

BUSINESS VALUATION DIGEST

BY JOSEPH L. BOWER

IN THIS ISSUE

Not All M&As Are Alike – and that Matters	1
Jointly-Retained Business Valuations in Disputes – Making Sure the Process Works.	11
Valuation of Data Processing Intangible Assets	18

The *Business Valuation Digest* is a publication of The Canadian Institute of Chartered Business Valuators. It is published semi-annually and is supplied free of charge to all Members, Subscribers and Registered Students of the Institute.

Statements and opinions expressed by the authors and contributors in the articles published in the Digest are their own, and are not endorsed by, nor are they necessarily those of the Institute or the Editorial Advisory Board.

EDITOR:

Tony P. Cancelliere, CA, CBV

EDITORIAL ADVISORY BOARD:

Mark L. Berenblut, CA, CBV
Nora V. Murrant, CA, FCBV
Blair Roblin, CBV, LLB

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the CICBV.

For more information, please contact:
The Canadian Institute of Chartered
Business Valuators
277 Wellington Street West, 5th Floor
Toronto, Ontario M5V 3H2
Tel: 416-204-3396
Fax: 416-977-8585

Not All M&As Are Alike – and that Matters

It's common to lump all M&As together, but there are five distinct varieties. If you can tell them apart, you stand a better chance of making them succeed.

We know surprisingly little about mergers and acquisitions, despite the buckets of ink spilled on the topic. In fact, our collective wisdom could be summed up in a few short sentences: acquirers usually pay too much. Friendly deals done using stock often perform well. CEOs fall in love with deals and don't walk away when they should. Integration's hard to pull off, but a few companies do it well consistently.

Given that we're in the midst of the biggest merger boom of all time, that collective wisdom seems inadequate, to say the least. I recently headed up a year-long study of M&A activity sponsored by Harvard Business School. That study sought to examine questions of M&A strategy and execution with a new rigor. Our in-depth findings will emerge over the next year or two, in the form of various books, articles, and cases.

Our work has already revealed something intriguing, however. The thousands of deals that academics, consultants, and business people lump together as mergers and acquisitions actually represent very different strategic activities. (See the table "M&A Strategies: Distinct Activities Mean Differing Challenges" for a breakdown of large

acquisitions from the last three years.)

- Acquisitions occur for five reasons:
- to deal with overcapacity through consolidation in mature industries;
- to roll-up competitors in geographically fragmented industries;
- to extend into new products or markets;
- as a substitute for R&D; and
- to exploit eroding industry boundaries by inventing an industry.

Despite the massive number of books and articles published about mergers and acquisitions, no one has ever tried to link strategic intent to the implications for integration that result. It stands to reason that executives overseeing each of these activities face different challenges. If you acquire a company because your industry has excess capacity, you have to figure out quickly which plants to close and which people to lay off. If, on the other hand, you acquire a company because it is developing a hot technology, your challenge is to hold on to the acquisition's best engineers. These two scenarios require the acquiring company to engage in nearly opposite managerial behaviors.

I will turn now to the problems that arise in different types of acquisitions, which I will examine using the resources-processes-values framework. Resources refer to tangible and intangible assets, processes deal with activities



that turn resources into goods and services, and values underpin decisions employees

make and how they make them. (See the sidebar "Some Order in the Chaos" for more on these terms.)

M&A Strategies

Distinct Activities Mean differing Challenges

	The Overcapacity M&A	The Geographic Roll-up M&A	The Product or Market Extension M&A	The M&A as R&D	The Industry Convergence M&A
Example	Chemical Bank buys Manufacturers Hanover and Chase; Daimler-Benz acquires Chrysler.	Banc One buys scores of local banks in the 1980s.	Quaker Oats buys Snapple.	Cisco acquires 62 companies.	Viacom buys Paramount and Blockbuster; AT&T buys NCR, McCaw, and TCI.
Strategic Objectives	The acquiring company (part of an industry with excess capacity) will eliminate capacity, gain market share, and create a more efficient operation.	A successful company expands geographically; operating units remain local.	Acquisitions extend a company's product line or its international coverage.	Acquisitions are used in lieu of in-house R&D to build a market position quickly.	A company bets that a new industry is emerging and tries to establish a position by culling resources from existing industries whose boundaries are eroding.
Major Concerns	<p>You can't run a merged company until you've rationalized it, so decide what to eliminate quickly.</p> <p>If the acquired company is as large as the acquiring one and its processes and values differ greatly, expect trouble. Nothing will be easy.</p> <p>If it is a so-called merger of equals, expect both companies' management groups to fight for control.</p> <p>These tend to be onetime events, so they're especially hard to pull off.</p>	<p>Members of the acquired group may welcome your streamlined processes. If they don't, you can afford to ease them in slowly.</p> <p>If a strong culture is in place, introduce new values with extreme care. Use carrots, not sticks.</p> <p>These are win-win scenarios, and they often go smoothly.</p>	<p>Know what you're buying: the farther you get from home, the harder it is to be sure.</p> <p>Expect cultural and governmental differences to interfere with integration.</p> <p>The bigger you are relative to your target company, the better your chances for success.</p> <p>The more practice you have, the better your chances for success.</p>	<p>Build industrial-strength evaluation processes so that you buy first-class businesses.</p> <p>This category allows no time for slow assimilation, so cultural due diligence is a must.</p> <p>Put first-rate, well-connected executives in charge of integration. Make it a high-visibility assignment.</p> <p>Above all else, hold on to the talent if you can.</p>	<p>Give the acquired company a wide berth. Integration should be driven by specific opportunities to create value, not by a perceived need to create a symmetrical organization.</p> <p>As a top manager, be prepared to make the call about what to integrate and what to leave alone; also, be ready to change that decision.</p>

Scenario 1: The Overcapacity M&A

A great many mergers and acquisitions occur in industries that have substantial overcapacity; these tend to be older, capital-intensive sectors. Overcapacity accounts for 37% of the M&A deals in our breakdown. (See the exhibit "Rationales for M&A Activity.") Industries in this category include automotive, steel, and petrochemical. From the acquiring company's point of view, the rationale for acquisition is the old law of the jungle: eat or be eaten. This kind of deal makes strategic sense, when it can be pulled off. The acquirer closes the less competitive facilities, eliminates the less effective managers, and rationalizes administrative processes. In the end, the acquiring company has greater market share, a more efficient operation, better managers, more clout, and the industry as a whole has less excess capacity. What's not to like? (Unless you overpaid.) Thousands of deals are undertaken with these objectives in mind. However, few of these deals have been judged successful after the fact. Why?

Decades of experience show us that it's extraordinarily difficult to merge well-established, large companies that have deeply entrenched processes and values. This, of course, describes most companies in mature industries. These are usually win-lose games: the acquiring company keeps open more of its own facilities, retains more of its own employees, and imposes its own processes and values. Employees of the acquired company don't have much to gain. As with any win-lose scenario, the loser doesn't make it easy for the winner. And because these are often megamergers, they tend to be onetime events, so the acquirer doesn't learn from experience.

For those reasons and more, excess-capacity deals require special attention, since just about anything that can go wrong with integration does. I'll explain each element along the resources-processes-values spectrum.

First, consider resources. It's far from easy to make good on the goal of rationalization. Inevitably, irrational factors intervene, in the form of interorganizational power dynamics, legal issues, or plain old human nature. These issues complicate what might initially seem to be clear priorities.

Let's start at the top, with the senior managers from both companies. Especially in a merger of equals, this piece is always messy, time-consuming, and political. Management teams focus their energies on the battle to maintain their positions, and the business suffers. This pattern is repeated all the way down the ranks. Problems exist even in acquisitions where one company is much larger. The best people from the new company are likely to leave. When mixed teams remain, employees must reconcile company cultures. Years after such mergers, it is common for managers from acquirer Alpha to describe an employee from the acquired company as a Beta company guy.

Deciding which physical facilities to eliminate is not necessarily simpler or cleaner than deciding which people to cut. Facilities vary by location, product mix, accounting costs, environmental problems, degree of governmental oversight, and staffing. Companies inevitably argue about the relative quality of their resources. The surviving business will usually assert that its resources are superior, but that is not always the case. And acquired managers, asked to decide which facilities or product lines to cut, are almost never able to design a good exit strategy; they're just too invested in the status quo.

Al Dunlap claimed that these cuts can be made quickly and with blunt tools. However, case studies of Scott Paper, where Dunlap (as CEO) succeeded, and Sunbeam, where Dunlap (as chairman and CEO) didn't, reveal something else. At Scott Paper, operating managers had an extensive understanding of the need for rationalization and how it could be accomplished; at Sunbeam, they did not. Dunlap's top-down approach - and his bluster - masked the important work of lower-level Scott Paper managers.

Business processes are no easier to integrate than employees. Large companies have elaborate systems for measuring performance, developing products, and

allocating resources, which are absolutely central to how they do business. Simply imposing a set of new systems takes time, and it may take years for managers to use them effectively. When Daimler-Benz and Chrysler merged, the questions multiplied by the day, and they ranged from the trivial to the profound.

Daimler-Chrysler started as a merger of equals in an industry the two companies' analysis revealed to have staggering overcapacity. The top management of both companies recognized the particular assets and qualities that made the other a perfect fit. But startling differences in their management approaches soon disrupted their working relationships.

German management-board members had executive assistants who prepared detailed position papers on any number of issues. The Americans didn't have assigned aides; they formulated their decisions by talking directly to engineers or other specialists. A German decision worked its way through the bureaucracy for final approval at the top. Then it was set in stone. The Americans allowed midlevel employees to proceed on their own initiative, sometimes without waiting for executive-level approval. The Germans smoked, drank wine with lunch, and worked late hours, sending out for pizza and beer. The old Chrysler banned smoking and alcohol in its facilities. The Americans worked around the clock on deadlines but didn't stay late as a routine.¹

Not surprisingly, these cultural and process differences were exacerbated, not improved, when tensions between the people at the very top intensified. When Thomas Stallkamp, Daimler-Chrysler president, created an in-house advisory staff to support the Chrysler members of the Daimler-Chrysler board, Jurgen Schrempp, Daimler's CEO, accused him of block voting. When Stallkamp raised questions

about working style, Schrempp chastised him for whining.

Finally comes the issue of differing company values. These are somewhat harder to pin down than processes, but they're just as important. Values include shared assumptions about what the company owes its employees and vice versa, which kinds of behaviors are rewarded, and what the company stands for. It's common for companies that merge in mature, oligopolistic industries to have similar values. For example, when Chemical Bank acquired Manufacturers Hanover and, later, Chase, these New York banks had similar cultures led by professional bankers, and their integrations were successful.

But when participants in a megamerger don't share values - as in the case of Daimler and Chrysler - serious problems can arise. As I've noted, these companies' working styles and assumptions were extremely different from the start. And their differences ran even broader and deeper than they first appeared to. Daimler was an engineering-centered company; Chrysler was more sales and marketing focused. Daimler executives had more perks, but Chrysler executives were paid much more. Schrempp, Daimler's dynamic leader, thought he had acquired a lean, innovative automobile company. For him, the entire experience was frustrating. Having moved into the ex-president's office at Chrysler, in Auburn Hills, Michigan, he turned off the sprinkler system so that he could smoke cigars, and he installed a bar for his red wine. He could do that.

What he couldn't do was hold on to the people he needed. The sources of Chrysler's energy - the top leaders of Chrysler's manufacturing, engineering, and public relations departments - left quickly as they learned that their fate was to subordinate themselves to the functional bureaucracies in Stuttgart. The perfect fit that seemed so obvious in the abstract was foundering on very real, fundamental differences in the way two groups of managers thought about themselves, their roles, and their companies.

Integrating companies and cultures is complex and idiosyncratic. No rule fits all situations, of

1. Bill Vlasic and Bradley A. Stertz, *Taken for a Ride: How Daimler-Benz Drove off with Chrysler* (Harper Collins, 2000).

course, but some general observations can be made about the merger and acquisition process, and a list of recommendations follows the discussion of each strategic activity. These guidelines discuss what works, what does not, and what to watch out for as you consider a merger or acquisition.

Recommendations

You can't run the merged company until you've rationalized it, so figure out how to do that quickly and effectively. Don't assume your resources are better than the acquired company's resources. And don't expect people to destroy something they've spent years creating.

