ROI Calculations for Electronic Performance Support Systems

by Hasan Altalib

Because of worsening economic conditions and an increase in competition, there is a growing mandate for organizations to become more efficient and streamlined. Many have started implementing new and innovative technologies that will help align policies and practices more closely with business goals. Organizations worldwide have realized that their survival during these turbulent times is directly tied to their ability to improve operational performance and become as efficient as possible.

Executives and managers have realized that in many cases an organization must spend money to save money. Justifying new technology expenditures, no matter how essential for survival, has become difficult. Qualifying and choosing the best possible solution for a positive impact on profitability and overall business performance has become a must. However, identifying those specific technologies or projects that will result in a streamlined business, increased competitive advantage, reduced costs, or an improvement in production and workforce efficiency is no easy task.

With a growing concern for the bottom line, electronic performance support systems (EPSS) are replacing both conventional information technology system development and traditional training. Proving that the value EPSS adds to the bottom line is becoming increasingly important as both government and the private sector need to justify expenditures and more closely align all technology-based initiatives with the bottom line.

Calculating return on investment (ROI) has therefore become an important practice in business, industry, and, more recently, government. A recent survey found that the percentage of organizations having developed EPSS ranges from 5% overall to 15% of organizations with 10,000 or more employees (Lakewood Publications, 1996). With this figure growing, there is certainly an increased need for and use of ROI methodology for measuring the value added by EPSS.

ROI methodology determines the expected value to the bottom line of EPSS expenditures and implementation. ROI information can be used to guide an organization's decisionmaking by distinguishing between those interventions or implementations that will enhance and those that may detract from overall profitability or goals.

The challenge for determining an ROI methodology still remains, because calculating ROI for such systems is neither an easy nor a straightforward task. Nevertheless, when an ROI methodology has been identified and built, it becomes an effective tool that can be used to ensure that only projects or interventions that have a positive impact on the organization's bottom line and goals are employed.

Despite the number of ad hoc success stories, EPSSs remain a relatively new concept, and not much is known about their critical success factors. While the challenges faced when attempting to conduct an ROI for any form of EPSS are significant, the benefits to the organization and the credibility of their creators are substantial.

What Is an EPSS?

For the purposes of this discussion, EPSSs are systems that reduce complexity and optimize tasks and processes, address the human factors, such as memory burden, provide information that is *just enough*, *just in time*, and generally support accomplishing the task as primary consequence, with learning a secondary consequence. Gery (1995) delineates 19 attributes and behaviors of such systems:

1. Establish and maintain a work context.
2. Help establish goals.
3. Structure work process and progression through tasks and logic.
4. Institutionalize business strategy and best approach.
5. Embed knowledge in the interface, support resources, and system logic.
6. Use metaphors, language, and direct manipulation to capitalize on prior learning and physical reality.
7. Reflect natural work situations.
8. Provide alternatives of the application interface and resources.
9. Observe and advise.
10. Show evidence of work progression.
11. Provide contextual feedback.
12. Provide support resources without breaking the task content.
13. Provide layers to accommodate performer diversity.
14. Provide access to underlying logic.
15. Automate tasks.
16. Provide alternative knowledge search and navigation mechanisms.
17. Allow customization.
18. Provide obvious options, next steps, and resources.
19. Employ consistent use of visual conventions, language, visual positioning, navigation, and other system behavior.

Integrating EPSS Into a Business Application

The cost and complexity of an EPSS depends on the type of development and degree of integration into the business application. The type of EPSS development will affect project planning and implementation, which in turn must be factored into the ROI calculation. There are several main types of EPSS development efforts (Benko & Webster, 1997):

Stand Alone, or External. This type of EPSS is not integrated into the target business application. It may be accessed from its own icon on the desktop or from some type of desktop menu. This type of EPSS affects the target application development team least.

Integrated Noncontextual, or Extrinsic. This type of EPSS is integrated into the target business application but is not contextual. It is accessed from the Help menu or from the Help button on an individual's screens. This type of EPSS requires some degree of effort from the development team to effectively integrate the EPSS into the business application.

Integrated Contextual, or Intrinsic. This type of EPSS is integrated into the target business application. Contextual support is available to users based on their location in the application and the task being performed. These types of EPSSs are complex and require significant effort from both application developers and EPSS development teams, to ensure seamless integration.

