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## Solving the Appraisal Problem with the Cost Approach

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**Abstract:** *This article examines the appraisal process as a logical analysis to estimate an asset's value in a hypothetical transaction, emphasizing the need to reconcile cost, income, and sales comparison approaches with real market data. It highlights common pitfalls, such as over-reliance on mathematical models or ignoring economic obsolescence, which can lead to non-credible valuations. The authors stress that credible appraisals require rigorous market research and balanced application of depreciation factors to reflect true market participant behavior.*

## The Appraisal Problem

An appraisal is an analysis of evidence and logic used to estimate what would happen in a hypothetical transaction. An actual transaction does not have to take place but the value<sup>1</sup> assumes a transaction between a theoretical buyer and a theoretical seller.

As we all know from our USPAP training, the reason for preparing an appraisal is to solve an appraisal problem. The appraisal is a solution to a question asked by a client which is "What are my assets worth (under a particular scenario)?"

Two of the seven elements of defining the appraisal problem to be solved are the intended use and the type of definition of value.<sup>2</sup> USPAP states that we must *consider* all three approaches to value—cost, income, and sales comparison—and use the one that is the most credible to arrive at a market-based opinion of value for this hypothetical transaction.

## Interconnection of Approaches to Value

Many appraisers erroneously consider the approaches to value as unrelated to each other. This is a result of not understanding how each approach is used to determine a value, and how they are interrelated.

The overall goal of using the cost, income, and/or sales comparison approach is to arrive at a conclusion of a value commensurate with the particular set of defined circumstances and in agreement with what market participants would expect in a transaction given those defined circumstances for the appraisal situation.

Each approach uses a different method to determine value. Any values arrived at through the methodology of any single approach are only credible when reconciled with the relevant market.

The cost approach starts with the cost new<sup>3</sup> and removes the effects of the various depreciation and obsolescence (physical, functional, and economic).

The sales comparison approach uses marketplace comparables and makes supportable adjustments to those comparables to "look like" the subject.

The income approach utilizes various discounting techniques in order to provide the present value of the estimated future cash flows.

These different methodologies can, depending on the inputs, provide quite different answers; however, they all should arrive at a credible value that solves the appraisal problem and answers the question of "What is this asset (or group of assets) worth?" If applied properly, all three approaches should provide similar results.

## The Math of The Cost Approach

The foundation of the cost approach is math. As such, as long as the calculations are done correctly, the answer will always be "accurate" but it may or may not be the "correct" answer for an appraisal.

Mathematics is based upon routine calculations that deliver consistent results. That is the beauty of mathematics—you can always be assured that the answer will be consistent. The answer to the problem of 1+1 will *always* equal 2. It never changes or varies with what is going on in the world around the calculation. Therein lies the main problem from an appraisal perspective.

If you estimate that an asset is 70% depreciated (from all factors) and the RCN is \$10,000, the mathematical answer will *always* be \$3,000. Depending on what is going on in the economics and technological advancements of the world, country, industry, or equipment type of that asset, however, \$3000 may or may not be the "right answer."

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All too often appraisers accept the math of the cost approach without consideration of what is going on in the market around the asset. Neglect of market realities can result in assets being over- or undervalued, producing a report that is not credible and creates major issues within the report’s intended use.

Appraisers who get tied up in cost approach mathematics and assuring that that results are calculating correctly can lose sight of the true endgame. Cost approach is only one method for modeling (through mathematics) the value the market would (theoretically) assign the asset if it were sold. Comparing the mathematical results to actual market conditions either confirms the accuracy of the results or provides data to the appraiser about adjustments that may need to be made in order to bring the results in line with market reality. If the mathematical result doesn’t match the market, the appraiser must take another look at the factors used in the modeling math.

**“People don’t act the way computer models say they “should” act. A computer model may sound right and be mathematically convenient, the problem is, it often does not accurately measure market behavior.”**

*Roger Grabowski, FASA*

### **What is the Item Worth?**

Let’s take a step back from math to the basics of what an appraisal/valuation is. In its purest form, an appraisal/valuation is an answer to the question “What is this item worth?”

There are always two participants in a sales transaction: a buyer and a seller. The seller wants to sell an item for as much as they can in order to provide a financial gain and the buyer wants to pay as little as they can to obtain ownership of the item. Somewhere in the middle is the (often unstated) value of the item.

Within the definition of Fair Market Value is the phrase “... both having reasonable knowledge of relevant facts...” This assumes that both buyer and seller know about the item and the environment in which this item typically operates.

Thus, whether these buyers and sellers know it or not they are both mentally deducting for physical depreciation, functional obsolescence, and economic obsolescence.

The job of the appraiser is to apply the three valuation approaches to model and quantify these thoughts in a well-documented and logical manner. The cost approach depends upon appropriate use of the three obsolescence factors to help answer the question, “What’s it worth?”

### **The Mistake of Ignoring Obsolescence**

While few appraisals ignore physical deterioration, the other two obsolescence factors are often less likely to be considered.

Many appraisals dismiss economic obsolescence for any number of reasons—or no explained reason at all. Simply dismissing economic obsolescence without any reasonable research as to whether it exists is inappropriate and will (most likely) produce values which are too high.

One of the most common scenarios for this dismissal is in the realm of an allocation of purchase price. I have seen numerous reports with a comment such as: “Since the value of the enterprise exceeds the value of the assets and goodwill exists in the transaction, we have assumed (or we have concluded) that no economic obsolescence exists.”

I have also seen commentary such as: “The facility is operating at 90% capacity, so there is no inutility or other form of obsolescence which is applicable.”

Another popular comment is something like: “We spoke to company management, and they indicated that no functional or economic obsolescence exists.”