Impose your own processes quickly. If the acquired company is as large as yours and its processes are dissimilar, expect trouble. Some key people will leave, making it harder to rationalize

the merged entities. Voluntary agreement is best, but early agreement is necessary. Don't try to eradicate differences associated with country, religion, ethnicity, or gender.

Remember that if a high premium is required, you'll have even less time to get results.

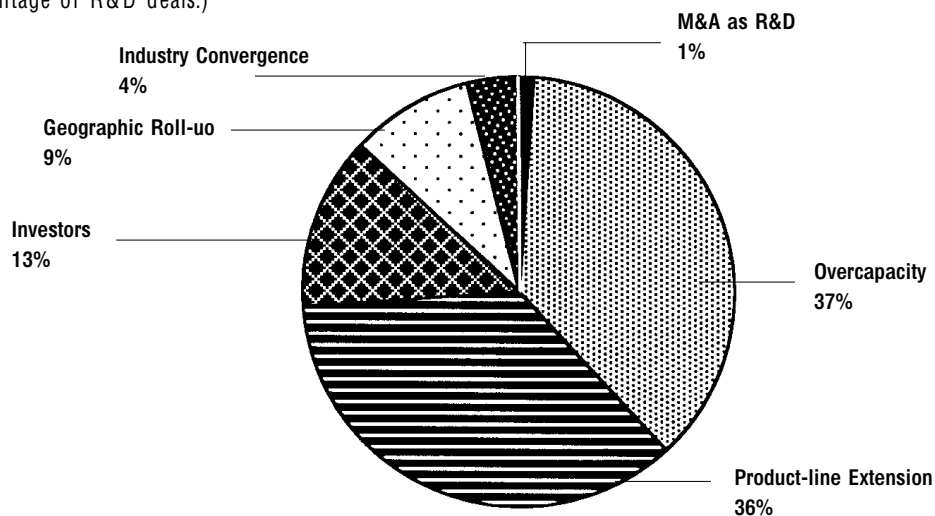
But if what you've acquired is valuable precisely because of processes and values, then time is required. Conquests by executives who didn't understand or appreciate those processes before the deal won't work after the deal is done.

If you're considering a megamerger and the two companies' processes and values aren't similar, back off and reconsider.

Rationales for M&A Activity

1997 – 1999

To determine the relative importance of the rationales identified in this article, I analyzed all U.S. M&A deals over \$500 million made between 1997 and 1999. Overcapacity deals and product-line extensions were the most common. The third-largest category was a type not covered in this article: deals in which a multibusiness company sold a division to a financial acquirer. Geographic roll-ups were next. Not surprisingly, M&A as R&D and industry convergence deals are still uncommon compared with the more established strategic rationales. (I suspect that, had I looked at M&As in the \$250 million to \$499 million range, we'd have seen a higher percentage of R&D deals.)



The data for this analysis are from Securities Data Company. Target companies and acquirers were identified by a four-digit SIC code. When the acquisition was made by a division of a multibusiness company, the division's SIC code identified the acquirer. Where the SIC code of an acquiring division was not identified, the deal was dropped. The sample contained 1,036 deals. The deals were sorted by strength-of-business similarity measured by comparing the companies' SIC codes. Deals in which all four SIC code digits matched were most alike, followed by three-digit matches, then two-digit matches, and so on.

Scenario 2: The Geographic Roll-up M&A

Geographic roll-ups, which appear at first glance to resemble overcapacity acquisitions, differ substantially in part because they typically occur at an earlier stage in an industry's life cycle. Many industries exist for a long time in a fragmented state: local businesses stay local, and no company becomes dominant regionally or nationally. Eventually, companies with successful strategies expand geographically by rolling up other companies in adjacent territories. Usually, the operating unit remains local if the relationship with local customers is important. What the acquiring company brings is some combination of lower operating costs and improved value for the customers.

Because both overcapacity acquisitions and geographic roll-ups consolidate businesses, they can be difficult to tell apart except on a case-by-case basis. However, they vary in some fundamental ways. For one thing, their strategic rationales differ. Roll-ups are designed to achieve economies of scale and scope and are associated with the building of industry giants. Overcapacity acquisitions are aimed at reducing capacity and duplication. They happen when the giants must be trimmed down to fit shrinking world markets.

Geographic roll-ups - unlike excess-capacity acquisitions - are often a win-win proposition, and, consequently, they're easier to pull off. Being acquired by a larger company can help a smaller company solve a broad range of problems. These include succession; access to capital, national marketing, and modern technology; and competitive threats from larger rivals. For the acquirer, the deal solves problems of geographic entry and local management. The large accounting firms were assembled this way. So were the superregional banks, the large chains of funeral homes, many hotel chains, and the emerging, large Internet consulting companies.

Resources aren't usually an issue in geographic roll-ups; the acquirer generally wants to keep the smaller company intact and very often retains local management. (I should add a caveat: resources aren't a problem, unless it turns out you didn't buy what you thought you did. Of course, any type of M&A deal can turn out to be a poor target-company choice and cost more than it was worth.) The challenges are largely about introducing the company to new processes and values.

While holding on to the target company's resources (local managers, brands, and customers), the acquirer nearly always imposes its own processes (purchasing, IT, and so on). Quite often, the deal makes sense because of the acquirer's processes: they turn the target company into a far more efficient business. But acquirers don't need to rush this second step along; in fact, they should go easy in the beginning. Target-company managers often need time to familiarize themselves with the new processes.

Banc One had a remarkably successful history of rolling up local and regional banks during the 1980s and early 1990s. It was particularly attentive to process issues. Under the rubric of "The Uncommon Partnership," Banc One's managers moved quickly to install their more straightforward processes for handling banking mechanics. But they allowed managers of acquired banks to learn how to meet new economic objectives much more gradually, using extensive mentoring and training as well as creative compensation incentives.

Many roll-ups involve the purchase of small, sometimes family-owned, businesses. If these small companies have strong, distinctive values, acquirers that force them to change quickly may lose the baby with the bathwater. This happened when Cap Gemini Sogeti bought the MAC Group and alienated the consultants, prompting an exodus of MAC talent. Cap Gemini's executives worked mostly on large systems projects, and they didn't know how to handle the MAC Group's highly paid strategic problem solvers.

Recommendations

Acquired companies often welcome more streamlined, efficient processes. But if you encounter substantial resistance, you can afford to ease the target company's employees into new processes. In geographic roll-ups, it's more important to hold on to key employees - and customers - than to realize efficiencies quickly.

If a strong culture is in place, introduce different values subtly and gradually. Carrots work better than sticks - especially with high-priced, hard-to-replace employees.

Scenario 3: The Product or Market Extension M&A

The third category is the M&A deal created to extend a company's product line or international reach. Sometimes these are similar to geographic roll-ups; sometimes they involve deals between big companies. They also involve a bigger stretch - into a different country, not just into an adjacent city or a state.

The likelihood of success depends in part on the companies' relative sizes. If near equals merge, the problems that crop up in overcapacity deals are in play: difficulties imposing new processes and values on a large, well-established business. If, on the other hand, a large player (think GE) is making its nth acquisition of a small company, chances for success go way up.

Although extension deals have much in common with roll-ups, the challenges of introducing new processes, let alone values, are greater. When Quaker Oats acquired Snapple, for instance, it found that its advertising and distribution processes were wholly unsuited to the target company's product line. Similarly, British retailer Marks & Spencer found that its famed distribution systems couldn't cope with Canadian geography when it acquired Peoples Department Stores.

GE, by contrast, has enjoyed great success with exactly this type of acquisition. Under Jack Welch's leadership, the giant company has learned to be extremely careful about the kinds of symmetry it imposes on its businesses. Executives identify and pay attention to the important distinctions between

GE central and valued acquisitions.

Take Nuovo Pignone, the Italian engine producer GE acquired in 1992 from ENI. It would be hard to imagine two companies - one in Turin, Italy, and the other in Schenectady, New York - that differ more from each other culturally. Both enjoy technical excellence, but the Italians had operated in the stultifying culture of a state-owned and subsidized conglomerate run with substantially political objectives - hardly Jack Welch's GE. Still, Paolo Fresco, then GE vice chairman responsible for international operations, wanted to prevent the "colonization" of Nuovo Pignone. As a result, he introduced a president whose explicit task was to "keep the bureaucrats away." GE systems would be introduced in time, but far more critical was getting NP's managers to use GE's resources to grow their business.

Recommendations

Know what you're buying. The farther you get from your home base, the harder it is to be confident of that knowledge.

Be aware that processes you consider core may turn out to be very different from those used by the target company. Cultural differences and governmental regulation often interfere with the implementation of core processes.

Take the time to figure out how the target company achieved the success that led you to buy it. If it's brilliant at product development and you're not...well, you figure it out.

Keep in mind that the bigger you are relative to your target company, the better your chances for success.

Scenario 4: The M&A as R&D

The next-to-last category, acquisitions as a substitute for in-house R&D, is related to product and market extensions, but I'll treat it separately because it's so new and untested. An assortment of high-tech and biotech companies use acquisition instead of

R&D to build market position quickly in response to shortening product life cycles. As John Chambers, Cisco's president and CEO, says, "If you don't have the resources to develop a component or product within six months, you must buy what you need or miss the opportunity." Since 1996, Cisco has acquired 62 companies, as it races to dominate the Internet server and communication equipment fields. From the target company's point of view, an acquisition is often desirable, since it takes a massive amount of money to build a sustainable company in technical markets. And potential acquirers (such as Microsoft) can easily crush you if you compete with them directly.

The successes of Microsoft and Cisco, both of which aggressively substitute acquisitions for R&D, indicate that the strategy can work. But the results of long-term research with a large sample are not in yet. Some evidence suggests it's a better strategy for IT than for biotech companies; many of the pharmaceuticals' R&D acquisitions have yet to pay off. The difference may well relate to the modularity of IT design. According to Carliss Baldwin and Kim Clark in their book *Design Rules, Volume 1, The Power of Modularity*, many computer and chip designs are based on compatible independent components, and this makes it simpler to buy technology that can be readily integrated. In contrast, we can imagine that the organic nature of pharmaceutical products makes integration far more difficult.

It's much too soon to attempt any definitive statements about the challenges facing R&D acquirers. But I can point out the obvious trouble spots, which spread pretty evenly across the resources-processes-values spectrum.

One huge challenge acquirers must face is holding on to key people. The expertise of these individuals is far more valuable than the technology they've developed. Generally, the acquisition won't succeed if they leave. Yet in all likelihood, the acquisition itself

made these people rich, so they can easily leave if they don't like the ways in which the company is changing. And no matter how careful acquirers are about imposing new processes and values, the small, entrepreneurial company is going to feel a lot more constrained - even bureaucratic - than it used to. A regional banker who sold out to Banc One could enjoy the low-cost capital, broad product range, and marketing power of the bigger bank, while still holding on to the title "president" - and generally reckoned it a good deal. However, it takes considerably more skill and effort on the acquirer's part to keep scientist-managers happy. I know one IT executive whose company's organization was obsessively nonhierarchical and fluid. Imagine how he felt when he received this call from the acquirer's head of HR. "We need the grade classifications for all your people," she told him. "What's a grade?" he replied.

This problem is complicated by the need for speed. Unlike with geographic roll-ups and traditional product or market extensions, the acquirer should waste no time linking the target company into its existing structure, because the terrain shifts so quickly.

A second challenge is making sure your own people don't mess things up. The "not invented here" syndrome is alive and well in today's technology giants, and it can easily foul a deal. In cases where the target company bet one way on a technical issue and the acquirer bet another, the in-house scientists will resent the outsiders. This has to be handled with great care. Cisco manages this tension extremely well; it is part of the company's culture to assume an acquisition is sometimes superior.

Recommendations

Again, know what you're buying. Netscape and a host of other high-tech companies bought second-rate technology again and again. This doesn't lead to first-rate business results. Cisco, by contrast, has industrial-strength evaluation processes.

There is no time for slow assimilation when substituting acquisitions for R&D. The new people won't work if the vision and values aren't compatible. Cultural due diligence is especially important when bringing in people who are giving

up the CEO title and have the wealth to walk away. Put well-regarded, powerful executives in charge of acquisition integration. Divest them of all other responsibilities during an important integration. Make this into a core competency, and a high-visibility assignment.