Existing Standalone EPSSs. This method is when the system itself is an EPSS, not an add-on to an existing system. This system is performance centered from the start.

Goals and Benefits of an EPSS

Once the type of EPSS development has been implemented, the goal of the system will be to allow any individual to enter the workplace without any prior knowledge or training, and to gradually bring this individual to higher performance levels than those achieved by traditional initial training sessions. Not only would such a system offer savings in training costs, but it would also provide productivity gains because of the user's enhanced performance. When the conditions are favorable and when the EPSS is designed and implemented correctly, an EPSS can provide huge benefits to the organization in a variety of areas (Desmarais, Leclair, Fiset, & Talbi, 1997).

Enhanced Productivity. Often the most significant returns will come from enhanced worker productivity stemming from just-in-time support, allowing the user easy access to useful information.

Reduced Training Costs. The availability of an EPSS on the job can reduce the initial training phase to the minimum set

of skills to perform the job. Workers learn the rest of the skills required for good performance while using the EPSS to do the job.

Increased Worker Autonomy. EPSSs provide an information-rich environment in which the employee is not only better supported to perform tasks, but can simultaneously acquire the knowledge to improve, thus reducing the burden on support teams and allowing for more worker autonomy.

	FACTOR
Start with these (easiest to identify)	• Reduction in time required to perform a task • Increase in the number of units produced or items processed • Reduction in number of errors • Reduction in training time
Then these (more analyses required to identify)	• Improved quality • Improved customer satisfaction • Reduced waste
Finally these (much more analyses required to identify)	• Improve competitive advantage • Improve morale • Reduce absenteeism

Figure 1. Obvious Factors.

Increased Quality Through Uniform Work Practices. Providing uniform information and procedures to all workers by means of an EPSS will reduce the variability in work practices. This constitutes a favorable outcome in many contexts, for example, in a customer service department: The customer is systematically given the same answer to the same problem, no matter who answers the call.

Knowledge Capitalization. Designing an EPSS generally includes involving experienced employees and formalizing the system for easy access. It also allows for the continuous addition of useful information by employees. Consequently, EPSSs are a means of documenting and formalizing the knowledge capital of an organization.

Decreased System Maintenance Costs. System maintenance often results from the need to add performance-enhancing features. If the system is designed with performance-support principles, it is less likely to require frequent or extensive maintenance to address traditional productivity, accuracy, or knowledge-oriented deficiencies.

Challenges of Measuring ROI

ROI calculations require extensive up-front data. Many variables come into play, and the decision must be made regarding which factors to calculate and which to disregard. For any ROI model to be accurate, most of the conditions that the company can experience must be accounted for, which makes it very difficult to utilize any one specific ROI model. There is not one generic tool that will deliver what is needed, because each company will have its own set of unique business procedures and challenges.

Before Jumping Into an ROI Calculation…

Determining the ROI of an EPSS project begins with the complex practical issue of identifying what will be measured and then assigning costs and benefits to each variable in monetary terms. The challenge is in defining and quantifying the real business benefits.

Before starting an ROI calculation, identify the following factors (Webb, 1999):

- **Know what you're measuring:** Successful ROI calculators isolate their true data from other factors, including the work environment and the level of management support.
- **Don't saturate:** Instead of analyzing every factor involved, pick a few. For example, reduction in the time involved in performing a task or reduction in the number of errors. This will save the amount of time and money involved in evaluating a large number of criteria. Start with the most obvious factors that can be identified immediately without too much search or analyses (see Figure 1).
- **Convert to money:** Converting data into hard monetary values is essential in any successful ROI study. However, translating all tangible and intangible benefits into dollars is challenging. The goal is to demonstrate the impact on the bottom line.
- **Compare apples to apples:** Measure the same factors before and after the project. In other words, make sure the results you predicted before the project began are the same as the results being evaluated after the EPSS is in place and in use.

The experts advise that one must, while setting a purposeful strategy toward the greater good of organizational performance improvement, know the kind of data that need to be collected and the types of processes that are going to be used. And make absolutely sure there is executive commitment between management and business units. Having these things clearly defined will help ensure that a company will achieve an acceptable ROI (Copeland, 2001).

Models/Methods Used for Calculating ROI

Due to the complexity of ROI calculations, there may seem to be many important factors to include in the calculation.

