White
Paper

C O S T   J U S T I F I C A T I O N   O F   A N   A U T O M A T E D
D A T A   C O L L E C T I O N   S Y S T E M

INTRODUCTION

There was a time when companies invested in computers for the sake of the technology. Management assumed that computerized systems were always more efficient. According to the Wall Street Journal, companies now demand to know the savings from all capital investments, including computer systems. Today, virtually all automation must be financially justified. Recent press indicates that attitudes may have even shifted to the opposite extreme in some companies. For example, a recent pull-out section in the Wall Street Journal on technology opens with: "It's the morning after. For the past ten years companies have been on a blind-faith buying binge investing well over $1 trillion in new computer systems to embrace the future and gain a competitive edge. Now, many of them are awakening with a hangover and wondering: What was it all for, and where did we go wrong?"*

"Automated data collection technology is used to enter information into a business computer system. It relies on machine-readable bar code symbols to increase the speed and accuracy of collected data."*

* The Wall Street Journal, Technology - Unleashing the Power, Dennis Knearle.

OVERVIEW

As a potential user of bar code data collection technology, you should know that data collection in general, and bar coding in particular, is one of the best productivity investments your company can make. The more you analyze your organization's return on technology investments, the more senior management will believe in the automated data collection applications you are trying to implement. If you stop and think about it, the entire automated data collection industry exists because bar coding makes companies more productive. Since productivity is the key performance indicator for any industry, you should understand the basic financial measurements of productivity. This knowledge will give you a good intuitive feel about the financial benefits of your proposed bar code application.

WHY COST JUSTIFICATION

Cost justification is the process of determining the return on a productivity investment. The savings are measured and evaluated relative to the cost of the system, in present value terms.

This guide is designed to help you accurately analyze and justify your current and future bar code projects. The guide takes an investment analysis approach that explains how a bar code project makes economic sense.

Remember, good ideas must be explained to top management in language that they understand. Be aware that an approved project only gets you a "ticket to the dance." The real win occurs when the implementation takes place as planned and is considered a success. All involved share in the benefit from a successful project.

SELECT AN APPLICATION

Most companies have hundreds of potential applications for bar coding. Start with the application that you believe offers the best return for your organization. If it's your first bar code application, be sure to scale the project appropriately. If it's a time and attendance application for example, start with one plant and then roll it out to all of the company's facilities. If you're unsure about the best initial application, talk to an experienced data collection professional who has implemented several systems.

DESIGN THE SOLUTION

Start with a clear idea of the problem to solve, then outline the solution. The solution should include the operational aspects as well as the technical solution. Having a clear idea of how your data collection application will work is the key.

QUANTIFY THE SAVINGS

Begin by calculating the current cost of the tasks that you plan to automate. Then, estimate the cost of the tasks under the proposed system. This is at the center of cost justification, so get this part right. The bad news is that quantifying savings can be challenging. Sometimes the benefits of the system are "soft". How do you quantify better information or fewer errors?

The good news is that bar code systems really do save lots of money - this is not smoke and mirrors. Even skeptical, tight-fisted operations managers can understand the benefits of eliminating manual key strokes and errors. The benefits of being wireless are intuitive to an experienced warehouse manager.

As great as data collection is, do not oversell or over promise what your system will do for the company. Be realistic and plan for the unexpected. Change – even positive change – causes uncertainty, so make allowances and be conservative in your estimates. You'll achieve great success with the system if you keep the following formula in mind:

Happiness = Perceived Outcome - Expectations

Approach the project with a positive and confident frame of mind. At the same time, avoid overly optimistic statements and projections until the system is installed, accepted and working as planned. Productivity gains from automated data collection generally fit into two categories: "Hard" savings, or easily quantifiable savings, and "soft" or less tangible benefits.

Hard Expense Savings
- **Labor,** including, taxes, benefits and variable costs
- **Material**
- **Operating Expenses**
- **Inventory**
- **Fixed Asset Reductions** such as reduced equipment needs or reduced equipment losses due to better equipment tracking. Reducing assets can save cash and make a dent in a company's return on asset calculation.

SOFT BENEFITS
- **Improved Sales** due to better management information, reduced out-of-stock situations and up-to-date product availability information.
- **General Efficiency**
- **Improved Employee Morale** by automating boring tasks such as data entry, creating more enriching job opportunities for workers.
- **More Satisfied Customers** due to higher quality, faster response and improved accuracy.

LABOR

The most common area of savings from automated data collection is labor costs. When calculating labor savings, determine the variable cost of labor. The variable cost is the cash expense that varies in direct proportion to the hours worked. Do not include fixed burden or other overhead that will not be reduced if labor hours are cut. Variable costs generally include wages, payroll taxes and employee benefits.