Spend equal amounts of time keeping the new people happy and fitting the new product or technology into existing activities.

Scenario 5: The Industry Convergence M&A

The first four categories involve changing the relationships among a particular industry's players. The final one involves a radically different kind of reconfiguration. It entails inventing an industry and a business model based on an unproven hypothesis: that major synergies can be achieved by culling resources from existing industries whose boundaries seem to be disappearing. The challenge to management is even bigger than in the other categories. Success depends not only on how well you buy and integrate but also, and more importantly, on how smart your bet about industry boundaries is.

As with M&A as R&D, this approach is hard to analyze rigorously. In this case, though, this difficulty is not because it's a new kind of activity. (When William Durant formed the vertically integrated GM, he was creating an industry.) The problem here is that attempts to gain strategic leverage by assembling disparate companies are idiosyncratic. Despite the players' sizes, this is entrepreneurial activity in progress, and success right now seems to depend as much on the entrepreneur's skill and luck as on anything else.

AT&T's recent history shows just how hard it is to make these bets and win. When AT&T acquired computer manufacturer NCR, it did so because AT&T (and many others) thought that computers and telecommunications were convergent industries. The combination never succeeded. By contrast, AT&T's purchase of McCaw's wireless telephone business has worked well. Whether the financial returns justify the price AT&T paid for McCaw is a different question. AT&T has recently made major purchases in the cable television industry, in

particular TCI, cable baron John Malone's geographic roll-up. Now we read that AT&T is separating itself into four units. At a minimum, one can conclude that AT&T's strategy is evolving.

Several entertainment companies are evidently doing better with this approach. Viacom seems to be enjoying success as a "global-branded entertainment content provider." It has a movie studio (Paramount), cable networks (MTV and Nickelodeon), and a video distributor (Blockbuster) that all run independently on a day-to-day basis. Viacom has used Paramount's movie library to drive the international expansion of MTV and Nickelodeon and to fix the industry structure of video rentals. Nickelodeon's branded cartoons, meanwhile, have helped Paramount control the cost of entertainment talent. Disney and Rupert Murdoch's News Corporation are active in the same arena.

In other industries, it's difficult to say why one convergence deal works and another fails. Sears, Roebuck thought that financial services was a natural extension of retailing but later chose to divest Discover and Dean Witter. American Express stumbled badly trying to add Shearson's retail brokerage and casualty insurance to its IDS business activities. On the other hand, the marriage of investment bank Morgan Stanley and Dean Witter Discover seems to be thriving.

At this stage, I'd be hard-pressed to say what works and what doesn't. But I will offer some tentative observations and Recommendations.

Recommendations

Successful convergence deals seem to follow a sequence of steps. First, the acquirer's accounting-and-control systems are installed at the target company. Next, the acquirer starts to rationalize the nonessential processes (but there seems to be no great rush). Finally, the portfolio is pruned of businesses that don't fit the acquirer's strategic objectives.

After those adjustments have been made, subsidiaries are allowed a high degree of freedom. Attempts to integrate the business are driven by specific opportunities to create value, rather than by any perception that symmetrical organizations and systems are important.

Top managers are integrally involved in deciding where to impose links; strategic integration is not a natural bottom-up activity. Intervention must be made with considerable diplomatic skill. (Successful despots do exist, but they are well-liked despots, and that is no accident.)

Varying Flavors, Differing Challenges

Rapid strategic change is a necessity for most companies in these days of globalization, hypercompetition, and accelerated technological change. Accomplishing change through acquisition appeals to a great many managers. What I have found by studying the record is that acquisitions come in several distinct flavors, and that each type presents managers with a different set of challenges.

In closing, it might be worth reporting a final challenge, what I call the "bluefish phenomenon." Some readers of this article will have experienced the spectacle of a bluefish feeding frenzy. When a school of blues comes across a school of herring or similar small fish, the blues go wild, charging every which way in an effort to gorge themselves. If you happen to be fishing in the surf, one may well bite your leg.

When capital is extensively available and companies are busy doing deals, some executives start behaving like bluefish. Doing deals is exciting. Making one's company bigger is thrilling. And the prospect of solving the problem of competing in a difficult industry by buying a competitor or diversifying into a related field can seem very appealing - a simple way out of an apparently hopeless industry situation. When the investment banker calls with a prospect,

the executive bites. And having eaten once and enjoyed it, the executive will bite again.

Many deals fall into this category. They are justified with one of the strategies discussed, but the quality of thinking, preparation, and postmerger management is inferior. Once in a while, the result is a success. But the reason is luck combined with superior scrambling by the acquirer - not good strategy, careful preparation, and skilled execution. Often the costs are very high: the CEO's job or the acquirer's independence. As I write, Quaker Oats is in the last chapter of that story.

The recommendation here is simple. M&A is a means to an end. If the strategy is unclear, there is no reason for a company to go down one of the more difficult paths it can follow.

Joseph L. Bower is the Donald K. David Professor of Business Administration at Harvard Business School in Boston. This is his sixth article for HBR. His most recent article, coauthored with Clayton M. Christensen, was "Disruptive Technologies: Catching the Wave" (HBR January-February 1995).

Reprinted by permission of Harvard Business Review. This article was originally published in the March 2001 issue of Harvard Business Review.

BY MICHAEL A. PASCHALL, ASA, FCA
GEORGE B. HAWKINS, ASA, FCA

Jointly-Retained Business Valuations in Disputes- Making Sure the Process Works

Family law attorney: Our business valuation expert came in at a value of \$1 million for the business while their business valuation expert came in at a value of \$10 million for the company. We have no idea what the judge is going to do here - he may go entirely with one side, he may just split it down the middle, or he may make us hire additional valuation experts. I have no idea which one of these numbers is correct - they both might be wrong. This whole process is costing these people tens of thousands of dollars just to arrive at one number. There has to be an easier way to do this.

Increasing Popularity of Jointly-Retained Valuation Agreements.

Does the above scenario sound familiar? Apparently it does to a large number of family law, corporate law, and litigation attorneys since the current trend in the legal field is a movement towards the joint retention of an independent valuation expert to prepare an independent valuation report to resolve disputes where valuation is a key issue. As opposed to each side hiring their own expert, by agreeing to jointly retain one independent business valuation expert, both sides of a dispute usually can save thousands of dollars as well as a great deal of time and anguish. Furthermore, under joint retention, there may be a greater sense that the process has been fair.

Our experience in the business valuation field has led to the observation of a definite national trend moving in this direction, whether by becoming more accepted practice in various geographic regions, or by statutory decree as in divorces. In fact, one county in California (discussed later) now requires independent, joint appraisals in family law cases. The typical scenario in which joint retention is used is in divorce cases or dissenting shareholder actions, however, joint retention can be used successfully before the matter ever reaches court, such as in settlement attempts or arbitrations. Its use, however, is not limited to legal disputes, as joint retention can

be used to successfully navigate the issues of a shareholder departing a company, the purchase of stock under a buy-sell agreement, family business transition to successive generations and so on.

Merely having a third party prepare the valuation does not guarantee that the outcome will be a success and that litigation over value will not result or continue. However, if the joint appraisal process is designed and followed correctly, the odds of a successful outcome can be markedly improved. This article will summarize the basic elements needed for success based on Banister Financial's experience over many years of preparing jointly-retained appraisals.

Identifying the Right Business Appraiser

In the typical joint retention situation, the attorneys for both parties will usually compile a list of potential valuation experts and then compare their lists to see if both parties can decide on the use of a particular business appraiser. If the case is definitely going to trial, both attorneys can draft an order for the judge to approve, appointing the valuation expert on behalf of the court. In other situations, the parties may not agree on an appraiser and the court may appoint a business valuation expert on its own. In some cases, the jointly-retained valuator derives a value merely to facilitate settlement negotiations.

Character and Integrity a Must.

Selecting the right business appraiser for the job is the most important aspect of all. Assuming the candidate is competent (this is addressed in a separate article), having the most degrees and certifications and following the best procedures in the world will mean

nothing if the appraiser is not honest and unbiased. Integrity is the most important appraiser attribute. The appraiser must be able and willing to objectively listen to the views of the parties and arrive at his or her own unbiased view of the picture, even if this assessment of value is ultimately not to the liking of either or both parties. The appraiser must reach a conclusion of value that is supported by the unique facts and circumstances present, irrespective of what the competing parties believe.

Some business appraisers want both parties to be happy and believe that if the appraisal can come down in between the competing views this will make the parties happy and lead to more jointly-retained jobs for the business appraiser in the future. This is not business appraisal, nor is it fair to the parties involved. Business appraisal is about determining the market value of an asset, not about being a psychologist. The appraiser must be willing to call the valuation shots as they are. Trying to engineer a value to make both parties happy is not what valuation is all about. Ultimately, the goal is for the appraiser and the process to be fair. Hopefully the parties will also perceive this to be the case, regardless of whether or not they like the outcome.

To enhance the prospects for a successful jointly-retained assignment, it is important to remember that the parties to the case will be attuned to some sign that the appraiser might be favorable or unfavorable to their position, whether by the appraiser's demeanor, questions asked, or willingness to listen. Even though the appraiser must remain objective, it is important to remember that one's actions can cause the perception by others that the appraiser's objectivity has become tainted. Therefore, the business appraiser should bend over backwards to be unemotional, straightforward, diligent and objective in all interactions with the parties.

Establishing the Ground Rules of a Joint Retention.

While the use of a jointly-retained business appraiser can be a key benefit, it is important that certain ground rules be established before the valuator does any work. If the parties to the process know the anticipated timeline and procedure of the valuation process, the chances for a successful outcome can be dramatically improved. While this sounds like obvious advice, it is surprising how often this does not occur. Furthermore, in many cases where one or both parties are not aware of the process, the outcome usually is bad. Imagine spending thousands of dollars and months of time to get to the end of the process, only to have the result blow up over comments like this:

"The Company didn't copy me on that memo they sent the business appraiser, so they must be trying to give him a distorted picture without allowing us to present the other view. I wonder what else they gave him that we didn't know about. I don't believe the value."

In our experience, the key issues to resolve on the front end include the following:

1. Written Correspondence.

It is crucial that the jointly-retained business valuator not only be independent, but also appear to be independent. It goes without saying that the professional appraiser must be unbiased, but if there is even a perception of bias in how the process is handled, one party or the other may reject the ultimate valuation findings even though they are valid, negating the whole point of using a jointly-retained appraiser. One way to be and appear to be unbiased is to be sure that all correspondence between the two attorneys and the business appraiser is copied to each of the parties. That is, if the business appraiser sends a letter to attorney A, the business appraiser should copy attorney B on that letter. Likewise, if attorney B sends a letter to the business appraiser, attorney B should copy attorney A on that letter. This practice creates more paperwork, however, it lessens or eliminates the appearance that one party is having

privileged, ex parte conversations with the business appraiser without the knowledge of the other side. It also lessens or eliminates the possibility that the business appraiser will receive key information or data that has not been available to the other side.

2. Information Gathering.

Before the business appraiser can begin the valuation process and intelligently know the questions to ask in the company interview, he or she must first be provided a wide variety of information needs about the company. This is best gathered based on an information needs list that will be tailored to the company, its business and industry, and submitted to the parties. In setting the procedures for jointly-retained valuations, it is important to determine the person responsible for preparing and submitting information. This clarifies to the valuator the person to contact if there is a delay in receiving the information. Also, this contact person will be utilized for follow-up purposes to see if any questions have arisen on the data that is being requested. Information needs lists have a habit of sitting in an inbox somewhere in an organization, and are often way down on an individual's "to do" list since it is not a great deal of fun to gather and copy the amount of documents needed. Having a key contact allows for appropriate follow-up by the parties to make sure the project doesn't languish.

In court appointed valuations, attorneys will often set time frames outlining when the documents must be provided to the appraiser. In our experience, attorneys often set the time frames too short (a week or two), and also do not provide for the possibility that the appraiser may identify new needs as the valuation progresses. Setting too short a date for document production often causes the producing party to short-change the process and leave out information that could have been included given sufficient time. Although a reasonable time frame varies depending on the complexity of the assignment, a good working figure needed might more reasonably be a month.