What Approach to Use

With the blizzard of metrics now available to companies to measure ROI, it's a good time to take stock of these varied

techniques. Arranging groups of metrics by their respective approaches provides an aerial view of what is available, reveals the rationale for specific metrics, and reinforces the importance of using the appropriate measurement based on a clearly defined business strategy. The metrics are as follows (Berry, 2001):

Treetop. Treetop metrics investigate the impact on profitability for the entire company. Profitability can take the form of cost reductions because of EPSS potential to reduce cycle times, increased accuracy (thereby reducing the need to spend time correcting data), and workforce size for any given process or task.

Pure Cost. Cost-oriented views of EPSS value include total cost of ownership, which details the hidden support and maintenance costs over time that render a more precise picture of the total cost of implementing an EPSS.

Holistic Information Technology (IT). This category is best explained by using the balanced scorecard approach to running IT. Just as a companywide balanced scorecard tries to align the company's mission with performance measures across four key indices (financial, customer, internal operations, and employee learning and innovation), the IT organization establishes its own scorecard across the same four benchmarks. Some experts think of an IT balanced scorecard as a way to measure the value of tactical IT against business initiatives, when in fact this framework is a broader, more structural approach to consistently delivering the best IT services. It is important to realize that EPSS development is IT development; thus, the balanced scorecard provides valuable insight to ROI.

Financial. Although the value of IT can be expressed in many ways, increasingly the only expression of this value that people take seriously is in dollars. Economic value added is a measurement approach that attempts to optimize a company's shareholder wealth. Nonprofit organizations do not benefit by an increase in stock value; however, they benefit by reducing the percentage from each dollar donated that goes to overhead and administration. Managed correctly, ROI is a powerful measurement tool that links different types of IT with strategic organizational benefits that are quantified in dollar terms.

ROI Calculation Methods

Several different methods for calculating ROI are available. The first method is the five-area method recommended by Davidson (1998). She suggests measuring the following:

- Productivity: Output per unit of input
- Processes: Systems, workflow
- Human Resources: Costs and benefits for a specific initiative
- Employee Factors: Retention, morale, commitment, and skills
- Organizational capabilities: Cycle time, learning, shared mindset, accountability

However, Phillips (1997) believes that the ROI calculation is not complete until the results are converted to dollars or monetary worth. Phillips recommends looking at combinations of hard and soft data. Hard data include such traditional measures as output, time, quality, and costs. In general, hard data are readily available and relatively easy to calculate. Soft data, on the other hand, include absenteeism, turnover rate, and other somewhat subjective behaviors and are harder to gather and more difficult to convert to dollars. In addition, soft data are often perceived as less valid than hard data. Figure 2 (on page 16) provides examples of the kinds of data that might be collected:

After the hard and/or soft data have been determined, they need to be converted to monetary values:

- *Step 1:* Focus on a single unit.
- *Step 2:* Determine a value for each unit.
- *Step 3:* Calculate the change in performance. Determine the performance change after factoring out other potential influences on the training results.
- *Step 4:* Obtain an annual amount. The industry standard for an annual-performance change is equal to the total change in performance data during one year.
- *Step 5:* Determine the annual value. The annual value of improvement equals the annual performance change, multiplied by the unit value. Compare the product of this equation to the cost of the program using this formula: ROI = net annual value of improvement – program cost. (Phillips, 1996)

Also recommended is looking at a variety of other data, each of which is briefly described below (Phillips, 1996):

Converting Output to Contribution. This reflects the profit contribution of an additional unit of product or service, or the contribution or the savings from producing an additional unit of output from the same input. Marginal-cost statements and sensitivity analyses can be used to pinpoint the values associated with changes if the output data are not available.

Calculating the Cost of Quality. Poor quality is waste generated by human error and bears a cost: defective products, spoiled raw materials, and discarded paperwork. The most costly waste occurs when a product is delivered to a customer and returned for repair. Staff perform the rework, and cost is added to the overhead. The highest cost of poor quality is customer dissatisfaction.