Example: Let's say you are installing a time and attendance system that will eliminate hand keying of payroll data. Currently, two people in the payroll department spend 1,040 hours each per year entering payroll data. The system will completely eliminate this task. Assuming that the average earnings of these data entry clerks is $8.65 per hour, plus taxes and benefits of 25%, the variable cost of this labor is $10.81 per hour. Total labor savings of this application is 2080 X 10.81 or $22,500 per year.

If your application is justified based on labor savings, then it's crucial that you explain what the company will do with the people who are affected by automation. For instance, can the department reduce overtime or eliminate part time or contract positions? Can surplus employees be transferred to another department? Is normal turnover high enough that attrition will eliminate the problem? Or, will the company be faced with a lay-off situation?

INVENTORY

A second major category of savings is inventory. Warehouse managers will admit they would reduce inventory if they had better, quicker, and more reliable information about what's in stock at any given time. Thousands of companies have used bar coding to improve inventory systems and give management better information.

We all know that reducing inventory saves money. As with labor, inventory savings should focus on the variable holding costs of inventory. When quantifying how much your inventory application will save, determine the variable holding costs of your inventory.

1. **Financing: Interest**
2. **Warehouse Expense:** Insurance, power, property taxes, physical inventory (a warehouse labor cost)
3. **Holding Costs:** Obsolescence, deterioration, scrap, shrinkage

Many companies have a rule-of-thumb they use to calculate the cost of carrying inventory. Depending on the industry, these costs range from 15% to 35%. Find out if your company has a generally accepted inventory carrying cost percentage. If not, ask your finance department and your warehouse manager to help you estimate your company's variable cost of maintaining inventory. You cannot go wrong using a conservative figure such as 15%. Most companies use 25%.

Example: Assume that your warehouse maintains a finished goods inventory of $4 million per year. Included in the $4 million is a safety stock of $400 thousand (or 10%) that you maintain because of problems with out-of-stocks due to errors in data. The bar code system will improve inventory accuracy and thereby give the manufacturing and warehouse managers the confidence to reduce the safety stock from $400 thousand to $200 thousand. This saves the company:

Financing	10% X 200,000 = $20,000 per year
Warehouse expense	5% X $200,000 = $10,000
Holding costs	5% X $200,000 = $10,000
Total Savings	$40,000 per year

As you reduce inventory you could very well reduce labor. One way would be to reduce the cost of the annual physical inventory count. These numbers are conservative and are on a variable basis. Do not include fixed costs, fixed overhead or sunk costs in your analysis. You'll also realize the additional benefit of having more accurate information on a real time basis.

SOFT COST BENEFITS

Here's where "soft costs" or intangible benefits from automated data collection come into play. Soft benefits include better information, fewer shipping errors, more customer satisfaction, and more efficient manufacturing operations.

Intangible benefits are important to your company and therefore should be highlighted in your proposal. At the same time, you may not want to quantify them. It all depends on the culture of your organization, and the nature of the key decision maker. If the decision maker is a "by the numbers" type of person, you probably should be painfully conservative with your assumptions and estimates of soft benefits.

There are ways to quantify soft costs if you believe it is necessary. The risk is that the reader may disagree with your assumptions or method and, instead of focusing on the benefit of the bar code system, criticize your approach. If you decide to quantify some intangible benefits, try to use conservative assumptions that are validated by well regarded people in your organization.

QUANTIFYING SOFT BENEFITS

Some data collection applications can help increase a company's income. Here is an example of a way to quantify a soft benefit:

Example: The VP of Sales, has documented that in the last two years twelve large orders totaling $1.2 million were lost because the company could not deliver product to customers on the needed date. In these cases the inventory system indicated the items were in stock, so the customer was given a promised delivery date. When the orders were scheduled to be picked, the product was not in the warehouse. The customers went elsewhere when the ship date was delayed. At an average gross margin of 20%, these missed opportunities cost the company $240,000.

If your system will reduce errors, and your company has determined the cost of an error, then use it to quantify the savings:

Example: Manufacturing engineering estimates that shipping errors cost the plant $50 each. Last year, out of 180,000 shipments there were 300 shipping errors. The $20,000 bar code system will reduce those errors by at least 75%, saving $11,250.

One of the real benefits to automated data collection is the information it makes available to management. The caveat is that you must have management that is progressive enough to use the information. Data alone is not a benefit - information is only useful when applied to operating decisions.