3. Interviews.

In any business valuation engagement, it is critical to interview management at the company to

derive a better overall understanding of the business and its various aspects and risks. In the jointly-retained situation, it is critical to determine in advance at least some of the specific parties that will be interviewed for the valuation (we say "some" because in any assignment it may be necessary to speak to others within a company with expertise or issues on a specific topic as it emerges). In disputed situations, these interviews usually also include (in addition to company management) the parties to the case (i.e., the husband and wife in a divorce matter, or the minority and majority shareholders in a dissenting shareholder matter). In many cases, these parties are already active in the management of the company.

In our experience, it is far better to conduct these interviews individually (as opposed to having both parties in the room at the same time), as this usually will reduce the potential for conflict and increase the potential for candor. We have also found it best to have all parties and their respective counsels to agree that the interviews will be conducted without the presence of the attorneys. In our experience, the free flow of responses to questions does not occur as readily and the information becomes filtered when the attorneys are present. Some attorneys chafe at this recommendation when we discuss setting the ground rules, although most attorneys ultimately agree to not being present. Although not present during the interview stage, the attorney can still be heard during the comment period. Obviously, if both parties desire to have counsel present, this wish needs to be accommodated.

4. Draft Valuation Report.

Every company is unique and there are many specific factors the appraiser must consider to arrive at a supported valuation, even if the purpose is for a non-litigation related reason (e.g., sale of company, estate planning, etc.). Therefore, it is always a good idea, where possible, to send a preliminary

draft report to the parties. A draft report allows the parties to review for accuracy and to ensure that there are no other issues, risks, or factors that were not brought to the attention of the appraiser that might reasonably impact the value. This is especially true in a litigated valuation setting where the added "suspicion factor" is present (i.e., one party being concerned that the other party will distort the picture for the appraiser or that he or she will be duped, resulting in an outcome that is inaccurate and unfair).

Issuing a draft report allows both sides to review the report and comment on its contents and result before the final valuation findings are concluded and printed. As with the copy-all-parties procedure recommended for any written correspondence, it is important that each side of the dispute receive the draft copy at the same time and that no preliminary results are "leaked" (orally or in writing) to one side before the other. For example, arranging for overnight, next-morning delivery to both parties should minimize the chance that one party has the report for a significant time before the other party.

5. Comment Periods.

The purpose in issuing the report initially in draft form is to give the parties a chance to review and understand the methodologies and techniques utilized by the appraiser. The independent business appraiser wants constructive feedback on his or her report, as there may be issues with the company that the appraiser did not give enough attention to or needs to readdress, factors of which the appraiser was not made aware, or simply matters where a party has a different opinion than the appraiser. Furthermore, allowing comment on the draft report enables the parties to have some input in the matter and at least have the opportunity to voice their opinion as to issues in the report. While a comment period is a necessary and beneficial stage of the valuation process, it is

crucial that the parties and the appraiser agree beforehand to some ground rules.

6. Length of Comment Period Should Be Limited.

The comment period should be for a limited amount of time (such as two weeks). This forces the parties to immediately focus their attention on the report and make its review a priority. Business valuations can be complex documents (particularly for people who do not have any financial training or experience), therefore, the time period should not be so short that a meaningful review of the draft cannot be done. However, if the time period is too long, review of the report either falls by the wayside or, worse, allows more time for "fishing expeditions" where parties attack every minute detail of the report (including issues that have little or nothing to do with the ultimate value). Furthermore, longer time periods allow for emotions to simmer and potentially boil over. A limited time period forces the parties to give their immediate attention to the report and focus only on the major issues. Banister Financial has found very few instances where a two-week comment period was not acceptable.

7. Submission of Comments in Writing Only.

Hand in hand with the limited time period aspect suggested above, the parties should also agree beforehand that any comments on the draft during the comment period will be in writing only and will be copied to the opposing party. It should be made clear that oral comments will not be considered, as they would most likely be ex parte, not allowing the other side a chance to refute. Furthermore, requesting comments in writing forces the parties to clarify and carefully organize their thoughts, a far superior form of feedback as opposed to the potential of numerous long, rambling telephone calls contesting every conceivable issue in the draft report. Early in our careers we learned that these phone calls often have little to do with issues relevant to the value, but rather involve emotional issues about how one side has been wronged by the other. Requiring written comments keeps the parties from focusing

on the emotional element. The parties may well have valid issues about who did what to whom, however, if these issues do not relate to value, they need to be dealt with separate and apart from the valuation process.

8. Providing for a Subsequent Second Comment Period.

In most cases, a second comment period is needed and should be set forth prior to undertaking the joint appraisal. The first comment period enables both parties to voice their issues, differences in opinion with the valuation, corrections and other matters for consideration by the appraiser. However, neither party wants to be precluded from responding if they believe that the comments raised by the other party are erroneous and would result in misleading the business appraiser before his or her issuance of a final valuation report. Therefore, in the majority of instances Banister Financial proposes at inception that both parties agree to procedures that allow for a second follow-up comment period where new issues can be raised or the issues raised by a party in the first round can be refuted by the other party.

9. Avoiding Oral Reports.

Unless there is a very compelling reason, it is generally wise to avoid engagements where only an oral report will be given. Oral reports are an invitation to potential disaster, since clients often will hear what they want to hear and ignore that which they do not want to hear. Additionally, there is a risk the appraiser may fail to raise a key point, or that the audience may fail to grasp the significance of a crucial valuation element without the chance to study it. Finally, humans have faulty memories. Even if a client is given a fully-informed oral presentation, they may not remember a key factor two days later. Sound, well-supported and fully documented written valuation reports help reduce the potential for these types of misunderstandings.

10. Payment Methods for Valuation Services to Avoid Allegations of Bias.

While both parties may be jointly footing the appraiser's bill, it is often the case (particularly in divorces) that one particular party will bear this responsibility. In a divorce this is typically the spouse involved in the business being valued. The other party may harbor suspicions that the business appraiser may be swayed in his or her opinion of value to the interests of the paying party in order to make sure that payment is received. One simple way to minimize or avoid this perception is to simply require that no valuation report or findings (even in draft form) will be issued until the balance of any fees owed to the appraiser are first received in full. Banister Financial has long followed this policy in jointly-retained appraisals and has found it to work well. This policy should be incorporated in the engagement agreement. If the paying client balks at this on the front-end in discussing the ground rules, this client may not really want an unbiased appraisal after all, and the jointly-retained process probably will end in failure.

11. Issuing the Final Report.

Ultimately, it is imperative that a final report is issued in a timely manner where possible. While the business valuator should never cut any time corners to reach a conclusion of value, neither should the valuator allow a project to linger interminably once the comment period is over and any remaining issues have been resolved. In dispute cases, it is important to reach supportable and independent opinions of value, however, it is also important to have closure to the situation and allow people to get on with the rest of their lives. The business valuator and the parties should agree that the final report will be issued soon after the valuator has had the opportunity to consider the valid comments made and reach a final conclusion of value. Unless the

comment period uncovered significant issues that were not addressed in the report, the final report should usually be issued within several weeks after the closing of the comment period. It does no good for the business valuator to dictate a brief comment period to the parties and then take two months after that to reach a final decision on value. In addition to inconveniencing the parties involved, the business appraiser who does this also is compromising his or her reputation for professionalism and reliability.

Brevity of time, however, should not come at the expense of the validity of the report. It is possible that the issues raised during the comment periods will require the appraiser to request additional information from the Company or the parties and to undertake additional analysis that may require an extended time frame. While this often occurs rapidly (several weeks or less), there can be circumstances where the issues can take substantially longer to resolve.

12. Responding to Issues Raised in the Final Report.

In issuing the final report it is helpful and important for the business appraiser to address major issues raised during the comment period (by both parties), and any resulting changes to the report. The business appraiser ultimately must make his or her own determination of the validity of any changes or issues raised by the parties, however, it is helpful for the appraiser to articulate to the parties the changes made and the reasons for those changes. Even if the appraiser took a different view than the party, articulating this view in the final report or by a cover letter with the report will allow the appraiser to explain why he or she made that particular decision. While one or both parties might not be happy with the decision, at least they will see that the appraiser had a reasonable basis for acting.

13. Allegations of Company Accounting Fraud Versus the Business Appraiser's Role.

In many dispute situations (particularly those that are noticeably acrimonious), there may be allegations of financial misrepresentation by one or both parties. Another article in this issue of Fair Value deals with the business appraiser's role as it relates to fraud, and why what is often cited as fraud is actually the expensing of non-business-related costs through the business. This related article also investigates the wide variety of potential income statement distortions for which the business appraiser might consider necessary adjustments.

Statutory Dictates for Jointly-Retained Valuation Experts.

As noted at the beginning of this article, at least one jurisdiction in the United States has mandated the joint retention of business appraisers in family law disputes. Under Rule 12.8 of Division V (Family Law) of the Coordinated Rules of the Superior and Municipal Courts of San Diego County, the following rules apply (for equitable distribution purposes), among others:

1. Before filing an "at issue" memorandum, the parties must jointly retain a business appraiser.
2. Before contacting a business appraiser for use at a settlement conference or trial, counsel shall meet and confer to select a joint appraiser.
3. If counsel cannot agree on a joint appraiser, a joint appraiser shall be appointed by the court on ex parte motion.
4. The appraiser shall be informed that he or she is retained as a neutral expert working for both parties.

Other provisions in the statute cover the various time periods expected in the appraisal process, the fact that all parties must be copied on written correspondence, the fact that the parties may not have verbal communication with the appraiser unless both parties and the appraiser participate in the communication, provisions for a draft report, provisions for a comment period, and other various items. The full statute (which is much more encompassing) has some very serious flaws,

although it is at least an attempt to move jointly-retained appraisals into the mainstream to resolve marital cases. Whether the above statute (or some derivative thereof) will become accepted law in other jurisdictions is unknown, however, the San Diego statute is an indication of movement towards joint retention.

Importance of Independent Work.

A good business appraiser must be independent in any valuation work he or she does - whether jointly-retained or for a single client. Although attorneys by definition must be advocates for their client, business appraisers play a very different role in that they are prohibited by the Uniform Standards of Professional Appraisal Practice (USPAP) from being advocates for a particular side in a dispute. Unfortunately, many business appraisers do not understand or abide by this policy, with the result being that many appraisers in the industry are perceived as "husband-friendly" or "wife-friendly" depending on whether the appraiser manufactures a low or high value for a business. Although these types of appraisers may be useful to a party desiring a particular outcome, if these manufactured appraisal reports are ultimately unsupportable, a knowledgeable attorney or qualified appraiser doing an independent appraisal will quickly expose the "low-ball" or "high-ball" appraisal for what it really is. In the context of the jointly-retained valuation context, it is crucial that the business appraiser at all times creates both the perception and the actuality of impartiality. An unsupportable high or low valuation is as bad as having no valuation report at all.

Conclusion.

The use of jointly-retained valuation experts is on the rise and, when handled correctly, can be a valuable solution to parties in a dispute. Although this may be detrimental to the business valuation industry (our business opportunities are cut in half!), overall, we believe this is a positive development in regards to increasing the time and efficiency of dispute resolution as well as to the hope that business valuation will be perceived, as it must be, as a truly independent exercise. Of course, this will be a positive development only if the valuation result reached by the jointly appointed appraiser is independent, fully supportable, and does not reflect any bias whatsoever from either side of the conflict. Therefore, in order for the jointly-retained approach to work, it is critical that the right business appraiser be selected and the appropriate process agreed to in advance by the parties and then followed thereafter. While the parties involved may not ultimately like or agree with the findings of the appraiser, the chances that they will accept the end result will be dramatically improved. "

The authors, Messrs. Hawkins and Paschall, are Managing Directors of Banister Financial, Inc., a Business Valuation Specialists firm.

(Copyright 2001, Banister Financial, Inc. (Charlotte, North Carolina, www.businessvalue.com). All Rights Reserved. Permission granted to The Canadian Institute of Chartered Business Valuators to reprint.

BY ROBERT F. REILLY, ASA, FCA
PAMELA J. GARLAND, ASA, FCA

Valuation of Data Processing Intangible Assets

Data processing intangible assets include computer software, the technical documentation related to computer software, automated databases, and intellectual property rights related to computer software. Computer software can be classified into two categories: (1) software developed for commercialization (i.e., resale) purposes and (2) internally developed software, or software developed for an owner or single user.

