the room's pigeonhole. The checks

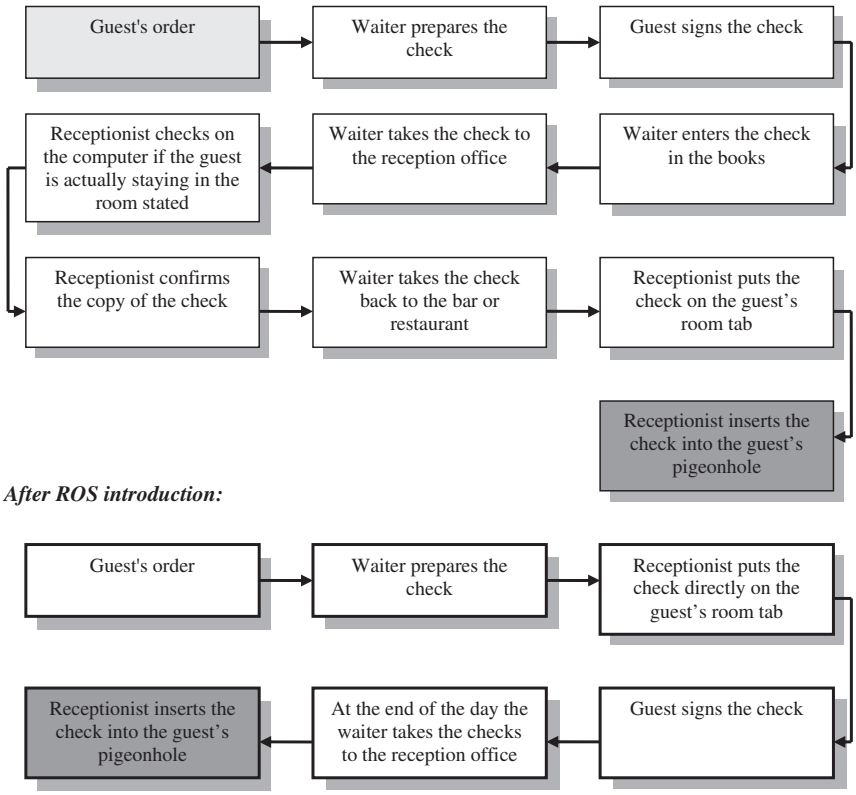

Fig. 6. The Process of Charging Hotel Bar and Restaurant Services to the Room before and after the Introduction of the ROS Information System.

prove that the guest has really used the service charged. After the introduction of the ROS, the process of charging services to rooms will change. The check will be automatically put on the guest's room tab as soon as the waiter prepares it and this is also recorded on the receptionist's computer. At the end of the day, the waiter only has to take the checks to the reception office for recordkeeping if guests demand proof that they really used the service charged.

The ROS information system was expected to optimize the process of charging hotel services to rooms. Through direct transfer of the check from the bar, restaurant, or wellness center to the guest's room, savings in the time used for the process are created for both the waiter as well as the hotel or wellness center receptionist. After the conversation with the managing

director of the Morje Hotels, time savings that the ROS information system makes possible were determined. Thus, it has been determined that a waiter saves 2.30 min for each process of charging to the room. A more accurate division of the waiter's time saved is as follows: (1) time saved walking to the reception office: 1.30 min, (2) waiting at the reception office to confirm the check copy: 45 sec, and (3) time used to enter the check into the books: 15 sec.

The division of time saved for the wellness center receptionist is similar to that for the waiter. By using the ROS information system, a receptionist would be no longer required to check if the guest is actually staying in the room stated and to confirm the check copies. He would only insert the checks brought to them from the catering or wellness center into the pigeonholes. This saves a receptionist 45 sec per process. These effects of time savings are direct; but the effects can also be indirect. By saving time, the ROS relieves employees' (waiters' and receptionists') workload, and so they can devote more time to the guests, which increases their satisfaction. Greater guest satisfaction results in increased use of hotel services. The assumption is that a satisfied guest will be happy to return and/or will recommend the hotel to friends and acquaintances. The effects of greater guest satisfaction can thus be summarized as follows: (1) related purchases: guests will use more hotel services, (2) repeated purchases: guests will be happy to return, and (3) recommendations: satisfied guests will recommend the hotel to their friends.

For a better overview of all direct results of introducing the ROS information system, a table is provided in Appendix.

