

BIM's Return on Investment

This paper delves into the return on investment (ROI) for building information modeling solutions - what variables to consider, a sample formula and typical numbers, and a heads-up as to what the ROI metric overlooks.

With the advent of building information modeling (BIM), the building industry is coming to appreciate that technology can radically transform the process by which a building is designed and constructed. But before committing the funds to purchase that technology, the bean counters in an organization will probably insist that an ROI analysis be done. At that point, the folks tasked with producing the numbers usually grimace in pain and start twitching.

But there's an upside to an ROI analysis. Although primarily used to justify a purchase, calculating the ROI for a technology investment forces those involved to reach an agreement about why the money is being spent and what are the expected results.

ROI 101

ROI analysis is one of many ways to evaluate a proposed investment. It compares the gains anticipated from an investment against the cost of the investment.

$$\text{Earnings/Cost} = \text{ROI}$$

ROI is used to evaluate many types of corporate investments, from R&D projects to training programs to fixed asset purchases. The more complicated the investment, the more complicated the formula becomes. Just think about calculating the total cost of a departmental Microsoft® Office upgrade versus calculating the total cost for a worldwide ERP implementation. And as the investment gets larger, the creativity required to calculate the ROI becomes more significant, eventually entering the realm of black art.

ROI for BIM Investment

Mercifully, calculating the ROI for a design system can be relatively easy. The only hitch is that you need to consider the changes in user productivity during ramp-up. Figure 1 illustrates what happens after a new system is put in place. There's an immediate dip in productivity as the users get up to speed on the new system. With time, productivity climbs back to where it was with the original system and levels off at a higher point as the new technology takes hold.

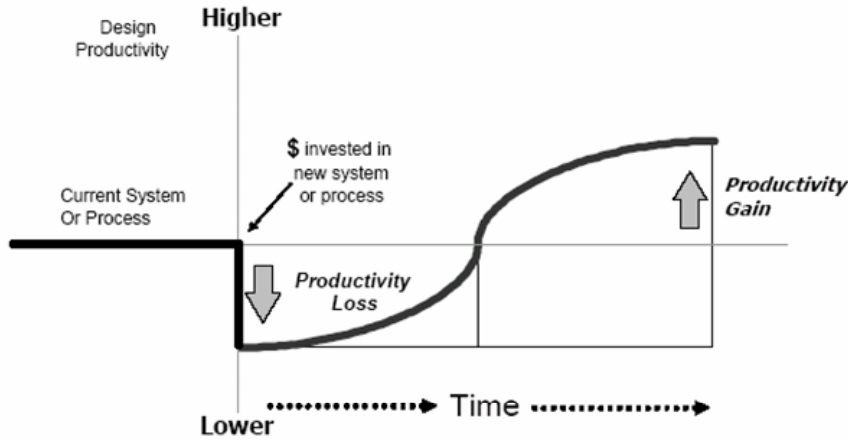


Figure 1
Design productivity during BIM system implementation.

A standard formula for calculating the first-year ROI is shown below. It uses just a few key variables related to system cost, training, and the overall productivity cost savings of a system.

$$\frac{(B - (\frac{B}{1 + E})) \times (12 - C)}{A + (B \times C \times D)} = \text{First Year ROI}$$

The formula variables are:

A = cost of hardware and software (dollars)
B = monthly labor cost (dollars)
C = training time (months)
D = productivity lost during training (percentage)
E = productivity gain after training (percentage)

The numerator represents the “earnings” part of the equation and those earnings come from an increase in human productivity. The increase in average monthly productivity is represented in the left bracket ((B - (B / 1 + E)). The right bracket (12 – C) is the number of months in a year (12) minus months in training (C). If the user needs three months to become as productive on the new system as on the old, then there are nine months left in the year to benefit from the productivity gains.

The denominator, which is the “cost” part of the equation, includes the cost of the system (A) and the cost of the productivity lost, in terms of labor cost, as the user learns how to use the system. This second term is the product of the monthly labor cost (B) multiplied by months in training time (C) multiplied by productivity lost in training (D), therefore B x C x D. Note that “training time” refers to the time it takes a user to reach the same level of productivity experienced on the original system - *not* the length of a training course.

Number Crunching

Now lets plug some real numbers into this equation. The sample numbers below are typical, but of course would be substituted by your own estimates for an actual calculation.