This article introduces the generally accepted approaches and methods for the valuation of computer software. While all valuation approaches should be considered as part of a software valuation, the cost approach is commonly used with regard to the valuation of internally developed software, which is the focus here. In particular, the discussion will explore several cost approach methods that involve software engineering models. These models are often applicable to the valuation of internally developed software.

In addition, this discussion will introduce the concept of remaining useful life and will explain one method—the analytical method—for estimating computer software's remaining useful life. The analytical method is useful in the estimating the expected remaining period of software utility and some forms of obsolescence.

Reasons to Value Computer Software

There are numerous reasons to conduct a rigorous valuation of internally developed (also referred to herein as owner/user) computer software. Most of these reasons can be grouped into the following categories:

1. Transactional reasons—e.g., establishing a purchase or sale price for a system, assessing the fairness of a purchase or sale offer, or assessing the reasonableness of a royalty rate or transfer price for the license of a system.
2. Financing reasons—e.g., assessing software collateral value for asset-based financing, estimating intangible asset value as part of a solvency opinion analysis, or establishing a sale price and a lease payment for the sale/leaseback of computer software.
3. Taxation reasons—e.g., estimating fair market value for purchase price amortization, charitable contribution, abandonment loss, and other income tax deductions, substantiating an arm's-length intercompany transfer price for international transfers, or estimating an assessment value for ad valorem property taxation.
4. Bankruptcy reasons—e.g., assessing the solvency of the software owner/user, identifying licensing or spin-off opportunities, or establishing debtor-in-possession financing collateral value.
5. Controversy reasons—e.g., quantifying copyright infringement or breach of contract damages, estimating fraud or misrepresentation damages, or quantifying lender liability damage.
6. Management information reasons—e.g., identifying, quantifying, or managing the value of the software owner/user's intellectual property.

Identification of Intangible Assets

The analyst should consider definitional questions that are relevant to the economic analysis and valuation of intangible assets. From an economic valuation perspective, there are two definitional questions that the analyst should consider:

1. What economic phenomena qualify as an intangible asset?
2. What economic phenomena manifest-or are indicative of-value in an intangible asset?

Economic Phenomena That Qualify as Intangible Assets

For a data processing intangible asset to exist from a valuation or economic perspective, typically it should possess certain attributes:

1. It should be subject to specific identification and recognizable description.
2. It should be subject to legal existence and protection.
3. It should be subject to the right of private ownership, and this private ownership must be legally transferable.
4. There should be some tangible evidence or manifestation of the existence of the intangible asset (e.g., a diskette or printout of source code, system or user manuals and documentation, system flow charts, or printouts of databases).
5. It should have been created or have come into existence at an identifiable time or as the result of an identifiable event.
6. It should be subject to being destroyed or terminated at an identifiable time or as the result of an identifiable event.

In other words, there should be a specific bundle of legal rights (and other natural properties) associated with the existence of any data processing intangible asset.

Economic Phenomena That Indicate Value in an Intangible Asset

For a data processing intangible asset to have a quantifiable value from an economic or appraisal perspective, it should possess certain additional attributes, such as:

1. It should generate some measurable economic benefit to its owner/user. This economic benefit could be in the form of an income increment or a cost decrement. This economic benefit is sometimes measured by comparison to the income otherwise available to the software owner/user if the intangible asset did not exist.

2. This economic benefit may be measured in any of several ways, including net income, net operating income, net cash flow, and so on.
3. It should be able to enhance the value of the other assets with which it is associated. The other assets may encompass all other assets of the business of the software owner/user, including tangible personal property, real estate, or other intangible assets.

Clearly, there may be a substantial distinction between the legal existence of an intangible asset and the economic value of that asset. An example of this situation would be the development, documentation, and copyright of a new management information system that, upon creation, is immediately and permanently locked inside the owner's vault. If the computer system is never (and will never be) used in the production of, or in the protection of, income, it has little or no economic value, even though it has legal existence.

Economic Phenomena That Do Not Qualify as Intangible Assets

Economic phenomena that do not meet the specific attribute tests described previously do not qualify as identifiable data processing intangible assets. Some economic phenomena are descriptive or expository in nature. They may describe conditions that contribute to the existence of-and value of-identified intangible assets. However, these phenomena do not possess the requisite elements to distinguish themselves as data processing intangible assets.

For a typical software owner/user, such "descriptive" economic phenomena-which do not qualify as identifiable intangible assets-may include:

1. High market share of the owner/user.
2. General positive reputation of the owner/user.
3. Monopoly position of the owner/user.

4. Market potential (heretofore unexploited) of the software.
5. Other economic phenomena.

However, while these "descriptive" conditions do not, themselves, qualify as data processing intangible assets, they may indicate that the actual identifiable intangible assets do have substantial economic value.

Describing the Data Processing Intangible Asset

The description of the subject data processing intangible should be complete enough to identify the intangible asset clearly. The description may identify the physical, functional, technical, or economic parameters of the subject intangible asset.

Computer software is sometimes defined as the programs that tell the computer what to do. The broadest definition of computer software is that software includes everything that is not hardware. In Rev. Proc. 69-21,¹ the IRS defines computer software as:

All programs or routines used to cause a computer to perform a desired task or set of tasks, and the documentation required to describe and maintain those programs. Computer programs of all classes, for example, operating systems, executive systems, monitors, compilers, and translator assembly routines, and utility programs, as well as application programs are included. "Computer software" does not include procedures which are external to computer operations, such as instructions to transcription operators and external control procedures.

Computer software can be classified into functional groups, as summarized in the table in Exhibit 1, on page 21:

With respect to the intangible asset owner/user, software falls into two general categories. The first category consists of software intended for sale or license, or product software. The second category

consists of software intended for internal use, or operational software. Operational software may include both (1) internally developed software and (2) software purchased or licensed from another party.

Electronic databases are organized collections of related data stored in an electronic format (e.g., computer disks). These databases are accessed, maintained, and manipulated using computer software. Most electronic databases are created as a normal part of the operations and recordkeeping of a business. These include customer information, inventory records, open order files, etc.

There are many specialized proprietary databases that have broad commercialization potential. Examples of this type of database are mailing lists, credit information, financial studies or compilations, and scientific data. These databases are sometimes bought and sold in their entirety, including the associated proprietary rights. More often, the database is used to generate income either directly, through the sale or license of the data to customers, or indirectly, through the internal use of the data to perform a service for customers.

Software and electronic databases, when they are original works of authorship and have been fixed in a tangible medium, are entitled to copyright protection. Computer screen displays may be protected as part of the software. Multimedia works, which combine two or more media (print, audiovisual, audio, or machine-readable), are also recognized under copyright law.

Mask works are protected under the Semiconductor Chip Protection Act of 1984, administered by the Copyright Office. A mask work is most simply described as firmware, or software stored permanently on a ROM (read-only memory) chip as a series of stencils of integrated circuitry.

Computer programs may be patented, although most programs do not meet the requirements for patentable technology. Computer programs may also contain trade secrets that are protected under state laws.

Data processing intangibles that are available for sale or license to customers may have associated trademarks or service marks. A relatively new area of dispute related to both trademarks and data

EXHIBIT 1:**Computer Software Functional Groups**

Functional Group	Representative Types of Software	Example
System Software	Operating Systems Languages Utilities	Windows 95, UNIX COBOL, C++ Anti-virus, backup programs
Business Operation Applications	Accounting Manufacturing Control Engineering	Payroll, general ledger Bill of materials Inventory control Computer-aided Design
Office Automation	Word Processing Spreadsheet Groupware	WordPerfect Microsoft Excel Lotus Notes
Educational/Recreational	Reference Tutorials Games	Encyclopedia, alphas Foreign language, Math Card/board games, simulators

processing in general is the use of domain names, or electronic addresses, used on the Internet. Domain names have been issued for years without any checking against registered trademarks. This has resulted in claims of trademark rights violations against domain name holders.

Software Valuation Approaches and Methods

Three methods are appropriate for the valuation of data processing intangible assets (such as computer software). These are the cost approach, the market approach, and the income approach. The following discussion of common valuation methods will address the valuation of computer software. However, similar methods may be used to value other data processing intangibles.

Any valuation of data processing intangibles should include consideration of (1) obsolescence, if any, and (2) remaining useful life analysis. An obsolescence adjustment (if needed) may be made either discretely or embedded in the valuation analysis. The issues of obsolescence and life analysis, as they apply to data processing intangibles, will be examined in more detail

following the discussion of the three valuation approaches.

Cost Approach

Two common types of cost may be estimated within the cost approach. The first is "reproduction cost," or the cost to construct an exact replica of the subject intangible asset. The second is "replacement cost," or the cost to recreate the functionality or utility of the subject intangible asset, but in a form or appearance that may differ from the actual asset subject to appraisal. This replacement asset may be created using different tools and methods than were used to create the subject asset.

Replacement cost new" typically establishes the maximum amount that a prudent investor would pay for a fungible intangible asset. However, specially developed computer software may be unique, and thus may not qualify as a fungible intangible asset. In many cases, an intangible asset is less useful than its ideal replacement. The value of the subject intangible asset should then be adjusted to reflect the loss in economic value due to

functional, technological, and economic obsolescence.

The two primary cost approach methods used to estimate the value of computer software are the trended historical cost method and the software engineering model method. While they are generally applicable to the valuation of purchased software, these methods are particularly suited to the valuation of internally developed software.

Trended Historical Cost Method.

The most straightforward cost method is the trended historical cost method. In this method, actual historical asset development (or acquisition) costs are identified and quantified and then "trended" to the valuation date by an appropriate inflation-based index factor. Care should be taken to include all costs associated with the development (or acquisition) of the software--and only those costs. For example, an allocation of overhead costs and the cost of fringe benefits should be included in addition to employee payroll costs (and payroll taxes). However, if data processing personnel are involved in tasks unrelated to software development (e.g., computer center operations), only those costs associated with the time spent on software development tasks should be included.

Often, historical software development costs are not readily available. In this situation, development costs are sometimes calculated using actual, or estimated, development time (person-hours, person-months, etc.). The development cost estimate is computed by multiplying the development time by an associated cost figure, using specific costs per person or a weighted average cost. Typically, analysis of payroll taxes, fringe benefits, overhead costs, and any other relevant costs is performed so that these costs may be added as a percentage of salaries. The development costs should be estimated in current dollars as of the valuation date.

If the trended historical cost method is

used, it is important that the historical costs include an allowance for the software developer's profit on the development project and an allowance for entrepreneurial incentive to motivate the development project. Additionally, direct development costs like salaries and wages, and indirect development costs like overhead and employment taxes and benefits should be included.

The trended historical cost method estimates the reproduction cost of the intangible asset. In many cases--due to technological advances in programming languages or programming tools, for example--the replacement cost for software may be lower than the reproduction cost. For older computer software, or for software that was developed or modified over an extended period of time, it is recommended that a replacement cost analysis be performed. This typically involves the use of software engineering models.

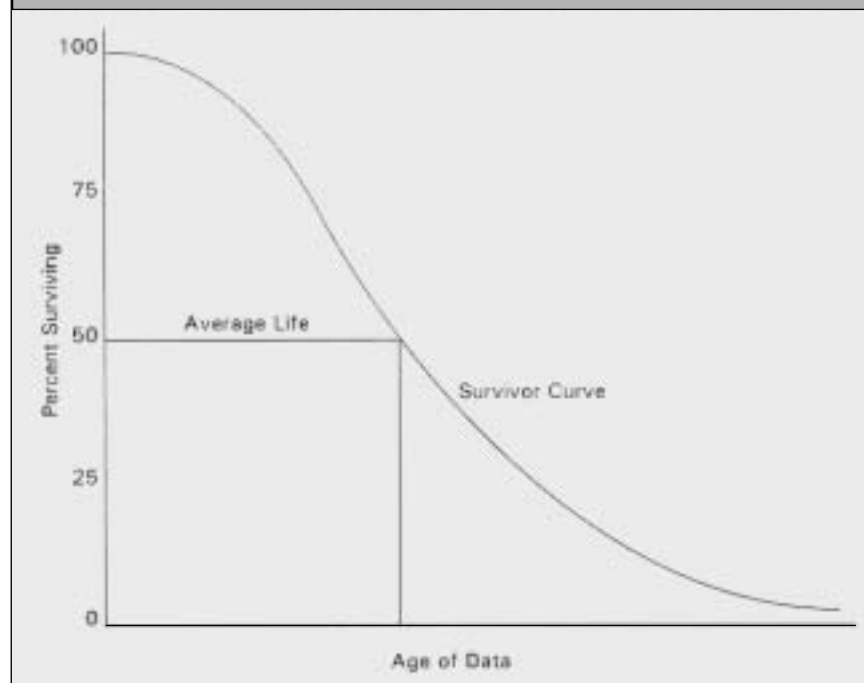
Software Engineering Model Method.

