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**The Changing Software Business:  
From Products to Services and Other  
New Business Models**

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**Michael Cusumano**

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## **The Changing Software Business: From Products to Services and Other New Business Models**

Over the past several years, the software business has been undergoing dramatic changes, with important implications both for users as well as producers of software products and services. Perhaps the most significant change is the decline of traditional product sales or license fees and the shift in product company revenues to services.<sup>1</sup> Services include annual maintenance payments (usually about 20 percent of the retail product price), which entitle the user to patches, minor upgrades, and often some basic technical support. This shift has been especially pronounced among vendors of enterprise software. We can clearly see this in the case of Siebel, whose product sales fell dramatically before it was acquired by Oracle. Even Oracle experienced the “crisscross” (service and maintenance revenues crossing over to exceed product revenues) as long ago as 1997. Figures 1 and 2 illustrate this phenomenon. The top graph for each company represents product sales versus service and maintenance sales in absolute numbers; the bottom graph represents these revenue streams as percentages of total sales. For Oracle or Siebel, either their product sales were dropping or product prices were falling – we actually cannot easily tell the difference. But the effect was the same: Services (including maintenance, which we estimate to be 55 to 60 percent of service revenues for firms breaking this out from other services) become more important than product revenues.

Of course, there are some exceptions. The revenues of game software companies continue to be mainly from product sales, though online gaming service revenues are growing fast. And a “platform” company like Microsoft, which has a large ecosystem of PC manufacturers as well as enterprise and individual users driving sales of Windows and Office, continues to generate enormous revenues from products. But even Microsoft is encountering change. In fiscal year 2006, Microsoft reported that 4 percent of its revenues were now from services (on its server products) and another 5 percent of its revenues came from online services (MSN). Even just a few years ago, Microsoft reported 100 percent of its revenues from product sales.

### **Product to Service: A Long-Term Trend**

The growing importance of the services business for software product firms is a long-term trend dating back at least to 1990. It has also accelerated with phenomena such as free and open-source software (which tend to drive down all software prices, including some to zero), as well as the Y2K and Internet boom and then bust in technology spending. In general, since 2000 or so, we have seen many enterprises and individual customers rebel against paying a lot of money for any standardized or commodity type of software product. A complicating factor is that we also have seen the rise of new business and pricing models: software as a service (SaaS) as well as “free but not free” software. Companies like Google, Yahoo, and even Microsoft (with Windows Live and Office Live) now deliver what used to be for-fee software products ranging from search and email to basic desktop applications as a nominally free service. The user does not pay for the software

directly (unless you count time to watch advertisements) but advertisers pay the software service vendor.

Companies such as Salesforce.com that sell software as a service, such as through monthly subscription fees, still count these revenues as product revenues, and keep these separate from professional services, such as to create customized features. However, the software as a service pricing model actually eliminates maintenance payments – a major source of service revenues for software companies – and often includes some bundled technical support – a source of costs. So the SaaS model has brought some confusion to the traditional separation of product and service revenues as well as costs and should result in a decline in service revenues because of the elimination of maintenance payments.<sup>2</sup>

In The Business of Software (2004), I suggested that what might be happening to software product companies, especially those selling to enterprise customers, was either a consequence of their life cycles or a business model choice to emphasize services more than product sales. The lifecycle idea suggests that, while software product companies may start out with all or most of their revenues coming from product license fees, over time they shift to a hybrid mixture of products and services and eventually to mostly services (again, including maintenance) (Figure 3). Firms may want to continue focusing on product sales because the potential gross margins on products can be as high as 99 percent, given that the marginal cost of producing a copy of software or any digital product is essentially zero. By contrast, IT service margins can be 30 percent or lower because they can be so labor intensive. But, over time, it seems that software product companies have trouble getting new customers as competitors appear, or their prices fall due to competition from similar firms or free software. Then these companies are more subject to what I call the “99 percent of zero is zero” rule: The great profit opportunity from software products becomes theoretical and not practical. And, whether they like it or not, their revenues gradually shift over to services.