STEP 5: Calculation of Total Costs and Benefits of the ROS Information System Implementation

The costs associated with the investment in the ROS information system comprise software purchase, hardware purchase, training and education costs, opportunity costs of employees' time, and annual maintenance costs. The costs in the first four groups are one-time costs that are created at the project's beginning (capital costs), whereas maintenance represents an annual (operating) cost. Training and education include costs of training and education for all modules implemented in the project. The opportunity costs of the employees' time are based on the time used for training and education, during which their normal work was interrupted. From the ROS time schedule, the information was retrieved on the planned number

Table 2. Expected Total Costs of Investment in the ROS Information System.

Cost	Calculation	Item Value (€)
Software	Istrabenz Turizem internal sources	95,438
Hardware	Istrabenz Turizem internal sources	19,629
Training and education	Istrabenz Turizem internal sources	9,114
Opportunity costs of employees' time	Labor hours planned for training and education × labor cost per hour	3,990
Total capital costs	Sum of all items above	128,171
Annual maintenance	Istrabenz Turizem internal sources	2,304

of hours for training and education by every employee. This time was then multiplied by employees' average hourly payment, which equaled the expected opportunity costs of the employees' time (see Table 2).

Table 3 shows the calculation of anticipated financial effects of time savings in catering and wellness after the introduction of the new information system for a five-year period of time (2006–2010). At the Istrabenz tourism division, the payback period for information systems is five years, which can be considered the period of the system's duration and thus the period of investment evaluation. The estimations for the first two years of the ROS being in place and in use also include the so called implementation factors which are used to substitute for suboptimal use of the information system and the subsequent disruption costs (0.6 and 0.8, respectively).

The same procedure was used for other areas (sales, reception office, support staff, material accounting, and invoices). Table 4 shows the calculation of selected anticipated financial benefits from general effects, such as increased guest satisfaction. An increase in the base of regular guests and recommendations by satisfied guests are included. Other effects include increased efficiency of marketing tools, related purchases, as well as decreased number of claims, and they were all included in the final calculations.

Altogether, total expected benefits for the first year sum up to € 55,073, the total costs are in the amount of € 130,474; in the second year, the benefits increase to € 73,882 and continue to rise up to the final year, while the costs fall to € 2,303 and remain at the maintenance level.

The investment in the ROS information system was evaluated by calculating the anticipated net present value of investment cash flows, the internal return rate, and the period of investment payback; at the same time,

Table 3. Calculation of Expected Financial Effects of Time Saving in Catering and Wellness after the Introduction of ROS.

Area	Result	Calculation	Financial Effects (€)				
			2006	2007	2008	2009	2010
Catering and wellness	Saving 2.5 min in waiter's work per each process of charging to room	*Time savings*: number of processes per year × 2.5 min = 7,500 × 2.5 min = 687.5 h *Time value*: € 5 per hour *2006 annual savings*: 687.5 h × € 5 × 0.6 = € 2,063	2,063	2,754	3,505	3,567	3,630
	Saving 1.75 min of wellness receptionist's work per every process of charging to room	*Time savings*: number of processes per year × 1.75 min = 8,250 × 1.75 = 239.3 h *Time value*: € 4.2 per hour *2006 annual savings*: 239.3 × € 4.2 × 0.6 = € 603	603	799	1,016	1,035	1,053
	Saving 45 sec of receptionist's work at Morje Hotels per every process of charging to room	*Time savings*: number of processes per year × 45 sec = 24,750 × 45 = 309.375 h *Time value*: € 6.25 per hour *2006 annual savings*: 309.375 × € 6.25 × 0.6 = € 1,160	1,160	1,549	1,972	2,007	2,042
	Saving 30 sec of the receptionist's work at Palace Hotels per day	*Time savings*: 3 h per year *Time value*: € 6.25 per hour *2006 annual savings*: 3 × € 6.25 per hour × 0.6 = € 11.25	11.25	15.02	18.78	18.77	18.77

Table 4. Calculation of Expected Financial Effects of Increased Base of Regular Guests and Recommendations by Satisfied Guests.