Valuation analysts often employ software engineering models in order to estimate the reproduction cost or replacement cost of software systems. These models were not necessarily created for valuation purposes, but rather to assist software developers in estimating the effort, time, and human resources needed to complete a software project. The primary input to these models is some measure of program, or system, size or functionality. Historically, this measure, or metric, has been lines of code (LOC), i.e., source program instructions. The definition of LOC and the associated counting conventions vary among the models.

Another metric--function points--has more recently been incorporated into software engineering models. The number of function points in a program is calculated with an algorithm that uses a weighted count of the number of inputs, outputs, inquiries, data files, and interfaces.

Other inputs to the models include programming language, experience, and quality of the project team; tools used; programming practices; complexity; type of application; time constraints; level of documentation; and required reliability. The analyst would use different assumptions with

EXHIBIT 2
A Typical Survivor Curve



respect to these attributes for a replacement cost analysis than would be used for a reproduction cost analysis. For example, if the subject software was written in Assembler, the programming language used in a reproduction cost analysis would be Assembler. However, the language assumed in a replacement cost analysis may be COBOL, a higher-level, and more efficient, language.

Two of the most commonly used LOC cost estimation models are the constructive cost model (COCOMO) and the software lifecycle management (SLIM) model. The most commonly used model that uses function points as its size metric is Checkpoint.

All three models are considered "empirical" cost estimation models. That is, the development time and development cost of the subject software are estimated by reference to a large database of actual software development projects, the actual development times of which were carefully monitored. The cost estimation models calculate an estimate of effort to develop a software system in terms of person-months. To estimate the cost to develop that system, the number of months is multiplied by a cost per person-month

For valuation purposes, the cost per person-month is a "fully loaded" cost per person-month. That cost would include the average base salary of the project team and other factors, including employee perquisites, payroll taxes, fringe benefits, and an allocation of overhead (e.g., secretarial support, office space, computer use, supplies, marketing, and management and supervisory time).

COCOMO. Barry W. Boehm developed COCOMO and described it in the authoritative textbook entitled *Software Engineering Economics*.² This cost estimation model projects the amount of effort required to develop the software, taking into consideration the size of the programs, the program characteristics, and the environment in which they are to be developed.

An updated model, COCOMO II, has been developed by Boehm and his associates at the Center for Software Engineering (CSE) at the University of Southern California. The first release of this model was COCOMO II.1997. The intent is to release a new calibration of the model each year. (Calibration is the

process of assigning numbers to the effort multipliers and other constants in the model.) A beta version of COCOMO II.1998 was released in October 1998.³

SLIM. A computerized cost estimation model, SLIM, is marketed by Quantitative Software Management, Inc. (QSM). This model was developed by Lawrence H. Putnam, a former special assistant to the commanding general of the Army Computer Systems Command and the founder of QSM.

Much of the basic theory of the SLIM model is presented in a three-part article, "Estimating Software Costs,"⁴ by Putnam and Ann Fitzsimmons. The SLIM model is described in detail in a book written by Putnam and Ware Myers entitled *Measures for Excellence: Reliable Software on Time, within Budget*.⁵

Checkpoint & KnowledgePLAN. Software Productivity Research (SPR), Inc. has created a software product called Checkpoint, an estimation, measurement, and assessment tool. The company was founded by Capers Jones, the author of several books including *Programming Productivity*⁶ and *Applied Software Measurement*.⁷

Checkpoint also supports the use of feature points, a metric developed by SPR that is an expansion of function points. A companion product, Function Point Workbench, is also available from SPR. It expedites the function point counting process and maintains a company's function point database.

Software Productivity Research has recently developed another software estimation tool, SPR KnowledgePLAN. It has a knowledge base of more than 8,000 actual software projects.⁸

Other Models. Other software engineering cost estimation models include CA-Estimacs from Computer Associates International, Inc.; Price S from PRICE Systems, a Lockheed Martin Company; and BYL (Before You Leap) from The Remarkable Software Company Limited.

Income Approach

In the income approach, the value of an intangible asset is estimated as the present value of the future economic income attributable to the ownership of the intangible over its expected remaining useful life. This economic income may result from prospective revenues, cost savings, or royalty or license incomes associated with the intangible asset.

The two most common income approach methods used in the valuation of data processing intangibles are the discounted cash flow method and the relief from royalty method. The discounted cash flow method is one application of the yield capitalization method. The relief from royalty method may also be considered a market approach method because a market-derived royalty rate is used in the analysis.

Discounted Cash Flow Method.

The discounted cash flow method is typically used in the valuation of data processing intangibles when there is an identifiable income stream associated with the intangible. Therefore, this method is usually used in the valuation of product software or databases that generate income through their sale or license. The future cash flow related to software, for example, may be calculated by projecting revenues, expenses (excluding depreciation and amortization), and capital investments over its estimated remaining economic life. A capital charge is included in the analysis when additional assets (e.g., existing computer equipment) are used or used up to produce the projected revenues. These future cash flows are discounted to a present value using either an appropriate present value discount rate or direct capitalization rate.

The remaining economic life of the data processing intangible is an important variable in a discounted cash flow analysis. Purchased software may have a life of three, five, or fifteen years for federal income tax depreciation/amortization purposes. The federal income tax life of software depends primarily upon whether it was purchased before or after 8/11/93, and whether it was purchased as part of the acquisition of a substantial

portion of a business.⁹ However, the economic life of computer software is an entirely different issue. In estimating the remaining economic life of software, the analyst should consider a number of factors, including:

- The age of the software and maintenance/enhancement practices.
- The market for the software (customers, competitors).
- The functional characteristics of the software (how well it satisfies users' needs and complies with industry standards, regulatory reporting, etc.).
- The technological characteristics of the software (speed and efficiency, programming language, and associated hardware and operating systems).
- The historical economic lives of similar software.

Relief from Royalty Method.

The relief from royalty method is used to estimate the cost savings that accrue to the owner of an intangible asset who would otherwise have to pay royalties (or license fees) on revenues earned through use of the asset. The royalty rate used in the analysis is based on an analysis of empirical, market-derived royalty rates for comparable or guideline intangible assets. For this reason, this method may also be classified as a market approach.

In the case of product software, revenues are projected over the expected remaining economic life of the software. The market-derived royalty rate is then applied to estimate the royalty savings. The net after-tax royalty savings are calculated for each year in the remaining economic life of the software and then discounted to a present value, as in the discounted cash flow method.

Market Approach

The market approach estimates the value of an intangible asset by reference to actual market transactions involving comparable or guideline intangible assets. This approach is difficult to use in the valuation of internally developed custom software for several reasons. First, information about sales of this type of software is not readily available. Second, these sales are typically a part of

an acquisition of an entire business. Third, by definition, custom software is usually unlike other software observable in the marketplace.

It is sometimes possible to use market approach methods in the valuation of computer software, however. The two market approach methods that are most often used are the market transaction method and a hybrid method, sometimes called the market replacement cost method.

Market Transaction Method.

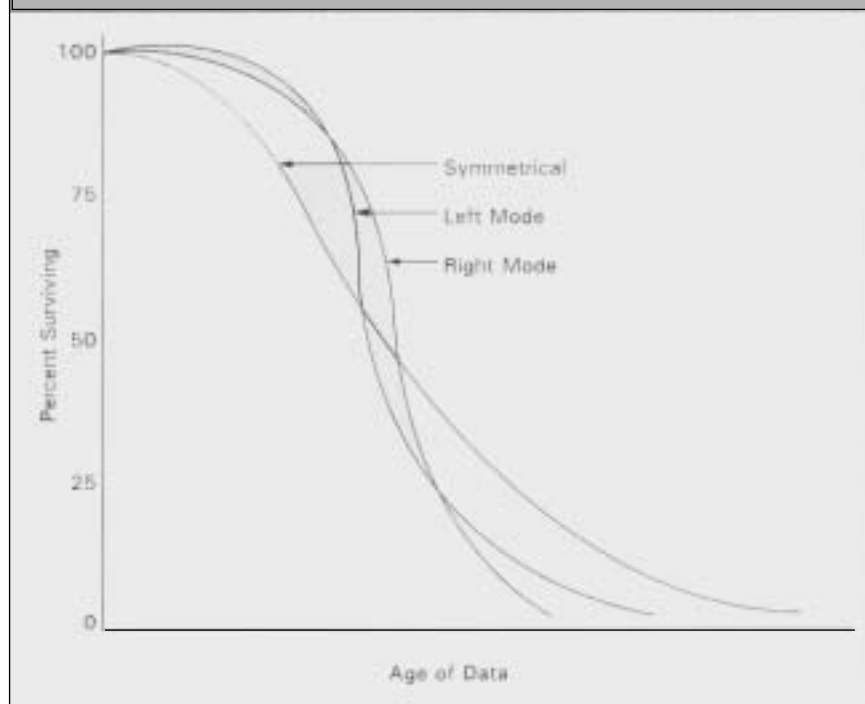
When arm's-length market transaction data are available for comparable or guideline software, the implied value is typically expressed in dollars per line of code (or dollars per function point). This unit value is then applied to the subject software LOC (or function points) to estimate the value of the subject software. As with any method that relies on comparable or guideline assets, adjustments should be made for material differences between the comparable or guideline assets and the subject asset.

Because of the lack of information typically available for software transactions, this method is frequently used only as a reasonableness check for estimates of value indicated by the other methods. It is often difficult to determine the comparability of the software in order to estimate what adjustments, if any, need to be made-and it is not always clear what LOC counting conventions were used.

Market Replacement Cost Method.

This hybrid cost/market approach method contemplates the replacement cost of the software in the open market. If commercial off-the-shelf software packages can be found that provide meaningful guidelines for the subject software, the cost to purchase or license these packages may be used to estimate the replacement cost of the subject software. However, if the proprietary rights associated with the subject software have any economic value (i.e., the subject software is, or could be, sold or licensed to others), this

EXHIBIT 3
The Three Basic Survivor Curves



method may understate the value of the software.

In a variation of this method, the analyst may interview software developers and request hypothetical proposals to develop software comparable to the subject software. These proposed estimates may assume development of a completely custom system or modification of an existing package. If objective arm's-length estimates can be obtained, they may be good indications of the market replacement cost of the software. Again, proprietary rights may be an issue.

Obsolescence

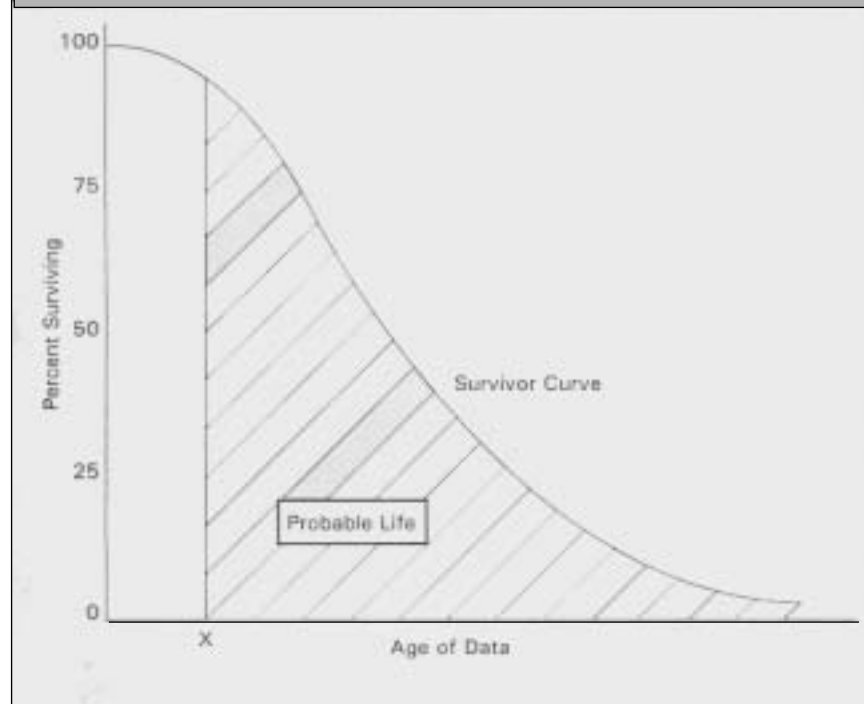
As previously discussed, when an intangible asset is less useful than its ideal replacement, its value should be adjusted to reflect a loss due to functional, technological, and economic obsolescence. A fourth form of obsolescence, physical deterioration, is not generally applicable to data processing intangibles. This is because such intangibles typically do not experience physical wear and tear. However, the possibility of physical

deterioration should be considered.