Converting Employees' Time. Converting the value of time saved is relatively easy and is an important measure of a program's success. The most obvious measure is the

Hard Data

PHILLIPS HARD DATA COMPONENTS

Output	→	- Units produced - Items assembled or sold - Forms processed - Tasks completed
Quality	→	- Scrap - Waste - Rework - Product defects or rejects
Time	→	- Equipment downtime - Employee overtime - Time to compete projects - Training time
Cost	→	- Overhead - Variable costs - Accident costs - Sales expenses

Soft Data

PHILLIPS SOFT DATA COMPONENTS

Work Habits	→	- Employee absenteeism - Tardiness - Visits to the dispensary - Safety-rule violations
Work Climate	→	- Employee grievances - Employee turnover - Discrimination charges - Job satisfaction
Attitudes	→	- Employee loyalty - Employees' self-confidence - Employees' perceptions of job responsibility - Perceived changes in performance
New Skills	→	- Decisions made - Problems solved - Conflicts avoided - Frequency in use of new skills
Development and Advancement	→	- Number of promotions or pay increases - Number of training programs attended - Requests for transfer - Performance-appraisal ratings
Initiative	→	- Implementation of new ideas - Successful completion of projects - Number of employee suggestions

Figure 2. Hard Data Versus Soft Data (Source: Phillips, 1997).

reduced cost of performing work. Monetary savings equal the hours saved multiplied by the per-hour labor cost. Time saving is realized when the amount of time saved translates to a cost reduction or profit contribution and the additional time saved is used productively. Most ROI calculations simply use the average wage (with a percent added for employee benefits). Some experts recommend adding in employee maintenance costs, including such items as office space, furniture, telephone, utilities, computers, calculators, and administrative support.

Using Historic Costs. Company records can often show the cost and value of one unit of improvement.

Using Internal and External Experts. Experts can provide the cost (or value) of one unit of improvement.

Using Data From External Studies. For some soft data, it may be appropriate to use information from studies or research projects that focus on the cost of those data items to estimate value or determine benchmarks and industry standards.

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Case Study of an EPSS

One article documents the construction, implementation, and evaluation of an EPSS within the U.S. Department of Veterans Affairs (Hawkins, Gustafson, & Nielson, 1998). The system was designed to replace traditional training. As the system was built, evaluation methodology and resources for implementing evaluation and ROI were carefully considered, and a web-based system was created that would calculate ROI. The system uses five downloadable spreadsheets that are used to calculate ROI at various stages (planning, development, and implementation) and assist the user in decisionmaking by estimating possible cost savings and benefits (Linder & Hyman, 1999).

EMPLOYEE		CALCULATION			
IDENTIFIED AREAS OF SAVINGS	YOU MEASURE				
Reduced time to learn system/job (worker hours)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced supervision (supervision hours)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced help from coworkers (worker hours)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced calls to help line/user assistance (technical assistance hours + phone call)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced "down" time (waiting for help, consulting manuals, etc.)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Fewer or no calls from help line to supervisor about overuse of help service	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
TOTAL SAVINGS OVER LIFE OF SYSTEM					

Spreadsheet 1. Initial Benefits Worksheet (Source: Hawkins et al., 1998).

Using Participants', Supervisors', and/or Senior Managers' Estimates. Sometimes the people closest to an improvement can provide the most reliable estimates on its value.

Using Human Resources Estimates. These may be perceived as biased. After all, the HR department will determine the basis for its claim for improvements due to training.

Three additional alternatives for calculating ROI are presented by Maglitta (1997):

Business Value Added. Measures IT contribution not in dollars but by support of key goals and metrics of functional groups.

Intangible Value. This is a less formal metric than evaluation of soft benefits, such as attracting new staff, improving product quality, enhancing reputation, or staying in the market. It looks for benefits measured in clear dollars, which works best when credibility is established and executives support the effort. However, it is not useful for heavily quantitative analysis.

Net Present Value. This measure gauges tomorrow's returns in today's dollars. It recognizes business conditions, interest rates, risk, and inflation and produces ballpark figures.