Effect	Result	Calculation	Financial Effects (€)				
			2006	2007	2008	2009	2010
Increased base of regular guests	Lower promotion costs	*Formula*: Δ of average use × annual promotion costs × training factor *2006 annual savings*: 1% × € 1,070,694 × 0.6 = € 6,424	6,424	8,724	11,103	11,302	11,500
Recommendations by satisfied guests	Lower promotion costs	*Formula*: Δ of the number of overnight stays × advertising costs per overnight stay × training factor Δ *of number of overnight stays with recommendations*: 0.05% × 64,800 = 32 *Promotion costs per overnight stay*: € 6.6 *2006 annual savings*: 32 × € 6.6 × 0.6 = € 126.72	126.72	174.48	222.10	226.03	230

a sensitivity analysis was also carried out. Investment cash flows represent the calculated financial effects of the ROS information system and the costs of investment. The discount rate by which the investment cash flows are discounted is the required return rate of the investor – in this case, the owner of the Istrabenz Group – according to the investment risk and returns of alternative investments with comparable risk. The required return rate of the investment in the ROS information system was 8.5%. The calculations show the net present value of investment cash flows is € 220,068, the internal rate of return is 139%, and the period of investment payback is 2 years and 15 days.

Sensitivity analysis tested the sensitivity of the investment's evaluation to the change in the evaluations of savings on marketing costs made by the sales manager at the Istrabenz tourism division. Results show that in the case of an evaluation of savings on marketing costs decreased by 1%, the net present value decreases by 8%, whereas the internal return rate decreases by 17 percentage points or by 12%. In the case of an evaluation of savings on marketing costs increased by 1%, the net present value of the investment increases by 9%, whereas the internal return rate increases by 19 percentage points or by 14%. With the $\pm 1\%$ change in evaluation of savings on marketing costs, the period of investment payback extends by 29 or shortens by 30 days. The sensitivity analysis presented above offers an example of great investment sensitivity to the evaluation of savings on marketing costs. This was taken into account in the final evaluation of the effectiveness of the investment in the ROS information system.

STEP 6: Design Performance Measures for Tracking

In the final step, after the project was approved, performance measures were developed to foster the anticipated changes as foreseen in the initial calculations. Performance measures were drawn from the causality of drivers' scheme; for outputs, however, a more detailed look at the changes in various processes was needed to design appropriate indicators. Table 5 provides selected performance measures for tracking the outputs of catering and wellness.

For many performance measures that have not been tracked before baseline indicators were determined. Specific measurements and evaluations took place as separate activities in the project to determine these baseline values. Then, target values or milestones were set for performance measures across the expected period of investment payback. These values were determined by

Table 5. Selected Performance Measures for Tracking the Outputs of Catering and Wellness.

Catering and Wellness Internal Outputs	Performance Measures
Time savings	% of time saved in the waiter's work
	% of time saved in the hotel receptionist's work
	% of time saved in the wellness receptionist's work
	Dollars saved based on time savings
Improved quality	% decrease in customer complaints related to waiters'/receptionists' work
	Dollars saved based on fewer customer complaints
External Outputs	*Performance Measures*
Customer acquisition	% of guests being recommended by friends and acquaintances
Customer loyalty	% of guests returning to the hotel
	Sales from retained customers versus new customers
Value capture	Dollars earned on related purchases

the project group members but with a consent of those employees who were responsible for the processes and activities under evaluation.

DISCUSSION

The chapter addresses an important methodological question that has been addressed in both the IT and management control literature, namely the question of identifying, measuring, and managing the IT's contribution to the bottom line. While empirical research work, recent studies, in particular, provides evidence of the IT value, there is little practical guidance on how to design and implement an appropriate IT performance measurement system. Various approaches and IT valuation measures fall short on providing a comprehensive overview of all critical drivers of IT success, their interrelations, the way they can be measured, and how to make better IT decisions based upon the analysis. In this chapter, we provide an integrated model (the *IT Contribution Model*) and a methodology (the IT Payoff Methodology) that bridge this methodological gap and help organizations measure an IT initiative's payoff in a more comprehensive way and execute efficient management control.

The academic contribution of the chapter is twofold. On the one hand, we present and empirically test, the *IT Contribution Model*, which upgrades the existing literature by offering an integrated model of critical drivers of

IT success. The model was designed based on empirically tested assumptions about the cause-and-effect relationships between the antecedents and consequences of IT success provided in existing empirical studies. With a model incorporating IT inputs, processes, and outputs that lead to overall IT payoff and improved corporate profitability, organizations will less likely rely on a reactive approach to their adoption of new technologies or risk making costly, personality-driven choices.

