MEASURING ROI IN E-BUSINESS: A PRACTICAL APPROACH

Manuel Mogollon and Mahesh Raisinghani, Ph.D.

The research in this article aims to provide an overview of how to calculate the ROI for E-commerce applications so that this information, and the attached ROI Calculator Tool Template, can be used by organizations to reduce the time in preparing the ROI for a project. Although there is much written about ROI, there is not that much said about how to prepare one specifically for an E-commerce project. By reading this article and using the annexed ROI Calculator Tool, any IT group or organization that is going to deploy E-commerce applications will have a starting point for calculating ROIs.

In an interview, Harvard Business School's Michael E. Porter had this to say about E-commerce: “The Internet as a family of technologies will have a very powerful effect on operational effectiveness. We’ll see deeper integration among service, sales, logistics, manufacturing, and suppliers. The first level of that will improve efficiencies, reduce transaction costs and reduce inventory.” Businesses are looking for those E-commerce applications, such as relationship-marketing software, integration software, customer management, E-procurement, and collaborative software, that can achieve the business integration discussed by Michael Porter to boost productivity and create new sources of revenue.

In the late 1990s, companies discovered the seemingly endless possibilities of the Internet and began to purchase E-commerce applications with little or no financial controls. There was a sense of urgency that precluded taking the time to measure the real economic value of these investments — companies were moving at Internet speed. Then the U.S. economy slowed dramatically, information technology (IT) budgets dropped considerably, and projects were competing for the few available dollars. In this new economy, IT managers must convince management of the value of a project, compare projects to determine which offers the best return, and justify the implementation of an E-commerce application.

A survey carried out by the Meta Group in November 2001 led to the following conclusion: “ROI has become one of the most important evaluation criteria for IT groups.” The renewed focus on ROI (return on investment) as an evaluation tool came after years of IT departments using some internal measurements, such as the number of visitors to a Web site and network uptime, that did not have any meaning for business executives who were trying to link a project to the overall performance of a company. Today, ROI is becoming an important tool for IT departments and corporate management to measure and quantify the return of E-commerce applications in relation to other investments.

In April and May of 2000, International Data Corporation (IDC) conducted an Internet Executive ePanel survey about ROI. These were some of the IDC findings:

- On the question of whether ROIs are calculated for E-business projects: 33 percent of respondents said yes, 16 percent said they did not know, and 50 percent said no.
Although most of the cost and return factors are easily measurable and have tangible values, the values of other factors involved are more difficult to determine.

Reasons given as to why ROIs should not be calculated included:
- The time and energy are not worth it because ROI is an imperfect calculation. Not enough firm data to base calculations on.
- The ROI is usually positive in E-commerce applications so there is no need to calculate it.
- Similar companies may already be doing it. Although ROIs are not comparable from company to company, if another company has similar programs, tools, and features, then it may not be necessary to spend the time and resources to calculate the ROI for each new element in E-commerce.

Reasons given for why ROIs should be calculated included:
- The ROI process will help determine the metrics that matter.
- Once the ROI is calculated, it is easier to do it for similar projects.
- The ROI process will provide a sense of which E-commerce applications produce the best and fastest results.

The results of the IDC survey summarize the disjunctive situation in which organizations find themselves today. On the one hand, they recognize that E-commerce applications need to be implemented quickly, but they do not want to spend too much time calculating the ROI for a project because they have problems finding the required data. On the other hand, they recognize that E-commerce investments are substantial and risky, and that they should have a thorough measure that projects the risk, yield, and benefit of a project. Organizations can resolve this situation by reducing the time to prepare ROIs, either by developing internal standardized processes and procedures, or by licensing tools already developed by companies specialized in preparing ROIs for E-commerce.

This article aims to provide an overview of how to calculate the ROI for E-commerce applications so that this information, and the ROI Calculator Tool Template, can be used by organizations to reduce the time in preparing the ROI for a project.

RETURN ON INVESTMENT (ROI)
In any type of investment, investors want to find out what their return will be. The return is calculated by dividing the profit by the investment. It is a straightforward calculation when measuring a capital investment, for example, a loan where the return on investment is the interest received. However, for a project, the investment is measured as the total cost in time, dollars, or any other unit required to plan, execute, and complete the project. The return is the savings — also in time, dollars, or any other measurable unit — generated by the project. The project’s ROI is, then, the ratio of the total return divided by the total cost of the project.

The difficulty in calculating ROI is in determining what constitutes the total cost of the project and what constitutes the total return of the project. The problem results from the fact that although most of the cost and return factors are easily measurable and have tangible values, the values of other factors involved are more difficult to determine. An example in point is the factor of customer satisfaction; it can be measured (surveys, focus groups) but its value may be difficult to specify.

In this article, the term “return on investment” is used as the benefit generated by a project, regardless of whether it is measured by the payback period (PP), net present value (NPV), or internal rate of return (IRR).

THE FINANCIAL ASPECT OF MEASURING THE ROI OF AN E-COMMERCE APPLICATION
In finance, the following standard steps are followed to evaluate the capital budgeted for a project.

1. Determine the cost of the project.
2. Estimate the expected cash flow from the project, including the salvage value of the assets at the end of the project’s expected life.
3. Estimate the project’s risks.
4. Determine the project cost of capital based on the project’s risk.
5. Calculate the present value of the expected cash flow.
6. Compare the present value of the expected cash flow with the required outlay. If the present value of the cash flow exceeds the cost, the project should be implemented. Otherwise, it should be rejected.

The same steps can be modified to establish a process to measure the return for E-commerce applications. The steps are as follows:

1. Determine the internal and external costs of implementing and maintaining current and new E-commerce application processes.
2. Calculate the cost savings between the current process and the new process, and add the benefits in productivity and efficiency. All savings should be measurable; however, it may be easier in some cases than others to measure value in dollars.