According to a 1998 *InformationWeek* survey, the most popular method of calculating ROI is traditional cost/benefit

CONTINUING WORKER HOURS SAVED IDENTIFIED AREAS OF SAVINGS	YOU MEASURE	CALCULATION			
Reduced time to perform operation (worker hours)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced overtime	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced supervision (supervisor hours)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced help from co-workers (worker hours)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced calls to help line/user assistance (technical assistance hours + phone call)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Reduced "down" time (waiting for help, consulting manuals, etc.)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Fewer or no calls from help line to supervisor about overuse of help service	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Fewer mistakes (e.g., rejected transactions)	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Fewer employees needed	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Total Savings in one year	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
Expected life of system in years	→	Hours/Person Avg	Cost/Hour	# of People	Total $ Saved
TOTAL SAVINGS OVER LIFE OF SYSTEM					

Spreadsheet 2. Continuing Benefits Worksheet (Source: Hawkins et al., 1998).

analysis; 97% of all respondents selected this option. Net present value reported by 44% of the respondents, weighted scoring (22%), and applied information economics (12%). Also gaining popularity is the economic value added (EVA) method (Violino, 1998).

EVA measures the difference between after-tax operating profit and the cost of capital employed to generate the profit (in other words, the equity involved in producing profit). In the fall of 1997, the Society of Information Management (SIM) introduced an ROI model called the value measurement model. This model brings chief executive officers (CEOs), chief financial officers (CFOs), business division heads, and information officers (CIOs) into the project-assessment process. Each has his or her own particular area of interest: For the CIO, it might be the investment in hard-

Quality Improvements w/Fixed Costs (per year)		CALCULATION		
IDENTIFIED AREAS OF SAVINGS	YOU MEASURE			
Fewer mistakes (e.g., rejected transactions)	→	Unit Cost	# of Units	Total $ Saved
Fewer rejects-ancillary costs	→	Unit Cost	# of Units	Total $ Saved
Total savings in one year	→	Unit Cost	# of Units	Total $ Saved
Expected life of system in years	→	Unit Cost	# of Units	Total $ Saved
TOTAL SAVINGS OVER LIFE OF SYSTEM				

Spreadsheet 3. Quality Benefits Worksheet (Source: Hawkins et al., 1998).

BENEFITS		DOLLARS SAVED
IDENTIFIED AREAS OF SAVINGS	YOU MEASURE	
Reduced employee turnover	→	$ Saved Per Year
Reduced grievances	→	$ Saved Per Year
Reduced absenteeism/tardiness (morale improvements)	→	$ Saved Per Year
Total savings in one year	→	$ Saved Per Year
Expected life of system in years	→	
TOTAL SAVINGS OVER LIFE OF SYSTEM		

Spreadsheet 4. Other Benefits Worksheet (Source: Hawkins et al., 1998).

ROI Calculation		Dollars Saved
Identified Areas of Savings	You Measure	
Initial time saved total over life of system	→	$ Saved Per Year
Continuing worker hours saved total over life of system	→	$ Saved Per Year
Quality improvements with fixed costs total over life of system	→	$ Saved Per Year
Other possible benefits total over life of system	→	$ Saved Per Year
Total benefits	→	$ Saved Per Year
Total system costs (development, maintenance, and operation	→	$ Saved Per Year
ROI = (BENEFITS – COSTS / COSTS)		

Spreadsheet 5. ROI Calculation Worksheet (Source: Hawkins et al., 1998).

Selecting an appropriate ROI method requires extensive front-end analysis to determine which factors will be measured and how they will be measured. Additional analysis is then required to select which method is the most appropriate for the organization or project at hand.

ware, software, and services required in a new project; for the business-line partners productivity gains, cost-savings, and effectiveness might be at issue; for the senior management, overall return on investment. EPSS ROI calculations tend to use a cost-effectiveness strategy (Linder & Hyman, 1999).

Phillips' ROI calculations, which are based on valuations of the improved work product, exemplify this strategy. In general, cost-effectiveness focuses on improvement of existing processes or installation of new processes or technologies that facilitate improved organizational output. These goals are consistent with the goals of an EPSS (Linder & Hyman, 1999).

Conclusion

The most important thing that companies need to know about evaluating the ROI of an EPSS is that it needs substantial up-front planning. Currently, most organizations make the decision to conduct ROI calculations after the program has been implemented. The difficulty with after-the-fact ROI is that it may be hard to know exactly what business issue the program was designed to address in the first place. This makes data gathering much more difficult. EPSSs require extensive up-front ROI data, which doesn't lend itself easily to the traditional ROI science; many variables come into play and many decisions must be made regarding what to calculate. Therefore, determining the ROI of an EPSS project begins with the complex practical issue of identifying what will be measured and then assigning costs and benefits to each variable in monetary terms.

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