On the other hand, we also present and implement the IT Payoff Methodology, which represents a more complete analytical tool for evaluating the payoffs of investing in IT based on the proposed model. The methodology is more straightforward than existing tools as it relies on six well-defined steps, applies standard methods and analytical tools, and does not require complex calculations. It includes the identification of critical drivers of an IT investment's success, develops the cause-and-effect relationships between the drivers and outcomes, helps identify and measure all important costs and benefits of the IT initiative to calculate the IT initiative ROI, and provides performance measures for tracking the IT initiative. All these steps are necessary to properly value and manage an IT investment.

Apart from the academic dimension, the chapter also has several practical implications. The new methodology for valuing IT investments offers practical insights into how to identify, measure, and manage the critical drivers of IT success. More specifically, the IT Payoff Methodology helped decision makers at Istrabenz in several ways

- Firstly, it provided exact calculations of the expected investment payoff and enabled well-informed resource allocation decision, which was the initial purpose of the project. The methodology specifically recognizes the importance of measuring both the total costs of an IT initiative – including a range of different disruption costs – as well as the benefits, and additionally considers the risks associated with IT investments. Since most organizations have little experience in assigning monetary values to IT outputs and the measurement of IT payoffs, the methodology's specific instructions on these questions helped resolve many dilemmas.
- Secondly, by having a clear picture of the IT cause-and-effect relationships, IT managers can monitor how the IT initiatives are progressing and more fairly evaluate their intermediate results. The causal linkage map of drivers is useful and important as it helps ensure that all actions that are necessary to achieve success are taken, that unnecessary actions are not taken, and that all employees understand their critical role in the success of the IT activities.

- Thirdly, the project group members specifically acknowledged the importance of steps 2–5 for a precise and objective calculation of the IT initiative payoff. The visual representation of the causality of critical drivers of success was considered as particularly helpful for projecting the monetary benefits and costs of the IT initiative. The financial calculations have further shown how important it is to understand the influence that the hypotheses about the cause-and-effect relations and various subjective evaluations have on the investment net present value, internal return rate, and payback period. The sensitivity analysis has revealed great investment sensitivity to the evaluation of savings on marketing costs.
- Fourthly, the IT Payoff Methodology requires the active participation of all important holders of processes under investigation, their managers, and subordinate employees. The active involvement in the identification of the critical drivers of success, expected internal and external outputs, in particular, however, substantially facilitates the IT initiative implementation by increasing the level of understanding and acceptance. In Istrabenz tourism division, this benefit has been widely acknowledged.
- Finally, the Istrabenz project team found the methodological tool to be very pragmatic, simple, and with feasible implementation costs. The methodology can be performed internally without the need to hire external consultants.

The project group also listed potential challenges of the methodology.

- Firstly, the methodology can best be applied when extant business processes are already identified and described thus allowing for the establishment of baseline indicators of performance. In the opposite case, baseline measurements and evaluations need to take place, which takes time but is crucial for subsequent comparisons.
- Secondly, the methodology necessarily requires various assumptions about expected savings from improved processes. The objectivity of these assumptions is best attained when they are set by those who perform these processes, the so-called key users of the new IT. Still, sensitivity analyses or probability scenarios are required to mitigate some of the uncertainty.
- Thirdly, one of the most vexing problems in estimating performance impacts of IT investment is simultaneity bias. If companies undertake technology implementations when demand for their products is high or when they expect to perform well, estimates of the impact of IT adoption on performance may be biased upward creating indeterminacy in causal interpretations (Brynjolfsson & Hitt, 2003).

- Fourthly, the case study supports Brynjolfsson's finding (Brynjolfsson, 2003), namely, that companies do not simply plug in computers and telecommunications equipment and achieve productivity gains. Discussions with the project group members revealed that without efforts to improve employee IT literacy, understanding, and ability to use these innovations, further, actually measure improvements based on implemented innovations, and, finally, establish proper compensation policies to stimulate employees to deploy the use of IT, the projected benefits will not be realized. To realize full potential of IT investment, organizations must often go through a process of organizational redesign. Brynjolfsson refers to a cluster of related innovations, such as automation of numerous routine tasks, highly skilled labor, more decentralized decision-making, improved information flow vertically and laterally, strong performance-based incentives, and increased emphasis on recruiting and training (Brynjolfsson, 2003, p. 42). Earlier research and case studies have also proven that IT investments complement other long-term performance-enhancing investments, including innovations in business methods and organization, human capital investments, and supply chain management systems, which are carried out over a period of several years (Brynjolfsson & Hitt, 2003; Bresnahan, Brynjolfsson, & Hitt, 2002; Davenport & Short, 1990; Short & Venkatramen, 1992).
- Finally, it has also been agreed in the project group that, to attain business value from an IT initiative, a structured and ongoing careful examination of costs, benefits, and risks from the initial feasibility through post-implementation is needed. Even when business value is achieved, there is no guarantee that this value will be maintained unless there is an ongoing attention to IT performance measurement.