3. Calculate the E-commerce application’s risk and determine the company’s cost of capital for that specific E-commerce application.

4. Calculate the net present value.

5. Compare the present value of the expected cash flow with the required outlay. If the present value of the E-commerce application cash flow exceeds the cost, the project should be implemented. Otherwise, it should be rejected.

The above steps use the NPV to measure the return for a project; however, other finance methods can be used to rank projects. Those methods include the following:

1. Payback period (PP), defined as the expected number of years required to recover the original investment.

2. Discounted payback, similar to regular payback, except that the expected cash flows are discounted by the project’s cost of capital.

3. Internal rate of return (IRR), which is defined as the discount rate that equates the present value of a project’s expected cash inflows with the present value of the project’s costs.

A more complete definition of these terms is presented in “ROI Terminology.”

The development of a comprehensive method for calculating the ROI for an E-commerce application is shown in the following steps. Initially, a project’s ROI can be calculated as:

\[
\text{ROI} = \frac{\text{Project return}}{\text{Cost to implement the project}}
\]

However, to further define the method, a project’s return can be determined by calculating the expenses that a company will incur with the new process and subtract that from the expenses that a company incurs with the current process. Normally, when a new process is implemented, a value can be given to some other benefits. In this article, “other benefits” will be included so as to learn how they can be measured and valued. Now the ROI formula can be written as:

\[
\text{ROI} = \frac{\text{Current process cost} - \text{New process cost} + \text{Other benefits}}{\text{Cost to implement the project}}
\]

Ideally, when implementing a new process, companies will incur a one-time-only cost, the initial investment. However, this is not normally the case. New processes may involve some new costs for maintenance and operation. Therefore, it is not only necessary to determine the initial investment, but also how much it is going to cost a company to operate and maintain this new process for a specified number of years. The time factor, measured in cost per year, needs to be included in the ROI formula. In an E-commerce application, a period of three years is usually selected to calculate the ROI because IT and E-commerce technologies change very rapidly. The ROI formula can now be written as:

\[
\text{ROI} = \frac{\text{NPV} \left( \frac{\text{Current process cost} - \text{New process cost} + \text{Other benefits}}{\text{Operation and maintenance per year}} \right)_{\text{per year}}}{\text{Initial investment} + \left( \frac{\text{Operation and maintenance per year}}{\text{3 years}} \right)_{\text{per year}}}
\]

If the net present value (NPV) method is used, then the formula for ROI can be written as:

\[
\text{ROI} = \frac{\text{NPV} \left( \frac{\text{Current process cost} - \text{New process cost} + \text{Other benefits}}{\text{Operation and maintenance per year}} \right)}{\text{Initial investment} + \left( \frac{\text{Operation and maintenance per year}}{\text{3 years}} \right)}
\]

When calculating ROI, some companies have the policy that if something cannot be assigned a value in dollars, even if it is measurable, it should not be included in the ROI calculation. Other companies allow intangibles to be included in the ROI. In the ROI formula above, the intangibles (also called soft benefits) are included in “other benefits.” Exhibit 1 lists some tangible and intangible benefits used in calculating ROIs.
THE BUSINESS PROCESS ANALYSIS ASPECT OF MEASURING THE ROI FOR E-COMMERCE APPLICATIONS

The main reason a company implements an E-commerce application is because it seeks to improve a process. “It is about doing the same work, in a more effective and efficient way such that it will increase capabilities and reduce costs,” states Dr. David Gordon, a professor at the University of Dallas and an expert in operations management and process improvement. In his opinion, customers and process meet in areas such as proposals, installations, purchasing/ordering, billing, inquiries, and complaints. Gordon further states that organizations can improve some of these processes by using electronic applications. By improving the processes, Gordon means the following:

- Learning about the cause-and-effect mechanisms that impact process performance
- Improving the effectiveness of current processes
- Developing and implementing counter-measurements
- Confirming the results of the improvement

As can be seen in this ROI formula, the different costs are related to a process, and this is where “business process analysis” becomes important to help determine the different activities involved in a process.

CURRENT AND NEW PROCESS COSTS

When measuring a proposed project’s ROI, the first step is to determine and identify the project’s benefits. It should be established what the main reason for the project is; for example, to increase sales, the number of sales leads, production, and customer satisfaction, or to reduce the sales cycle, network downtime, operating costs, the cost per sales lead, and the time to configure a data or voice network. It must also be determined what the expected results are. Statements such as, “The objective of this project is to improve…. ” help identify these results.

Once the proposed project’s expected results are established, the following basic BPA procedures should be used for collecting the information regarding the current process:

1. Understand the current process:
   - Go to the actual location of the process.
   - Observe the actual process in action; walk through the process.
   - Get the facts by talking to those directly involved.
2. Map the actual process by developing a process flowchart.
3. Select the right metrics and make sure they describe the business case.
5. Rate the process.

As can be seen in this ROI formula, the different costs are related to a process, and this is where “business process analysis” becomes important to help determine the different activities involved in a process.

EXHIBIT 1 Tangible and Intangible Benefits

<table>
<thead>
<tr>
<th>Tangible Benefits (measurable and a dollar value can be assigned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales increase</td>
</tr>
<tr>
<td>Production increase</td>
</tr>
<tr>
<td>Reduction in operating cost</td>
</tr>
<tr>
<td>Reduced network downtime</td>
</tr>
<tr>
<td>Increased mean time before failure</td>
</tr>
<tr>
<td>Reduced time to configure a data network</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intangible Benefits (measurable but difficult to assign a dollar value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer satisfaction</td>
</tr>
<tr>
<td>Customer retention</td>
</tr>
<tr>
<td>Managerial know-how</td>
</tr>
<tr>
<td>Employee retention</td>
</tr>
<tr>
<td>Stronger channel ties</td>
</tr>
<tr>
<td>Increased customer base</td>
</tr>
<tr>
<td>Improved employee morale</td>
</tr>
</tbody>
</table>

As can be seen in this ROI formula, the different costs are related to a process, and this is where “business process analysis” becomes important to help determine the different activities involved in a process.