All of these statements are misconceptions and an indication that the appraiser does not really understand the many potential levels of economic obsolescence. Statements such as these acknowledge only the *entity* level of economic obsolescence, ignoring any possible obsolescence at the *economic level*, *industry level*, and *asset specific level*. Ignoring any one of the important levels of economic obsolescence may result in misleading and/or non-credible results. A prudent appraiser should not assume that the company management is completely aware of all external obsolescence factors that must be considered in a conclusion of value and should do their own research.

While appraisers use similar explanations for not considering functional obsolescence, it is generally economic obsolescence that’s dismissed. Perhaps because it is often the hardest form of depreciation to quantify.

### **The Mistake of Ignoring the Market**

In other appraisals, which considered obsolescence factors such as inutility and other depreciation factors but demonstrated little to no regard for what an asset could sell for in the marketplace, the final conclusion of value was far too low.

As a simple example, let’s consider a lathe with an RCN of \$60,000.

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As an appraiser, you estimate the Normal Useful Life to be 15 years and the lathe is 5 years old. As such, the physical depreciation (PD) is  $(5/15 =) 33\%$ . This means that RCN less PD is  $[\$60,000 - (33\% \times \$60,000) = \$60,000 - \$19,800] = \$40,200$ .

Let's assume that there is no functional obsolescence. However, let's say that this lathe is located in a factory that is only operating at 15% capacity.

Using the inutility calculation (and a 0.7 exponent), this works out to approximately a 74% additional obsolescence adjustment. As such, the concluded value would be  $[\$40,200 - (\$40,200 \times 74\%) = \$40,200 - \$29,748] = \$10,452$  (rounded to \$10,500).

Remembering our original premise, which is that an appraisal is essentially an analysis of evidence and logic to estimate what would happen in a hypothetical transaction, we will need to turn to the market to determine which of these cost approach results most accurately reflect the market value of the lathe.

A search of the market shows that there are several comparable asking prices for similar lathes for \$30,000 to \$35,000 and a search of auction results shows a range of \$20,000 to \$23,000.

The inutility calculation results in a considerably understated value of \$10,500. The auction results show that the company could sell the asset for over double that value.

The original cost approach calculation, however, provided an overstated value of \$40,200.

USPAP requires appraisers to provide credible results. Neither the \$40,200 value nor the \$10,500 valuable would be credible based upon the marketplace data.

This is a simple and overexaggerated example but the authors have seen several valuations where a process very similar to this has been undertaken and a value opinion offered without regard to what an asset could sell for in the marketplace.

### Investigating a Less Obvious Market

The above scenario is for an asset where market data is available. In many cases the cost approach is undertaken for assets for which no existing marketplace exists or actual market data is scarce or unreliable. As such, there is no easy or obvious way to check whether the value conclusions are reasonable. What does an appraiser do in that situation?

In such situations the appraiser/valuer needs to take a deeper dive into the drivers that would influence the value of the asset if it were to be sold on the open market. The job of an appraiser is often akin to that of an investigative reporter or a detective. They are after the facts which are then used to develop a documented and supported conclusion of value. Often the appraiser/valuer must perform other procedures such as calling manufacturers and dealers actively involved with the subject to get their input on a hypothetical transaction.

An appraiser has several tools in their toolbox to quantify depreciation and obsolescence. Rather than describe those here, please refer to the excellent information available in *Valuing Machinery & Equipment: The Fundamentals of Appraising Machinery and Technical Assets*<sup>4</sup> and in various other articles published in the *MTS Journal*.<sup>5</sup>

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## Conclusion

The combination of analytical tools applicable to any given project will vary, but the ultimate objective remains consistent: to model what typical market participants would agree is a fair transactional price for an asset, given a particular set of circumstances. Appraisers must ensure that their adjustments for physical deterioration and obsolescence are accurate, avoiding errors such as double counting or overcompensation.

An appraisal is a process that integrates logic, evidence, and analysis to simulate the behavior of market participants in a hypothetical transaction. While the cost, income, and sales comparison approaches each provide distinct paths to determining a market value, they converge on the shared goal of answering the fundamental question: “What is this asset (or group of assets) worth?”

For the MTS appraiser, the cost approach stands out for its mathematical precision, yet appraisers must recognize that accurate computations alone are insufficient. Failing to account for physical deterioration, functional obsolescence, economic obsolescence, or prevailing market conditions can lead to values that misrepresent market realities.

Similarly, appraisers must be diligent when applying inutility or obsolescence calculations and must always verify their conclusions against market evidence. Values hinge on the informed decisions of buyers and sellers, which demands thorough investigation and integration of relevant market data.

Ultimately, the appraiser’s responsibility is to deliver a credible, well-substantiated opinion of value that mirrors the behaviors and expectations of market participants, ensuring the valuation aligns with real-world economic realities. By thoughtfully balancing analytical rigor with market insight, appraisers fulfill their essential role in providing reliable conclusions of value.

## About the Author

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<sup>1</sup> The values can be anything from a Forced Liquidation Value to a Fair Market Value transaction and anything in between.

<sup>2</sup> Under USPAP, the seven elements of the appraisal problem that must be disclosed in an appraisal report are client, other intended users, the intended use, type and definition of value, effective date of value, subject and relevant characteristics of the assignment, and the assignment conditions.

<sup>3</sup> Replacement Cost New or Reproduction Cost New

<sup>4</sup> Machinery & Technical Specialties Committee of the American Society of Appraisers, *Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets*, 4th ed., American Society of Appraisers (Herndon, Virginia: 2020)

<sup>5</sup> For example, see Engels, William, ASA, “Research: Tips to Make Your Interviews More Effective,” *MTS Journal*, Volume 39, Issue 1 (2023); 39-41.