The implementation of an IT payoff measurement system should by no means be seen as a threat to or imposition on staff, rather as a mechanism to enhance performance and corporate learning. A properly developed and implemented measurement system promotes productivity by focusing attention on the most important issues, tasks, and objectives of the project.

CONCLUSION

The chapter presents the empirical testing of a new model and the subsequent methodology for identifying and measuring the IT investment payoff in the case of Istrabenz Group. While the use of a singular study

limits the generalization of the findings, the research shows that with a properly implemented *IT Contribution Model* and the IT Payoff Methodology IT managers are able to demonstrate the impact on corporate profitability and value creation from IT.

The new methodology can assist IT managers as they evaluate the trade-offs and decide which IT project provides the largest net benefit to both short-term financial performance as well as the overall long-term success of the organization. It can help CIOs, CTOs, CFOs and other senior corporate and financial managers as they develop an IT strategy to make overall corporate resource allocations to support that strategy. They can rely on convincing evidence based on formal measurement and evaluation when making recommendations on these allocations. Also, the IT staff will know better how well they are performing, correct any deficiencies, and by seeing the results of their work develop an important sense of personal satisfaction.

The *IT Contribution Model* and the IT Payoff Methodology can be adapted into any management system that an organization utilizes. It is compatible with measurement and management frameworks such as the balanced scorecard and shareholder value analysis that focus on a better understanding of the causal relationships and linkages within organizations and the actions managers can implement to improve both customer and corporate profitability and drive increased value.

The proposed methodology could be further improved, although methodological refinements should not jeopardise its pragmatism and comprehensiveness, which are two of its greatest benefits. It would be of great theoretical and practical importance to be able to test the methodology along all six steps, including the role performance measures can play in coordinating employee efforts, both as metrics in the performance measurement system as well as reward triggers in the compensation system. The *IT Contribution Model* should also be further tested and validated to provide additional empirical evidence of the causal relationships stated in the model.

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APPENDIX. RESULTS OF INTRODUCING THE ROS INFORMATION SYSTEM PER INFLUENCE AREA

Area	Result	Result Specification
Sales	Time savings	ROS accelerates the response to the demand and thus creates savings in the work time of • Sales personnel: 10% of work time, • Heads of reservation department: 15% of work time.
	More efficient management tools	ROS enables better analysis of marketing segments and more target-oriented marketing. Thus, the company saves on marketing expenses.
	Fewer complaints	ROS decreases the number of reservation errors and thus the number of complaints. In this way, certain costs concerning claims are saved.
	Fewer guests lost	Unsatisfied guests may not complain, but they will never return.
Catering and Wellness	Time savings	ROS saves time for the • Waiter: 2.5 min per process, • Hotel receptionist: 45 sec per process, • Wellness receptionist: 1.75 min per process.
	More satisfied guests	ROS relieves the waiter's and receptionist's workload, which is why they can devote more time to guests. Thus, ROS results in • Related purchases, • Guests returning to the hotel, • Recommendations to guests' friends and acquaintances.

APPENDIX. (*Continued*)

Area	Result	Result Specification
Support staff	Time savings	Savings in the work time of • Cleaning staff: 1 min per day, • Receptionist: 30 sec per day.
Material Accounting	Time savings	ROS aids in recording deliveries and thus saves two bookkeepers 1 h of work per day.
Invoice Department	Time savings	Time savings will not be visible until next year; they will amount to 25% of the work of two invoice clerks.
General Effects	Optimization of human resources	ROS enables detailed analyses that help organize work.
	Economization of human resources	ROS standardizes working processes and thus simplifies transfers of employees from one hotel to another.
	Greater guest satisfaction and loyalty	ROS enables the use of a uniform guest database, creating a basis for keeping records of regular guests, and can also help direct the relationship with the customer. This increases guest loyalty and satisfaction, which results in • Related purchases, • Guests returning to the hotel, • Recommendations to guests' friends and acquaintances.

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