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Mapping the Process
After developing an understanding of the current process, the following steps should be used to map the current process and the new process:

1. Prepare a task/activity matrix with all the events that now take place in the current process. Highlight the activities that are going to be eliminated and the activities that are going to be improved with the new process. The matrix should include the tasks and the activities in each process (see Exhibit 3).

**EXHIBIT 2** Initial and Recurring Costs

<table>
<thead>
<tr>
<th>Consulting</th>
<th>Create an overall strategy and a roadmap for project implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assign a project manager</td>
</tr>
<tr>
<td>Project Management</td>
<td>Hold customer meetings to determine the concept, project plan, requirements, training needs, and to evaluate progress</td>
</tr>
<tr>
<td></td>
<td>Create an entire IT department for the E-commerce application. People to hire may include:</td>
</tr>
<tr>
<td></td>
<td>Department director</td>
</tr>
<tr>
<td></td>
<td>A Webmaster in charge of developing and maintaining the site</td>
</tr>
<tr>
<td></td>
<td>A database engineer</td>
</tr>
<tr>
<td></td>
<td>Site programmers</td>
</tr>
<tr>
<td>IT Staff</td>
<td>Customer representatives</td>
</tr>
<tr>
<td></td>
<td>Purchase as needed:</td>
</tr>
<tr>
<td></td>
<td>E-commerce application platforms</td>
</tr>
<tr>
<td></td>
<td>Additional hardware</td>
</tr>
<tr>
<td></td>
<td>Security software, firewalls, and VPNs</td>
</tr>
<tr>
<td>IT Purchases</td>
<td>Build and verify configurations</td>
</tr>
<tr>
<td></td>
<td>Develop and maintain new software</td>
</tr>
<tr>
<td>Implementation and Integration</td>
<td>Make Web site enhancements</td>
</tr>
<tr>
<td></td>
<td>Do test configuration</td>
</tr>
<tr>
<td>Training and Documentation</td>
<td>Provide internal and external training</td>
</tr>
<tr>
<td></td>
<td>Provide workforce transformation and change management training</td>
</tr>
<tr>
<td></td>
<td>Lease more office space</td>
</tr>
<tr>
<td>Facilities</td>
<td>Modify existing physical facilities</td>
</tr>
<tr>
<td>Advertising</td>
<td>Do internal and external promotion</td>
</tr>
</tbody>
</table>

The same should be done for the new E-commerce application process; variations in performance, schedule, and cost should be noted.

**EXHIBIT 3** Activity Matrix for Configuring Data Products at ABC, Inc.

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Activity</th>
<th>Activity</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain</td>
<td>Train customers’ sales engineers</td>
<td>Update engineering configuration rules</td>
<td></td>
</tr>
<tr>
<td>Maintain</td>
<td>Send pricing catalogs to customer</td>
<td>Load pricing catalogs</td>
<td></td>
</tr>
<tr>
<td>Product configuration</td>
<td>Prepare configuration draft</td>
<td>Send configuration for review</td>
<td></td>
</tr>
<tr>
<td>Product configuration</td>
<td>Verify configuration</td>
<td>Resolve differences</td>
<td></td>
</tr>
<tr>
<td>Product configuration</td>
<td>Key-in configuration</td>
<td>Price configuration</td>
<td></td>
</tr>
<tr>
<td>Purchasing/shipping</td>
<td>Place order</td>
<td>Match or approve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check received items</td>
<td>Check for missing parts</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: The activities in **bold** can be eliminated. The ones in *italics* can be improved.*
2. Prepare two flow diagrams showing all the events that take place in the current and in the proposed new process, indicating who the contributors are (i.e., the departments in which the events take place) for each process. Exhibits 4 and 5 show the customer and company events that take place. By putting the events for the current and the new processes in the same time format, it is easy to visualize the efficiency of the new process.

3. Determine, in hours, how long it takes for the vendor and for the customer to carry out a transaction at a specific point in the flowchart. Then multiply that number of hours by the labor rate for the vendor and for the customer. The result in dollars is the labor cost of each transaction at a specific event. Exhibit 6 shows an example of the labor cost for the actual and for the new proposed process. When the labor costs per transaction are added in, the total cost per transaction of the current and the new process is given.

**Initial and Recurring Costs**

"Underestimating implementation costs is not as big a problem as underestimating maintenance and operation costs," states Barbara Gomolski. She points out that, typically, ongoing costs of new systems are 40 to 60 percent of the first year’s expenses. If the first year’s expenses of hardware, software, and staffing are $1 million, then it will cost a company approximately $500,000 per year to maintain and integrate that system.

Many consultants and IT managers share Gomolski’s opinion about the cost of maintaining and integrating an E-commerce solution. Therefore, when trying to determine the cost of a new process, not only the initial investment should be considered, but also the recurring cost that will continue after the project has been implemented. A good example of this point is that of DoveBid, which, in November 1999, rolled out an online auction service for surplus capital assets. The IDC prepared a bulletin describing DoveBid’s ROI for adding E-commerce to an existing bricks-and-mortar company. In that bulletin, the IDC showed that most of the costs were not related to acquiring information technology, but to other expenses. For its B2B auction site, DoveBid spent 1 percent on IT equipment and software purchases, 10 percent on consulting fees, 34 percent on staffing, and 55 percent on advertising.
Initial and recurring costs fall into seven broad categories: consulting, personnel, software, hardware, implementation & integration, training, and facilities (office space expense). Exhibit 2 shows some of the costs that need to be taken into account when calculating implementation, operation and maintenance costs.