Functional obsolescence is the loss in value of an asset because the subject asset does not have the functionality of-or is less useful than-a replacement asset. In the case of software, functional obsolescence is often immaterial when the software is continually maintained and enhanced. However, a perfect example of functional obsolescence is the inability of some software to accommodate the year 2000.

The "Year 2000" or "Y2K" problem has resulted from the common data processing practice of storing only two digits for the year in date fields on computer files. Software developers who did not have the foresight to anticipate this problem are now scrambling to make their software Y2K compliant before the proverbial stroke of midnight. If they do not make it, 65 year-old people will suddenly be -35 years old and no creditor's invoices will be past due. In fact, users of many systems will have problems before the new millennium as budgets, ship dates, etc., creep past 1999. Systems that are not Y2K compliant may have increasing functional obsolescence as 1/1/00 approaches-if this functional obsolescence is not cured.

EXHIBIT 4
The Probable Life Integral



Technological obsolescence is often considered to be a specific form of functional obsolescence. It is the loss in value of an asset due to technological improvements that make its replacement more efficient or effective. In the valuation of software, technological obsolescence usually exists when the software was written in an inefficient or outdated language, runs on a platform (hardware, operating system, etc.) that is becoming obsolete (and the software is not portable), or when the outmoded methods or practices of the developers result in a less than optimal use of resources.

Economic obsolescence is a reduction in the value of a subject asset due to events that are typically outside of the control of the owner of the asset, such as legal or regulatory changes or restrictions, social or economic changes, or changes in market conditions, such as new competitors. Economic obsolescence may be an important issue in the valuation of product software. Economic obsolescence is generally not evident with regard to internally developed operational software that is being used by a financially successful company.

In valuing computer software, all forms of obsolescence should be considered. Again,

functional obsolescence may not be evident in software that is properly maintained, but the analyst should consider the extent of any functional obsolescence. When a reproduction cost method, such as the trended historical cost method, is used to value software, technological obsolescence can be significant. This is due to increasing productivity and technological advances over time. The use of a replacement cost method typically eliminates the productivity-related technological obsolescence, but other adjustments for technological obsolescence may be necessary. Economic obsolescence usually has more relevance with respect to product software, but this form of obsolescence should be examined in valuing operational software as well. Discrete adjustments for obsolescence are generally not necessary when the value of software is estimated using the income approach. This is because the revenue and expense projections implicitly take obsolescence into account.

Though the value of tangible assets is often estimated using depreciation schedules,

properly maintained software does not become obsolete in any predictable, continuous way. Software value tends to vary over time by a relatively small amount (due to increasing productivity/technological advances on the one hand and increasing labor costs and software enhancements on the other hand) until the (usually unpredictable) point in time that its replacement is contemplated, for any number of reasons. Therefore, any attempt to estimate obsolescence for properly maintained software by "depreciating" it over some finite period of time may be arbitrary and simplistic.

Remaining Life Analysis

Estimating the remaining useful life is an important consideration in each of the three approaches to computer software valuation:

- 1 Income Approach-A lifing analysis may be performed in order to estimate the projection period for economic income subject to either yield capitalization or direct capitalization.
 - Normally, a longer remaining useful life would indicate a higher value.
 - The intangible asset's value is particularly sensitive to the remaining useful life estimate when the remaining useful life is less than ten years.
 - The intangible asset's value is not very sensitive to the remaining useful life estimate when the remaining useful life is greater than 20 years.
- 2 Cost Approach-A lifing analysis may be performed in order to estimate the total amount of obsolescence, if any, from the estimated measure of "cost"-that is, either reproduction, replacement, creation, or re-creation cost.
 - Normally, a longer remaining useful life means a higher value.
 - Normally, a shorter remaining useful life means a lower value.

3. Market Approach - A lifing analysis may be performed in order to select or reject and/or to make adjustments to comparable or guideline sale and/or license transactional data.</list>

- The "market" should indicate an acceptance for the remaining useful life of the subject intangible asset.
- If the subject asset's remaining useful life is different from guideline intangible asset sale or license transactions, adjustments to the transactional multiples may be required.
- If the subject asset's remaining useful life is substantially different from guideline intangible asset sale or license transactions, this may indicate a lack of marketability of the subject intangible asset.

The analysis of remaining useful life will typically have a direct and predictable effect on the value of the computer software.

The following list presents the most common determinants, or factors, that directly influence the expected remaining useful life of most data processing intangible assets:

- Legal determinants.
- Contractual determinants.
- Functional determinants.
- Technological determinants.
- Economic determinants.
- Analytical determinants.

Each of these remaining useful life determinants should be considered in the estimating remaining useful life. Typically, for valuation purposes, the determinant that indicates the shortest remaining useful life deserves primary consideration.

With data processing intangible assets, the analytical determinant method often provides the best indication of remaining useful life. There are two important categories of procedures related to the application of analytical methods to remaining useful life estimation:

- 1 Estimation of an historical attrition rate.
- 2 Development of survivor curves based on historical attrition rates.

The theory of analytical methods for remaining life analysis was developed at Iowa State University in the early 1900s. In the analytical method, survivor curves are used to estimate the mortality-or the decay rate-of a group of similar data points (e.g., computer programs) as those data points age. The analytical method-and the survivor curve theory-is similar to the mortality theory used by insurance company actuaries to estimate the human life span.

The following discussion describes an illustrative remaining useful life analysis as it relates to LOC. In practice, age and life data at this level of detail are rarely available. However, a similar analysis may be performed using objectives, modules, programs, or subsystems, depending on the availability of reliable data.

Remaining useful life analysis is the process of estimating the behavior of a group of data points (e.g., LOC) by fitting a "test group" of the data points to various survivor curves. In that way, by selecting the survivor curve that best "describes" the historical decay patterns of the LOC test group, the future mortality behavior of the group can be estimated.

Exhibit 2, on page 23, illustrates a typical survivor curve. The x-axis represents the age of the data, and the y-axis represents the percent of the original data points (LOC) that are still surviving at any given age. For example, at age zero, 100% of the LOC are still surviving. As time passes, LOC "retire" (i.e., are rewritten or replaced). Therefore, the percent of the LOC surviving decreases. This creates the downward sloping characteristic of the survivor curve. A survivor curve can be any mathematical function of age that can accurately depict the test group's mortality pattern.

The age at which 50% of the original LOC group still survives is defined as the LOC "average life." That is, a new LOC that starts-or has started-at any given time would have an expected life of the average life of the LOC group. In reality, LOC are "live" (i.e., in use) across a wide range of possible time units. However, the expected lifetime (i.e., the mean lifetime) for a newly written LOC is the average life for the LOC group.

There are three basic types of survivor curves

that are considered in the analytical method of remaining life analysis: left mode, symmetrical, and right mode. A left-mode survivor curve depicts a group that retires at a faster rate before the average life is reached and then at a slower rate after the average life is reached. In other words, if the left-mode survivor curve accurately predicts a LOC group's past behavior, it could be interpreted that the older LOC are in service longer than the newer LOC-and they tend to have a longer relative expected life. A symmetrical survivor curve predicts that LOC will "retire" at a similar rate at any given relative age on either side of that LOC group's average life. A right-mode survivor curve is the opposite of the left-mode survivor curve. LOC that has reached the LOC group's average life tends to decay faster than LOC that has yet to reach the group's average life.

Exhibit 3, on page 26, illustrates the "curve structure" of a left-mode, symmetrical, and right-mode survivor curves plotted on the same graph.

The objective of a remaining useful life analysis is to estimate the specific remaining useful life of each LOC within the group. Remaining useful life is defined as the amount of time before a LOC is expected to "retire" (and no further economic income can be expected from the use of that LOC).

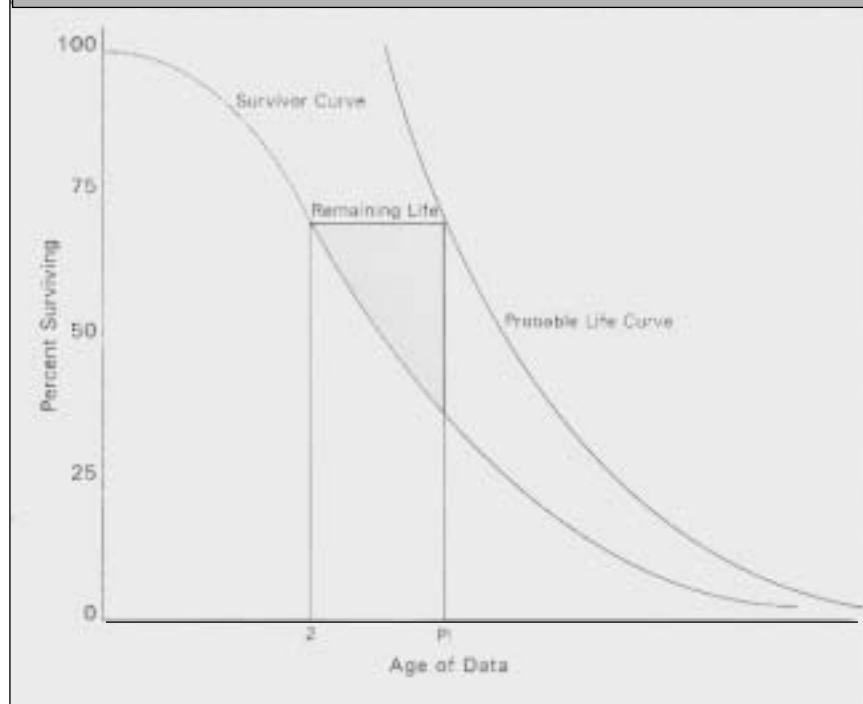
The key to estimating the LOC remaining life is to calculate the "probable life" for each LOC within the LOC group. The probable life is the age at which a LOC will "retire," given that it has already reached its current age. By subtracting the current age of the LOC from its probable life, the remaining life of the LOC can be estimated. That is:

Probable Life of the LOC =
Survivor curve

Exhibit 4, on page 27, illustrates the relationship between percent surviving and probable life. The probable life of a LOC at age "x" is depicted by the shaded area.

By solving for the probable life in the

EXHIBIT 5
The Typical Probable Life Curve



equation above for all possible ages, a probable life curve can be constructed. A typical survivor curve and its corresponding probable life curve are illustrated in Exhibit 5, above.

To estimate the probable life of LOC that are already "z" years old using Exhibit 5, first locate "z" years on the x-axis. Second, find the corresponding point on the survivor curve. Third, draw a ray parallel to the x-axis to the point of the intersection with the probable life curve. The probable life is obtained by moving down the y-axis to the number of years (or months) on the x-axis. Exhibit 5 illustrates the probable life (i.e., point PL) of LOC that are already "z" years old.

The remaining life of the subject LOC can be calculated by using the formula presented above.

There are several sets-or series-of survivor curve mathematical functions that are generally used in these analytical method remaining useful life analyses. These common

survivor curve mathematical functions include:

- Iowa-type curves (the exponential function is a special case of this type of survivor curve).
- Weibull distributions (Iowa-type curves themselves are a special case of this type of survivor curve).
- Gompertz-Makeham curves.
- Polynomial equations.

All of these mathematical functions should be considered when selecting the best fitting survivor curve relative to a specific set of LOC age characteristic data.

Special Considerations in Software Valuation

There are a number of issues specific to computer software that should be considered in a software valuation, particularly when software engineering models are used in the analysis.