ESTIMATE THE PROJECT COST

Start out with your system cost, including purchased hardware and software. Be sure to include spares, cables, batteries, accessories, label supplies, sales tax, service contracts, etc. Do not forget custom programming and interfaces. Most companies want the project cost to include in-house programming and resources. Others treat in-house costs as a sunk cost since they will be incurred regardless of whether or not the project is approved and implemented. Use whatever approach is accepted at your company.

FINANCIAL ANALYSIS

Financial analysis is the process of comparing savings to costs. Imagine your project in terms of the stock market. When you buy shares of stock, you pay your money up front with the expectation that you will get your investment back, plus interest or dividends. Companies expect the same from their capital investments. The dividend and return of principal comes in the form of cost savings or income improvements. Two common accounting statements are used to illustrate the savings.

Project Income Statement

We all are familiar with the concept of an income statement. Income statements are prepared on an accrual basis, which means that expenses are recorded when the cost is incurred, not when the bill is paid. Income statements include non-cash expenses such as depreciation. The project income statement includes the labor saved or inventory costs avoided on an annual basis. It also should include the depreciation of the data collection system.

Project Income Statement

Year	1	2	3	4	5	Total
System Depreciation	(25,000)	(25,000)	(25,000)	(25,000)	(25,000)	**(125,000)**
Service Contract	(6,020)	(8,028)	(8,028)	(8,028)	(8,028)	**(38,132)**
Supplies & Miscellaneous	(500)	(500)	(500)	(500)	(500)	**(2,500)**
Installation	(25,000)	0	0	0	0	**(25,000)**
Labor Savings	15,900	31,800	31,800	31,800	31,800	**143,100**
Inventory Holding Cost Savings	8,500	17,000	17,000	17,000	17,000	**76,500**
Operating Income	(32,120)	15,272	15,272	15,272	15,272	**28,968**
Reduced Interest to Finished Inventory	45,000	90,000	90,000	90,000	90,000	**405,000**
Pre-Tax Income	12,880	105,272	105,272	105,272	105,272	**433,968**
Income Tax @ 34%	(4,379)	(35,792)	(35,792)	(35,792)	(35,792)	**(147,547)**
Net Income	8,501	69,480	69,480	69,480	69,480	**286,421**

Project Cash Flow Statement

The cash flow statement is similar to the project checkbook. Like the income statement, it includes the cash savings such as labor and inventory savings. The primary difference is that the cash flow statement does not include depreciation expense. Instead, the cost of the system is a cash outflow in the initial period, when the check is written.

Project Cash Flow Statement

Year	0	1	2	3	4	5	Total
System Cost	(125,000)	0	0	0	0	0	**(125,000)**
Service Contract	(6,020)	(8,028)	(8,028)	(8,028)	(8,028)	0	**(38,132)**
Supplies Miscellaneous	(500)	(500)	(500)	(500)	(500)	0	**(2,500)**
Installation	(25,000)	0	0	0	0	0	**(25,000)**
Labor Savings	0	15,900	31,800	31,800	31,800	31,800	**143,100**
Inventory Holding Cost Savings	0	8,500	17,000	17,000	17,000	17,000	**76,500**
Inventory Financing Savings	0	45,000	90,000	90,000	90,000	90,000	**405,000**
Income	0	(4,379)	(35,792)	(35,792)	(35,792)	(35,792)	**(147,547)**
Net Cash Flow	(156,520)	56,493	94,480	94,480	94,480	103,008	**286,421**

Return on Investment

Return on Investment (ROI) measures the average income as a percentage of the cost of the project. The formula is *average after tax savings divided by the initial system investment.* Investment is the capitalized cost of the project. Use the project income statement to calculate the project ROI. At most companies, the target ROI or "hurdle rate" is 25%.

Return on Investment

5 Yr. Ave. Project Earnings (Cost Savings)	57,284
Capital Investment	125,000
Average Return on Investment	46%

Payback Period

The Payback Period tells you how long it takes to recover the cash cost of the project. Payback is always expressed in time, such as 2.5 years. Use your project cash flow statement to determine the cash savings of the system. Compare the cash savings from the project cash flow statement to the initial cash outflow. Then use that to calculate the period of time it will take to recover the cost. Most companies want to see a payback period of less than 4 years. Automated data collection projects generally payback in 6 months to 3 years.