Calculating the Intangibles: Other Benefits
Measuring the ROI for an E-commerce application is no different than measuring it for any other project in the sense that all projects have tangible and intangible benefits. The initial investment and the operational and maintenance
expenses for implementing an E-commerce project are tangibles, also referred to as “hard dollars,” which can be translated directly into a value such as money or time.

The intangibles, also called “soft dollars,” are benefits that sometimes cannot be tied directly to cash. This is mainly due to a lack of information that can be used to establish a level of value. For example, it is difficult to give a value to the intangibles on the following list:12,13

- Increased customer satisfaction
- Increased customer retention
- Greater customer reach
- Increased customer base
- Reduced customer contact/support requirements
- Reduced fulfillment and customer response errors
- Increased employee retention
- Improved employee morale
- Improved customer or employee knowledge and learning
- New business processes
- Decreased time-to-market
- Reduced ordering process complexity
- Better or improved managerial know-how
- Stronger channel ties
- Better delivery date information
- More productive time on Web site
- Increased brand awareness
- Better business alignment
- More product information availability
- Improved communications
- Organizational flexibility
- Streamlining of knowledge
- Ability to work from a remote location
- Reduced days sales outstanding (average collection period)
- Increased efficiency
- Improved information access, search, and retrieval time

In any ROI calculation, it will take significant time and effort to determine the value for these intangibles. Product managers, sales teams, and personnel in IT and the E-commerce departments might be of assistance in placing values on intangibles (the finance department generally seems to generate hard dollar values for tangibles). Once the values have been established and agreed upon, it makes sense to use them in all ROI calculations, not only to save time, but also to make all ROI calculations comparable.

**THE DECISION TO IMPLEMENT AN E-COMMERCE APPLICATION**

After calculating a project’s ROI, how can it be determined whether or not the project should be implemented? If a project has an ROI of 15 percent, for example, is that enough return for a company to implement the project?

After calculating the ROI for an E-commerce application, it is necessary to compare it to a point of reference; in this case, it should be compared to the company’s cost of capital. The cost of capital of a company is a complex interaction of several factors such as interest rate depreciation, taxes, and capital gains. Different projects have different risk levels, so companies have different costs of capital for different types of projects. A company’s financial officer can determine the company’s cost of capital for E-commerce applications. This cost of capital may be different for other company investments because of the different risks involved in E-commerce projects versus other expenditures.

In a simple ROI calculation, not using present value (PV), the ROI of a project should be higher than the cost of capital to be considered for approval. In an ROI calculation using the present value, the cost of capital is the rate used to discount the cash inflows and outflows.

**CONCLUSION**

Companies should include E-commerce initiatives in their visions and strategies. Further, they should consider E-commerce applications that are in accord with those visions and strategies and that have appropriate ROIs.

When calculating the ROI for an E-commerce project, it is necessary to take into account the following:

- ROIs are not perfect calculations and are not comparable between different companies, between similar E-commerce projects from two different companies, or from strategic business units within the same company.
- ROIs should not only be used as an approval tool, but also to continue measuring the project’s benefits during the project’s life. Once approved, the same data used to evaluate the ROI can be used to determine whether or not final project costs are on target. A higher or lower actual project cost will result in a different ROI than projected.
- If two companies are implementing the same E-commerce application, having a higher ROI for one only means that a greater improvement was achieved in that company and not necessarily that the implementation was better.
Measuring ROI is a way to present the value of an E-commerce application in a language understood by corporate finance and management.

It is generally assumed that measuring the ROI for an E-commerce application is associated more with finance than with the business process analysis; but in reality, it is the other way around. Finance rules are standard and the same formulas can be used to calculate the ROI for any project; for example, this article includes a template with all the standard finance formulas. On the other hand, the activities are different from project to project, and to uncover and quantify those activities requires much more effort. Calculating the intangible benefits is another area that will require a lot of time because standardized information is not available. In addition, how one company calculates intangibles might substantially differ from how other companies might do it. This article includes some E-commerce intangibles collected during the research phase that might be used as a starting point.

ROI STEP-BY-STEP: CASE STUDY
In this section, a case study — the ROI of an Online Tool for Configuring and Pricing a Data Product — will be used to show, step-by-step, how to conduct an ROI calculation. The numbers used in this case study are hypothetical.

Situation Snapshot
In data communications, a high level of expertise is required to configure a data product. Engineering rules to configure a product are established by the engineers who developed the product or by other engineers who learned to operate the product. Knowledge and access to information is therefore in the hands of a relative few, and it would not be cost effective to train the number of engineers needed to be available to answer sales support technical questions.

Situation Verification
ABC, Inc., a global telecommunications company that sells data products to its distributors, has received complaints from the distributors that it takes too much time to configure and price a data product. Distributors have mentioned that it takes four days to configure the ABC product, while it only takes four hours to configure data products from DEF, Inc., a competitor of ABC.

Severity Assessment
Distributors’ dissatisfaction with the time it takes to configure data products is causing ABC to lose revenue.

Improvement Target
The Internet allows companies to post information on their Web sites that users can access to carry out electronic commerce activities, such as finding prices and ordering products. ABC, Inc., would like to develop or purchase an online tool to allow its distributors to configure data products for complex networks and to determine the price of those configurations. An online E-commerce application to configure and price data products would have a beneficial impact on the overall cost associated with doing business, but ABC, Inc., would like to calculate the ROI for such an E-commerce application before deciding whether to make the financial investment involved in developing or purchasing the application.