[A quick note about these numbers. Autodesk commissioned an online survey of users of their Autodesk® Revit® Building software in December 2003. Approximately 100 users provided responses to the survey. Those results, compiled in a white paper entitled *Return on Investment with Autodesk Revit*, are used as the basis for the sample numbers below. Please reference the white paper (available online at www.autodesk.com/revit) for details about how these numbers were derived. In addition, the white paper also includes an Excel-based ROI calculator for BIM that you can use for your own ROI calculations.]

A = cost of hardware and software	\$6,000
B = monthly labor cost	\$4,200
C = training time	3 months
D = productivity lost during training	50%
E = productivity gain after training	25%

Using these numbers, the ROI is calculated at just over 60%! That's a healthy ROI for an IT investment, and would be an easy financial decision for most CFOs.

Critical Variables

If you play around with the numbers, you'll notice that the productivity gain and loss are the most sensitive variables in the equation. Slight changes in those figures produce the most dramatic changes in the ROI. Intuitively, one can understand why productivity is so critical as it's the long-term result of an IT investment.

The productivity gain figure used in our sample calculation (25%) is indicative of results reported to Autodesk and a conservative estimate. One Autodesk Revit Building customer, Rhode Island-based Donald Powers Architects (www.donaldpowersarchitects.com), recently measured the productivity gains they've experienced by using Revit Building. Principal Donald Powers reports that "With about 20 projects completed in Revit, the firm has seen productivity gains of 30 percent in design and documentation, and a 50 percent drop in requests for information during construction." In addition, their training time (the time it took them to become as productive on the new system as the old) was just 14 days, versus the 3 months used in our sample formula.



Figure 2

Donald Powers Architects use Revit on a variety of commercial and residential projects, including this inner-city rehab.



Figure 3

Using Revit on projects like this high-end residential design has resulted in a 30% productivity gain (a key variable used in ROI calculations) for Donald Powers Architects.

In Autodesk's recent online survey, over half the respondents experienced productivity gains of over 50% using the Autodesk Revit building information modeling solution and 17% experienced productivity gains of over 100%.

The least important factor in our ROI calculation turns out to be the system cost, an interesting fact to remember the next time you're involved in a technology purchase. Doubling the system cost in the original set of numbers (from \$6K to \$12K) only reduces the ROI by 20% (from 61% to 41%).

Limitations of ROI

ROI is a popular metric for sure. It boils down a complex soup of numbers into a single percentage that everyone can digest. But beware: the ROI metric is more accurate for cost-saving projects than for revenue-generating projects. ROI analysis works best for IT implementations that produce tangible easy to measure cost benefits like improved productivity.

When calculating ROI from a revenue generation point of view, estimates are often used - lessening the accuracy of the analysis. A more extensive ROI on the adoption of BIM could include profit gains from; increased billing, project quality and increased repeat business, improved communication and client presentations, links to external analysis applications, and so on. The difficulty is in projecting the value of those gains.

For example, one respondent to the Autodesk Revit survey stated that their adoption of BIM had shifted the time split between traditional design and documentation. Their use of Revit Building decreased the hours they spent on producing construction documents by 10%, allowing them to spend that extra time in more constructive up-front design work. As a result, they were re-evaluating their own fee structures. This profitability boost may be complicated to calculate, but could certainly be factored into a more complex ROI analysis.

Likewise, another survey respondent (a 300-person architectural firm) reported that several projects done on Revit Building were completed with half the budgeted staff and in half the budgeted time. It would be easy to factor in the reduction in budgeted time (a direct component of productivity) but the ramifications of the excess design staff is a bit more complicated and more difficult to quantify.

ROI – Final Thoughts

So if you're tapped to help with the ROI for building information modeling, don't go into a tailspin. You could adopt the viewpoint that it's a necessary evil or turn it into a useful learning experience for yourself and your organization, providing crucial insight for future projects. And once the ROI is complete and the technology is in place, don't forget to actually measure your organization's performance against the plan!

About Autodesk Revit

The Autodesk Revit platform is Autodesk's purpose-built solution for building information modeling. Applications such as Autodesk Revit Building and Autodesk® Revit® Structure built on the Revit platform are complete, discipline-specific building design and documentation systems supporting all phases of design and construction documentation. From conceptual studies through the most detailed construction drawings and schedules, applications built on Revit help provide immediate competitive advantage, better coordination and quality, and can contribute to higher profitability for architects and the rest of the building team.

At the heart of the Revit platform is the Revit parametric change engine, which automatically coordinates changes made anywhere — in model views or drawing sheets, schedules, sections, plans... you name it.

For more information about building information modeling please visit us at <http://www.autodesk.com/bim>. For more information about Autodesk Revit and the discipline-specific applications built on Revit please visit us at <http://www.autodesk.com/revit>.

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