Payback Period

Year	0	1	2	3	4	5
Initial Cash Outflow	(156,520)	0	0	0	0	0
Net Cash Savings	0	56,493	94,480	94,480	94,480	103,008
Payback Period			2.1 years			

Net Present Value

The Net Present Value of Cash Flow (NPV) model takes the cash flow statement and uses an interest rate (also called discount rate) to convert the annual flows in the future to current dollars. It essentially uses the concept of the time value of money to compare the cost of the project in today's dollars to the savings that occur over several years in the future. If you are not familiar with the concept of discounted cash flow, think of a $1 million dollar lottery that pays off in 20 annual installments of $50 thousand. We all would rather have the $1 million up front than to wait for the annual checks. A dollar today is worth more than a dollar in the future.

One piece of information you must have is the discount rate or interest rate used by your company. If you do not know it, ask your Chief Financial Officer for the appropriate rate to use. Once you have the discount rate, apply it to the annual cash flow from the project cash flow statement. Add up the discounted cash flows and you have the NPV of the project. If you have additional questions about

the concept of Net Present Value or how to calculate it, refer to the spreadsheet model or a basic accounting or finance textbook.

Most use the company's cost of five-year money as a discount rate for bar code projects. You should, of course, use the rate considered appropriate by your company's financial management. The following table is designed to help project managers determine the cash savings needed to justify a capital asset purchase under different discount rate assumptions.

Project Net Present Value

Year	0	1	2	3	4	5	Total
Net Cash Flow	(156,520)	56,493	94,480	94,480	94,480	103,008	286,421
Present Value Factor @ 10%	1.00000	0.90909	0.82645	0.75131	0.68301	0.62092	-
Net Present Value Cash Flow	(156,520)	51,357	78,083	70,984	64,531	63,960	172,395

Example: Assume your company uses a discount rate of 20%. The table below shows that a $100,000 project with a five-year life must save at least $31,793 per year for 5 years. To use this for your project, determine the cost of your investment; let's say it's $50,000. Since $50,000 is 50% of $100,000, your cash savings must be $15,897 per year, at a 20% discount rate.

Annual Cash Savings Required
Net Present Value Basis
Assumptions: $100,000 Project Cost -- 5 Yr. System Life Savings Received Monthly Over the Life of the System

Discount Rate	Required Annual Cost Savings
10%	$25,496
15%	28,548
20%	31,793
25%	35,222
30%	38,824
35%	42,588
40%	46,502
45%	50,552
50%	54,726

WRITTEN PROJECT PROPOSAL
Good writers always know their audience before they start. The same rule applies here. Who will approve or reject the project for your company? Who else will influence the decision? Are there secondary signatures required? Is the capital budget available or will you be better off waiting until the next fiscal year?

Once you have a clear understanding of the process and the players, identify what they want to see. Ask them for a sample of a complete and well-formatted capital project proposal. Having a good report template can save many hours and keep the discussion focused on the content of the project rather than the style of the write up.

GATHER A TEAM OF EXPERTS
One critical factor in the success of your project is the people on the project team. Recruit a team of competent, motivated people who are open to change and highly regarded within your company. This not only adds to your credibility when asking for capital funds, it also greatly increases the probability that the implementation will go smoothly. At a minimum, the project team should include an operations expert from the user department and an IT person. Also, it may be beneficial to have an operations manager and a finance department representative on the team. Keeping the team small is important, but having motivated impact players from the areas that may influence the outcome is more important. Every member of the team must feel they will share in the successful implementation of the system.

DESCRIBE THE IMPLEMENTATION

Start out by relying on the expertise of the user team members and applying good project management skills to produce a good implementation outline. After you have gained solid buy-in on the outline, fill in the details and dates. Be sure and allow for unforeseen circumstances and build contingency time into the schedule.

You must convince the decision-makers that your project is well planned and you have the ability to make it happen. The time you spend writing a good proposal and implementation plan is worth the effort. A well-written proposal can be used as a yardstick to document your success on the project.

Write the proposal for your reader – not yourself. Use strong, assertive headlines. Emphasize key ideas by repeating them. At the same time, do not create a wordy document that will not be read. Scale your proposal appropriately for this type of project at your company. Superfluous fluff and technical jargon should be edited out or included in an appendix.

When your project proposal is finished, have it reviewed by someone outside of the project. The proposal should stand on its own and be clear to people not intimately familiar with the project.

GET STARTED

Real productivity gains and cost savings are the keys to successfully cost justifying capital projects. Unlike some technologies, automated data collection is one of the easiest technologies to cost justify. A number of proven techniques for quantifying savings and the return on a capital project have been outlined. Follow these steps and your project will not only get approved - it will be considered a much needed and profitable investment.

Remember our proposal is the way you set expectations for your project. Set reasonable expectations and deliver more than expected and you will join the ranks of those who have made their companies more profitable with automated data collection.

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