The following are the steps to calculate the ROI for this business case:

Step 1: ROI Depth and Level of Complexity.
If several persons are asked to individually prepare an ROI for a specific project, chances are that each ROI would be calculated in a different way. Everyone’s approach to the ROI is different; and although the ROIs are prepared using different approaches, the results may be the same. However, it is recommended before starting work on an ROI that several interviews should be conducted to gather information about how ABC, Inc., measures ROIs, so that the ROI is prepared according to the company’s or manager’s guidelines. ABC’s E-commerce group can help determine the issues involved in measuring the ROI of E-commerce applications. Questions such as the following could be put to five executives from E-commerce:

I Is it worth it to measure the ROI of an E-commerce project?
I Do you feel that ABC, Inc., should measure the ROI for all E-commerce projects?
I Does ABC, Inc., have some guidelines for calculating the ROI for E-commerce projects?
I What is your opinion of using intangibles in the ROI calculation?
I Do you track the ROI of an E-commerce project to determine whether the results meet the expectations?
I Do you track the actual implementation costs against the ROI analysis to determine how actual costs compare to forecasted costs?
The answers to these questions provide input as to the type and depth of the ROI measurement. The Center of Public Technology of the University of North Carolina recommends using a three-tiered set of business case methodologies that are scaled to the size and complexity of an IT or E-commerce initiative. The following are the three possible methodologies.14

1. **Tier 1 (least complex/cost):** total cost of ownership
2. **Tier 2 (middle/cost):** total cost of ownership, payback period, benefit-cost ratio, internal rate of return, and return on investment
3. **Tier 3 (most complex/cost):** applied information economics

ABC’s executives agree that the three-tiered model is the best, and they will use complex ROI measurements only if the benefits of the E-commerce application are not obvious or if the investment is very high.

**Step 2: Identifying the Processes.** The second step in preparing the ROI analysis for ABC, Inc., is to determine the activities that take place for the current process, as well as the activities that would be involved with the new process.

Again, interviews could be used to gather information; five people who are very familiar with the current process could be asked the following questions:

- Is the company satisfied with the way the current process is carried out, or has someone requested changing the process?
- Can the process be improved? How? What advantages would these changes bring to the company’s process?
- How do employees or customers carry out the current process?
- How much time do employees spend on the current process, broken down by activity?
- How does this time compare to the time another company spends executing a similar process?
- What would be the impact of changing the current process to the new process?
- How would changes made to the current process affect other departments or customers?

**Step 3: Current and New Process Costs.** With the information collected during the interviews, a task–activity matrix should be prepared; it should list all the activities, grouped by tasks, as shown in Exhibit 3. This matrix shows the activities that take place at ABC, Inc., when configuring a data product. The activities are grouped by their four main tasks: Maintain, Product Configuration, Purchasing and Shipping, and Installation. The next step is to determine which activities are going to be eliminated and which ones are going to be improved with the new process. Based on this information, a flow diagram for both processes — the current process and the new improved process — should be drawn as shown in Exhibits 4 and 5.

The flow matrix diagram for the current and new processes shown in Exhibits 4 and 5...
includes the activities, contributors, time spent on each activity, labor rate for each activity, and total cost of the process on one worksheet.

Combining all this information on one worksheet helps not only to visualize the process, but also to enter the information and calculate the cost for each process.\(^ {15,16} \)

This flow matrix diagram model is used in the ROI Calculator Tool that is part of this document.

**Step 4: Calculate the Initial and Recurring Costs.** The cost for the initial investment (see Exhibit 6) and the recurring costs (see Exhibit 7) are entered on the worksheets. In the ROI Calculator Tool, the highlighted part of the ROI formula at the top of the worksheet shows which part of the ROI formula the information is for.

For each of the worksheets, the ROI Excel tool provides additional formulas to calculate the cells not highlighted in yellow.

**Step 5: Preliminary ROI Results.** Before trying to calculate the intangible benefits, it must be determined whether the ROI results satisfy the company’s requirements. The ROI tool provides two calculations: the Simple ROI and the Net Present Value (NPV) ROI.\(^ {5,11} \) It is necessary to enter the company’s Federal and State Taxes Bracket, the Company Discount Rate, and the Straight-line Depreciation (Yrs) on the worksheet to calculate the NPV.

Exhibits 8 and 9 show the ROI results without taking into account the intangible benefits.

The Simple and NPV ROI calculations for this example (Exhibits 8 and 9, respectively, show that this project has a very high return, and that it is not necessary to measure and calculate the intangible benefits (which would be shown above as “Other benefits”).

**Step 6: Calculating the Intangible Benefits.** Intangibles, by definition, are assets that are not physical in nature, for example, goodwill, patents, trademarks, customer satisfaction, and copyrights. For those intangibles that can be measured, a dollar value can be assigned or calculated.

The ROI Calculator Tool calculates several intangibles, such as customer satisfaction, customer and employee retention, decreased time-to-market, reduced sales outstanding, and Web improvement. These measurements are discussed in this section.
ROI IN E-BUSINESS

Customer Satisfaction
Customer satisfaction reduces cost or increases profits in the following areas:

- Increase in customer retention
- Increase in sales
- Increase in customers' lifetime value (LTV)
- Increase in market share
- Decrease in customer support service
- Reduction in the purchasing decision lead-time, prospect, sale
- Creation of new customer value propositions and profit models

Enhancement and strengthening of customer relationships
Leveraging of talent to drive higher productivity improvements

Increasing Customer Retention
Companies are always losing customers and, normally, it costs more to get a new customer than to keep one. That is why there is so much emphasis on retaining customers. The value of a customer to a company is the profit that he brings to the company. Suppose, for example,
that ABC, Inc., is losing 10 percent of its customers a year and would like to implement a customer relationship management (CRM) application with the idea of losing only 4 percent of its customers. Furthermore, ABC, Inc., is more interested in retaining its more valuable customers than those that bring less profitability.