Ownership

As with any asset, the ownership of the software is a critical consideration. In the valuation of an automotive fleet, for example, ownership is quite

EXHIBIT 6**Cost Approach: Software Engineering Model Method – COCOMO 1981**

Subsystem	Less Non- Total Lines of Code	Executable Executable Lines	Delivered Source Instructions	Source Instructions	Effort to Develop (PM)	
					Organic Systems	Semi-detached Systems
System 1	51,000	5,000	46,000	46,000		94
System 2	66,000	7,000	59,000	59,000		124
System 3	12,000	1,000	11,000			
System 4	18,000	2,000	16,000	16,000	25	
System 5	47,000	5,000	42,000	42,000		85
Totals	210,000	21,000	189,000	178,000	25	303
Total person months to develop						328
Times cost per person month						8,750
Indicated value of the subject computer software						<u>\$2,870,000</u>
Indicated value of software (rounded)						<u><u>\$2,900,000</u></u>

EXHIBIT 7**Income Approach: Relief from Royalty Method**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Software related sales	\$9,500,000	\$10,450,000	\$11,495,000	\$12,644,500	\$13,908,950	\$15,299,845
Royalty savings	760,000	836,000	919,600	1,011,560	1,112,716	1,223,988
Income taxes	266,000	292,600	321,860	354,046	389,451	428,396
Net royalty savings	494,000	543,400	597,740	657,514	723,265	795,592
Periods discounted	0.50	1.50	2.50	3.50	4.50	5.50
Present value interest factor	0.9206	0.7801	0.6611	0.5603	0.4748	0.4024
Present value of net royalty savings	454,764	423,932	395,191	368,399	343,422	320,140
Indicated value of subject computer software	<u>\$2,305,848</u>					
Indicated value of software (rounded)	<u><u>\$2,300,000</u></u>					

straightforward. A vehicle is either leased or owned. It is extremely unlikely for the engine to be leased while the body is owned. Furthermore, a leased car should not be valued, as an owned vehicle may, by reference to published used car prices, though the lease may have some value.

The ownership of software is often more difficult to determine than the ownership of tangible assets. Source code for software packages is frequently sold or, more likely, licensed to companies that then modify the programs for their

own internal use. Depending on their standards and methods, it may be fairly simple or nearly impossible to separate the internally developed additions and modifications from the original purchased, or licensed, code.

The distinction may not be critical in a historical cost method, where both (1) the purchase price, or license fee, and (2) the cost to modify the software are included in the analysis. However, care should be taken

in the application of software engineering models not to include the purchased/licensed LOC. This is because a replacement cost analysis would most likely assume the purchase or license of the packaged software—not the actual development of the programs. In addition, these rights of ownership differ between internally developed and licensed software. Proprietary rights may also be an issue when using the market replacement cost method.

Obsolete and Duplicate Code

A particular concern when using software metrics such as LOC or function points is obsolete or duplicate code. It is not uncommon for source code libraries to contain obsolete programs or duplicate copies (or multiple versions) of the same program. Similarly, some programs are developed by "cloning" other programs. When "cloning" occurs, the effort to develop the second program may be significantly less than the effort to develop the original program (although they may be close to the same size). Also, sections of code that would ideally be stored in shared subroutine libraries or copybooks (such as date validation routines, credit card check-digit calculations, or file definitions) are sometimes written once but copied into the source code of multiple programs. This would result in those lines being counted several times, though the effort to develop them was expended only once.

The valuation analyst should make an effort to quantify and eliminate duplicate or obsolete code from the analysis. This would typically include an examination of the software developer's standards, methods, and practices.

Software Life Cycle

The definition of software typically used in the valuation of software, as part of a going business enterprise, reflects the software's function in satisfying its owner/user's needs. Thus, software is the culmination of an

entire range of life cycle activities, including feasibility studies, planning and requirements, product design and architecture (including file structures and layouts), coding, integration, testing, documentation, and implementation that permit delivery of computer processing services to the end-users.

Software cost estimation models often break down the development effort over the software life cycle by development phase or activity (e.g., feasibility study, design, coding, testing, maintenance). The models in their generic form usually assume a certain level of documentation, testing, etc. Many models allow the analyst to modify these levels and to include or exclude certain phases of the life cycle.

The valuation analyst should use a cost estimation model in such a way that it reflects the characteristics of the subject software (or its ideal replacement). If the model does not allow for modification of the life cycle or activities, an adjustment may need to be made to the resulting effort estimation. For example, if the model assumes an average level of documentation and there is no user documentation for the subject software, an estimate of the average user documentation effort (usually, a percentage of total effort) should be subtracted from the total effort estimated by the model.

Software Metric Counting Conventions

As discussed previously, LOC definitions and counting conventions vary among the software engineering models. Most exclude comment and blank lines, including only executable source instructions. Typically, declarative statements, such as data definition lines (while not, perhaps, strictly speaking, executable), are usually included, as well as any job control language (JCL), procedures, batch files, etc., required to run the programs. The LOC for the subject software should be counted in a manner consistent with the conventions used in the model being used.

Allan J. Albrecht of IBM Corporation introduced the function point metric in 1979. Another fairly well-known variation (particularly in the United Kingdom) of Albrecht's function point is the Mk II

EXHIBIT 8**Market Approach**

Income Approach: Market Transaction Method

	Number of LOC	Transaction Price p	Prices er LOC
Comparable sale transaction 1	225,000	\$3,300,000	\$14.67
Comparable sale transaction 2	150,000	\$1,700,000	\$11.33
	Low End of Indicated Value Range	High End of Indicated Value Range	Average Indicated Value
Subject software LOC	198,000	198,000	198,000
Times market-derived price per LOC\$	11.33	\$14.67	\$13.00
Indicated value of subject computer software	\$2,243,340	\$2,904,660	\$2,574,000
Indicated value of software (rounded)			<u>\$2,600,000</u>

(Mark II) function point, developed by Charles R. Symons. The counting of function points has been standardized to a large extent by the International Function Point Users' Group (IFPUG).

Data Sources

There are a number of data sources that apply to the valuation of data processing intangibles.

Internal Data Sources

Internal financial reports, such as historical financial statements and budgets, are needed for almost all of the valuation methods described above. Payroll records and project management-or timekeeping-reports are relevant to any cost approach valuation method.

Internal documentation related to the data processing intangible should be reviewed by the analyst. This documentation may include system or user documentation as well as marketing materials. Reports showing LOC or function points for software-or records or data items for databases-should be used whenever possible. For software, examination of sample source code and a demonstration of the software are advisable.

Software owner/user interviews are useful to any

valuation analysis. With respect to data processing intangibles, these interviews can inform the analyst on a variety of topics, including:

- Prior market transactions or offers for data processing intangible assets of the subject company or similar assets of other companies.
- Competitors and comparable software or databases available in the marketplace.
- Software development history, environment, methods, and practices.
- Characteristics of the software (e.g., functionality, complexity, and reliability).
- Obsolescence and remaining life of the data processing intangibles.

External Data Sources

Trade publications are useful data sources in the valuation of data processing intangibles. Advertisements for and reviews of software packages and databases can be helpful in locating comparable or guideline assets. Published software catalogs list off-the-shelf software packages that may be used in a replacement cost analysis of operational

software. Newsletters specializing in intangible-asset licensing can be a good source of royalty rates.

Salary surveys published in computer publications and available from personnel consulting and placement companies may be used in the calculation of the estimated cost per person-month for the cost approach methods, or to check the reasonableness of the actual compensation of development personnel at the subject company. Many of these are available on the Internet.

Press releases and articles available from a variety of news sources may provide information about market transactions for the sale or license of data processing intangibles. Court cases may provide valuable guidance with respect to analytical methods, royalty rates, costs per LOC, and economic lives appropriate to the valuation of data processing intangibles.

Software engineering textbooks provide a great deal of information pertaining to the time and cost required to develop software. Another excellent source of articles related to software engineering is the IEEE Transactions on Software Engineering published by the Institute of Electrical and Electronics Engineers, Inc.

It is not surprising that a wealth of information related to data processing intangibles can be found on the Internet. Software developers and software engineering companies are more likely to have Web sites than perhaps any other industry group. Of course, the reliability of information from Internet sources should be taken into consideration by the analyst.

Illustrative Valuation Example

Exhibit 6, on page 31, presents an example of the valuation of product software using the cost approach, and specifically a software engineering model method.

For simplicity, the 1981 COCOMO model is applied and the following set of facts is assumed with respect to the software:

1. The LOC counts are as presented below.
2. System 3 has been abandoned with little likelihood of being revived.
3. The other systems are continually maintained and are running on a state-of-the-art hardware/operating system platform.
4. The calculated effort adjustment factor (EAF), based on the ranking of the 15 attributes defined by the model, is 0.43.
5. One system has been classified as organic and the other four as semi-detached.
6. An average annual salary of \$60,000 was assumed, with an estimate of employee benefits and overhead at 75% of salary.
7. The software development effort equations defined by the COCOMO model are:

$$\text{Organic PM} = 3.2 (\text{KDSI})^{1.05} \times \text{EAF}$$

$$\text{Semidetached PM} = 3.0 (\text{KDSI})^{1.12} \times \text{EAF}$$

Where:

PM = Person-months

KDSI = Thousands of delivered source instructions

EAF = Effort adjustment factor

Exhibit 7, on page 31, presents an example of the valuation of the same product software using the income approach, and specifically the relief from royalty method. The following additional facts related to the same software are assumed for the relief from royalty method example:

Economic Variable	Projection
Next year projected revenues attributable to the sale/license of software	\$9,500,000
Revenue growth rate	10%
Market royalty rate	8%
Income tax rate	35%
Present value discount rate	18%
Expected remaining economic life of the software (until replacement) years	6

Exhibit 8, on page 33, presents an example of the valuation of the same product software using the market approach, and specifically the market transaction method.

Assume that the valuation analyst is able to find arm's-length market transactions for comparable software where all proprietary rights were conveyed in the transactions. Assume further that no material adjustments are necessary and that the LOC counts represent total LOC, including comments, etc. Our equivalent LOC is 198,000 (i.e., 210,000 - 12,000 for System 3).

Conclusion

There are several alternative methods for identifying, valuing, and estimating the remaining use life of data processing intangible assets. While all valuation approaches were introduced here, cost approach methods-and particularly software cost engineering models-were emphasized and illustrated. These methods and models are particularly useful with regard to the valuation of internally developed, owner-used computer software.

-
- 1 1969-2 CB 303
 - 2 Boehm, *Software Engineering Economics*. (Prentice-Hall Inc., 1981).
 - 3 The COCOMO II Model definition Manual is available from the CSE via their Web site, sunset.usc.edu. A book describing the application of COCOMO II (as a complement to Boehm's original text) is scheduled to be published in 1999.
 - 4 Putnam and Fitzsimmons. "Estimating Software Costs." *Datamation* (September, October, and November 1979), pp. 19098, 17178, and 13749. respectively.
 - 5 Putnam and Myers. *Measures for Excellence: Reliable Software on Time, within Budget*. (P.T.R. Prentice-Hall, Inc., 1992). Additional information regarding OSM and their products is available from their Web site. [_Hit4343294720_Hit443294720](http://Hit4343294720_Hit443294720).
 - 6 Jones, *Programming Productivity*, (McGraw-Hill, 1986).
 - 7 Jones, *Applied Software Measurement* (McGraw-Hill, 1991).
 - 8 Additional information regarding SPR and their products is available from their Web site, www.spr.com
 - 9 Section 167 (f)
 - 10 Symons, *Software Sizing and Estimating Mk II FPA (Function Point Analysis)* (John Wiley & Sons, 1991).
 - 11 IFPUG is a non-profit, membership-governed organization that publishes *the Function Point Counting Practices Manual*. The most recent release of this manual, release 4.0 was published in January 1994.
-

Robert F. Reilly, ASA, CPA, CMA, CFA, is a managing director of Willamette Management Associates, a valuation consulting, economic analysis, and financial advisory firm with regional offices in San Francisco, Chicago, Atlanta, Portland, Oregon, and McLean, Virginia. He holds a BA in economics and an MBA in finance, both from Columbia University.

Pamela J. Garland is a senior associate in the Chicago office of Willamette Management Associates. She holds a BA in mathematics from DePauw University, and a Masters of Management in accounting and information systems from the J.L. Kellogg Graduate School of Management, Northwestern University.

"Reprinted by permission of Valuation Strategies. This article was first published in the May/June 1999 issue of Valuation Strategies.