Exhibit 10 shows a customer retention calculation.\textsuperscript{17,18}

The following methodology shows how to calculate the different values. First, the customers should be grouped into profitability segments; then it should be determined, of the 10 percent that ABC is losing, what percentage

---

### Exhibit 10

#### Customer Retention Calculation

- **Current process cost**
- **New process cost**
- **Other benefits (intangibles)**

#### Calculation Methodology

1. Group customers into profitability segments.
2. Determine what percentage of the 10 percent ABC is losing.
3. Retain more valuable customers.

---

### Exhibit 9 NPV ROI without Intangible Benefits

<table>
<thead>
<tr>
<th>Business assumptions</th>
<th>Customer (5,000 Transactions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in number of transactions per year</td>
<td>Project’s net present value $3,398,029</td>
</tr>
<tr>
<td>Number of transactions per year</td>
<td>Three-year ROI 842.7%</td>
</tr>
<tr>
<td>Three-year ROI</td>
<td>743.0%</td>
</tr>
<tr>
<td>Internal rate of return</td>
<td>346.6%</td>
</tr>
<tr>
<td>Payback in years</td>
<td>0.34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual benefits</th>
<th>Start-Up</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current process cost</td>
<td>$3,850,000</td>
<td>$4,235,000</td>
<td>$4,658,500</td>
<td></td>
</tr>
<tr>
<td>New process cost</td>
<td>$(545,800)</td>
<td>$(600,380)</td>
<td>$(660,418)</td>
<td></td>
</tr>
<tr>
<td>Other benefits (intangibles)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Total savings per year</td>
<td>$3,304,200</td>
<td>$3,634,620</td>
<td>$3,998,082</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expensed costs</th>
<th>Initial</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investment</td>
<td>$366,504</td>
<td>$299,625</td>
<td>$299,625</td>
<td>$299,625</td>
</tr>
<tr>
<td>Operation and maintenance costs</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total per period</td>
<td>$366,504</td>
<td>$299,625</td>
<td>$299,625</td>
<td>$299,625</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capital cost and depreciation Schedule</th>
<th>Initial</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investment/depreciation</td>
<td>300,000</td>
<td>60,000</td>
<td>60,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Total depreciation per period</td>
<td>300,000</td>
<td>60,000</td>
<td>60,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Salvage value at end of project</td>
<td>120,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Basic financial assumptions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal and state taxes</td>
<td>40.0%</td>
</tr>
<tr>
<td>Discount rate (cost of capital)</td>
<td>17.0%</td>
</tr>
<tr>
<td>Straight-line depreciation (yrs)</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Net cash flow</th>
<th>Investment</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total benefits</td>
<td>N/A</td>
<td>$3,304,200</td>
<td>$3,634,620</td>
<td>$3,998,082</td>
</tr>
<tr>
<td>Less expended cost</td>
<td>$(366,504)</td>
<td>$(299,625)</td>
<td>$(299,625)</td>
<td>$(299,625)</td>
</tr>
<tr>
<td>Savings cash flow before taxes</td>
<td>$(366,504)</td>
<td>$3,004,575</td>
<td>$3,334,995</td>
<td>$3,698,457</td>
</tr>
<tr>
<td>Depreciation adjustment</td>
<td>—</td>
<td>$(60,000)</td>
<td>$(60,000)</td>
<td>$(60,000)</td>
</tr>
<tr>
<td>Operating income before taxes (EBIT)</td>
<td>$(366,504)</td>
<td>$2,944,575</td>
<td>$3,274,995</td>
<td>$3,638,457</td>
</tr>
<tr>
<td>Taxes on operating income (40%)</td>
<td>$146,602</td>
<td>$(1,177,830)</td>
<td>$(1,309,998)</td>
<td>$(1,455,383)</td>
</tr>
<tr>
<td>Net savings after taxes</td>
<td>$(219,903)</td>
<td>$1,766,745</td>
<td>$1,964,997</td>
<td>$2,183,074</td>
</tr>
<tr>
<td>Adjustment for capital investment</td>
<td>$(300,000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjust for salvage value</td>
<td>—</td>
<td>$120,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net savings flow after tax</td>
<td>$(519,903)</td>
<td>$1,766,745</td>
<td>$1,964,997</td>
<td>$2,303,074</td>
</tr>
<tr>
<td>Net savings present value after tax</td>
<td>$(519,903)</td>
<td>$1,510,038</td>
<td>$1,435,457</td>
<td>$1,437,972</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financial analysis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Project’s net present value</td>
<td>$3,863,565</td>
</tr>
<tr>
<td>Three-year ROI</td>
<td>743%</td>
</tr>
<tr>
<td>Internal rate of return (IRR)</td>
<td>346.6%</td>
</tr>
<tr>
<td>Payback in years</td>
<td>0.34</td>
</tr>
</tbody>
</table>
is in each profitability segment. This calculation is not necessary, but it helps to visualize which segment of the customers ABC, Inc., is losing. This is given by:

\[
\text{Customers lost} = \text{No. of cust.} \times \text{Total percent of lost cust.} \times \text{percent per segment}
\]

\[
\text{Customers lost} = 100,000 \times 10\% \times 18\% = 1800
\]

Second, the number of retained customers in each of the profitability segments that ABC, Inc. would like to have should be determined. This is given by

\[
\text{Retained customers} = \text{No. of cust.} \times \text{percent goal for retained cust.} \times \text{percent per segment}
\]

\[
\text{Retained customers} = 100,000 \times 6\% \times 25\% = 1500
\]

Third, the profits that ABC, Inc., will gain by retaining some of the customers that it is currently losing should be calculated. This is given by:

\[
\text{Gained profits} = \text{No. of retained cust.} \times \text{profit per segment}
\]

\[
\text{Gained profits} = 1500 \times 600 = 900,000
\]

This procedure shows that if ABC, Inc., implements a CRM application that results in retaining some of the customers that they are now losing, ABC, Inc., will have a profit of $3,015,000. The same approach can be used for a company that is gaining more customers than it is losing. The percentage of gained customers can be used instead of the percentage of retained customers.

**Customer Lifetime Value (LTV)**

Customer lifetime value (Exhibit 11) is a measure of the net present value of a customer’s profitability for the period, in years, that a customer will remain loyal and keep buying a company’s product. It includes the initial cost of getting a new customer.

**Increasing Employee Retention**

To determine the savings to a company for increasing employee retention, the number of retained employees should be multiplied by how much it costs a company to hire and train a new employee (Exhibit 12).

**Decreasing Time-to-Market**

Engineers exchanging information online can reduce considerably the time spent in product development. The main effect of introducing a product earlier to the market is that it brings future sales to the present. The profit to the company is the net present value of those sales (Exhibit 13).
An early product introduction may also allow a company to increase its market share or to charge more for the product.

**Web Updates**
The number of Web pages that a company posts on the Internet or on its intranet increases continuously. Updating Web pages is costly, and the solution is to update the Web pages using a software application that updates the pages dynamically (Exhibit 14).

**Reduced Days Sales Outstanding (Average Collection Period) and Float**
Companies using ABC’s online tool for configuring and pricing data products will be able to place the order and pay online with a wire transfer using electronic data interchange (EDI) in their ordering management process. Wire transfers expedite receivables collection by several days (Exhibit 15).

The benefit to ABC, Inc., for collecting accounts receivables earlier is what a company can earn on those early cash flows; that is, the

---

**EXHIBIT 11** Customer Lifetime Value (LTV)

<table>
<thead>
<tr>
<th>Cost of getting a new customer</th>
<th>$245</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of years customer keeps buying from the company</td>
<td>3</td>
</tr>
<tr>
<td>Customer profitability per year</td>
<td>$1000</td>
</tr>
<tr>
<td>Discount rate (cost of capital)</td>
<td>17%</td>
</tr>
<tr>
<td>Net present value of customer lifetime value (LTV)</td>
<td>$1965</td>
</tr>
</tbody>
</table>

**EXHIBIT 12** Increasing Employee Retention

<table>
<thead>
<tr>
<th>Retained Employees</th>
<th>Cost to Hire and Train New Employees</th>
<th>Total Savings per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>799</td>
<td>$546</td>
<td>$436,254</td>
</tr>
</tbody>
</table>

**EXHIBIT 13** Decreasing Time-to-Market

<table>
<thead>
<tr>
<th>Reduction in Time to Market</th>
<th>Forecasted Prod. Sales per Year</th>
<th>Cost of Money</th>
<th>Total Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>181</td>
<td>$2,568,747</td>
<td>5.25%</td>
<td>$66,875</td>
</tr>
</tbody>
</table>

Decreasing time-to-market may allow a company to increase market share, thus increasing sales.

<table>
<thead>
<tr>
<th>Qty of Units Sold per Year</th>
<th>Increase in Market Share</th>
<th>Profit per Unit</th>
<th>Total Revenue Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,685</td>
<td>6.00%</td>
<td>$354</td>
<td>$120,749</td>
</tr>
</tbody>
</table>

Decreasing time-to-market may allow a company to charge more for a product, thus increasing profits.

<table>
<thead>
<tr>
<th>Qty of Units Sold per Year</th>
<th>Units Sold in 181 days</th>
<th>Increase in Price/Profits</th>
<th>Total Revenue Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,685</td>
<td>2820</td>
<td>$75</td>
<td>$211,500</td>
</tr>
</tbody>
</table>

Total decreasing time-to-market savings | $399,125
investment produced when the savings are reinvested or by having to borrow less money to maintain the required cash balance to operate.

**Increasing Online Sales**
When customers purchase products online, they do not require any assistance, thus reducing the cost of sales. The resulting cost savings can be calculated by determining how long it takes a salesperson to do a sale and multiplying that by his or her salary (Exhibit 16).

**Providing Online Support**
When customers find the information they need at a company’s Web site, it saves the company the cost of technical support. One way to calculate the savings of online support is to determine offline and online support costs per

---

**EXHIBIT 14** Web Updates

<table>
<thead>
<tr>
<th>Average Time to Update a Web Page</th>
<th>Number of Web Pages Updated Daily</th>
<th>Web Designer Salary</th>
<th>Company Benefits Overhead</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLD PROCESS</td>
<td>0.25</td>
<td>560</td>
<td>$75,000</td>
<td>1.75</td>
</tr>
<tr>
<td>NEW PROCESS</td>
<td>0.05</td>
<td>560</td>
<td>$75,000</td>
<td>1.75</td>
</tr>
</tbody>
</table>

Total savings per day $7,350

Assuming 2000 working hours per year.

---

**EXHIBIT 15** Reducing Collection Period

**REDUCING DAYS SALES OUTSTANDING (AVERAGE COLLECTION PERIOD) AND FLOAT**
Electronic payment reduces the average collection period and float (time the check is in the mail)
Last year number of days sales outstanding (DSO) 45
Forecasted days sales outstanding with new process implemented 22
Float (time the check is in the mail, time to process the check, and time to clear) 6
Forecasted reduction in days sales outstanding 29

<table>
<thead>
<tr>
<th>Reduction in Accounts Receivables DSO</th>
<th>Average Accounts Receivables</th>
<th>Cost of Money</th>
<th>Total Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>$24,256,385</td>
<td>5.25%</td>
<td>$101,179</td>
</tr>
</tbody>
</table>

---

**EXHIBIT 16** Calculating Cost Savings of Online Sales

Cost savings of online sales (consumers doing much of the sales work themselves)
Time a salesperson expends per sale: 10 minutes

<table>
<thead>
<tr>
<th>Average Salary Salesperson</th>
<th>Benefits Overhead</th>
<th>Cost per Sale</th>
<th>No. of Online Transactions per Month</th>
<th>Total Savings per Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>$40,000</td>
<td>1.75</td>
<td>$5.83</td>
<td>15,000</td>
<td>$87,500</td>
</tr>
</tbody>
</table>

Assuming 2000 working hours per year.
unit, and then multiply the difference by the percentage of customers looking for support online (Exhibit 17).

Finding Information on the Web Site
The calculation of this savings is similar to the savings calculation of “Providing online support.” Determine the number of visitors who will not call the company and then multiply that number by the cost of each phone call (Exhibit 18).

ROI TERMINOLOGY
A definition of some terms associated with ROI terminology and the pros and cons of using alternative measurements will assist in understanding the measured benefits of a project. The ROI term definitions were compiled from different sources.5,14,19,20

Return on Investment
The return on investment (ROI) is the total quantitative net savings or return, in hours, dollars, or other measurable units, generated by an initial investment, divided by the total cost of the initial investment. It is the most popular metric. The following are some of the pros and cons:

<table>
<thead>
<tr>
<th>ExHIBIT 17 Calculating the Cost Savings of Online Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of product support offline per unit: $4.50</td>
</tr>
<tr>
<td>Cost of product support online: $1.50</td>
</tr>
<tr>
<td>Total savings per product sold: $3.00</td>
</tr>
<tr>
<td>Number of products sold per month: 25,000</td>
</tr>
<tr>
<td>Percentage of customers looking for support online: 40%</td>
</tr>
<tr>
<td>Total savings per month: $30,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ExHIBIT 18 Finding Information on the Web Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of visitor sessions per month: 100,000</td>
</tr>
<tr>
<td>Percentage online successful sessions: 50%</td>
</tr>
<tr>
<td>Total successful sessions: 50,000</td>
</tr>
<tr>
<td>Cost of answering a customer’s call: $4.50</td>
</tr>
<tr>
<td>Total savings per month: $225,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Visitors looking for information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of visitors who find the information</td>
</tr>
<tr>
<td>Percentage of visitors who will not call for information</td>
</tr>
</tbody>
</table>

| Use widely as a key metric to sell IT and E-commerce application investment decisions. |
| Indicates the percentage return over a specific period of time without taking into account the magnitude of the project. Would it be better to have 80 percent ROI in a $20,000 project or 40 percent ROI in a $200,000 project? |
| Net Present Value |
| The net present value (NPV) is the calculation of the project’s cash inflows and outflows discounted to the present time using a preselected project discount rate or cost of capital. The difference between the discounted inflows and outflows is the net present value. A positive NPV means that the project will earn a return greater than an investment would make using the discount rate. A negative NPV means that the company would be better served by investing in another project because the project’s return is less than the discount rate. The following are some of the pros and cons: |
| Helps determine if the project, the improving effort, or the E-commerce investment should be made |
| Gives a direct measure of the project’s dollar benefits but does not explicitly produce a project’s rate of return |
| Recognizes the time value of money; a negative NPV implies that the initiative should be avoided if it is directed at cost reduction; a positive NPV implies that the assessment should include further risk analysis |
The IRR is very useful for comparing dissimilar initiatives because it is a rate or ratio.

Internal Rate of Return
The internal rate of return (IRR) is the investment yield rate produced by a project when the net present value (NPV) calculation is used; it is the rate at which the present value of the inflow is equal to the outflow. The IRR is compared to the project discount rate (PDR). If the IRR is higher than the PDR, the project is selected; if it is lower, the project is rejected. The pros and cons of using the IRR for implementing decisions include the following:

- Is the project’s expected rate of return
- Does not give any indication of the magnitude of the project involved
- Determines the interest rate and then compares this rate to a minimum required rate of return, project discount rate, or cost of capital
- Is useful in the ranking of IT investment initiatives because they can easily be compared
- Is very useful for comparing dissimilar initiatives because it is a rate or ratio
- Is best used in conjunction with net present value (NPV)

Payback Period
The payback period (PP) calculation determines the amount of time, either estimated or measured, required for a project, improvement effort, or E-commerce application savings to recoup the initial investment, to show a profit, or to break even. Typically, projects with a short PP are preferred because they are assumed to indicate a lesser degree of risk. The following are some of the pros and cons:

- Does not provide information about the magnitude of the savings or how the investment performs beyond the payback period
- Ignores the timing of cash flows
- Emphasizes liquidity and allows managers greater flexibility in planning for the availability of funds (shorter payback projects)
- Should not be used as the sole indicator for a project, improvement effort, or E-commerce application investment

The discounted payback is similar to regular payback, except that the expected cash flows are discounted by the project’s cost of capital.

Applied Information Economics (AIE)
Applied information economics (AIE), developed by Douglas Hubbard, a principal of Hubbard Ross, applies proprietary scientific and mathematical methods to compute the return on the IT investment — including all intangibles. The following are some of the pros and cons:

- Synthesizes a variety of techniques from scientific and mathematical fields (decision theory, financial theory, and statistics)
- Determines the value of information, methods for modeling uncertainty in estimates, and treating the IT investment as a type of investment portfolio

Investment
Investment is the estimated or measured total cost in hours, dollars, or other units that an improvement effort requires to be planned, executed, and completed.

Cost of Capital
The cost of capital is the interest rate that a company has to pay to providers of capital when borrowing capital to implement a particular business or project; also called the project discount rate (PDR).

COMPANIES OFFERING ROI MEASURING SERVICES
Sometimes, organizations are considering E-commerce applications that would require a large financial investment to implement, and they would prefer the help of an external company to prepare the ROI. In doing the research for this article, the authors came across the names of some companies that offer those services. (The authors neither had any contact with those companies nor do they recommend any of them.)

Following is a list of companies that provide those services:

References