Today, I believe that more is going on here than either an inevitable lifecycle effect or, in some cases, explicit managerial decisions to emphasize services more than products. On the one hand, if we look at other industries, usually in the beginning of their histories, we see a lot of attention paid to product innovation and design. Once companies get the product designs right or if a “dominant design” emerges, then they shift their emphasis more to the process side, such as mass production, in a “product-process lifecycle.”<sup>3</sup> Firms tackle questions such as how do you make the product more efficiently? In the automobile industry, Ford in the early 1900s introduced what become the standard design for the automobile with the Model T and then focused on standardizing components and automating mass production. In the software industry, we can see a similar shift in emphasis from product design in the 1960s (what should a database product or an operating system look like?) to software engineering in the 1970s and 1980s, even culminating in “software factories” in Japan and India as well as the Capability Maturity Model (CMM) in the United States. But what I suggest here is that an aspect of the lifecycle that may be affecting software and some other industries is yet another curve, beyond product and process – and that is service innovation (see Figure 4). For example, if the product design has basically become a commodity – that is, it has become widely available around the world with little differentiation and low-priced or even free – and after a company has gotten as much efficiencies as it could in process improvement – then the next focus of management attention may indeed be services.

On the other hand, it occurs to me that yet another way to think about what we are seeing may be related to what have been called “S-curves” and “disruptive technologies”<sup>4</sup> (see Figure 5). In software, not only do we have maturity setting in for different product segments and companies shifting their emphasis to services. But some of the new technologies that we have now enable different kinds of business models, including different ways of pricing and delivering software, and reaching different kinds of customer. Obviously the Internet and wireless technologies enable all sorts of on-demand or transaction-based pricing models or Google types of advertising-based revenue models. In addition, a platform transition seems to generate demand not only for buying new products but also for services. For example, if you are a customer switching from mainframe platforms to client/server or from client/server to Internet or from stationary to mobile you probably need a lot of services in terms strategic assistance, rewriting applications and data, or retraining employees. In other words, platform transitions such as we have experienced over the past 15 years or so could also be generating as much or more new revenues from services as from products, especially since a lot of products are now free or low-priced.

### **Maturity and Innovation – Simultaneously**

To try to sort out what is happening in the software business, in 2003 I launched a research project at MIT to examine this shift from products to services, for companies in software and other industries.<sup>5</sup> My colleagues Fernando Suarez and Steven Kahl and I are still analyzing the data, but we have some preliminary findings and observations.

The first database we created, which covers 1990 through 2006, is a comprehensive list of firms that consider themselves software product companies selling “prepackaged software,” listed under U.S. SIC (standard industrial classification code) 7372 (see Figure 6). These data include foreign firms listed on U.S. stock exchanges, such as SAP and Business Objects, and include game software firms, which sell products almost exclusively. The total number of distinct firms in this data set is about 500 and the number of product companies listed in any one year peaked in 1997 at just over 400. We are down to less than 150 firms in 2006 – which indicates a dramatic consolidation of the software products business. The second database, which covers 1990 through 2004 (we have not yet updated it), consists of firms that compete in IT services, under several different SIC codes (Figure 7). These data also show a peak in terms of listed companies in 1999 at just below 500, and a decline to less than 250 in 2004. The strong rise in IT services companies in the 1990s does suggest that the transition from client-server to internet platforms provided as many or more opportunities for services firms as it did for software product firms to become public companies, though both the services and products side of the business have experienced significant consolidation since that time.

The fact that the number of public software and IT services companies is consolidating suggests the software business is indeed maturing. However, other data collected at MIT suggests that we have a strong rise in startup enterprise software companies, especially in 2005, utilizing a variety of new business or pricing models.<sup>6</sup> Figure 8, which shows the business models of 180 companies competing in web-based enterprise software (about 20 percent of the companies are publicly listed), indicates that the most popular pricing model was now monthly subscription fees.

A minority of companies also offered free software or advertising-based software (Google falls into this category), and others the traditional license fee.

Figure 9 shows a model developed by students in my class at MIT that categorizes the variations now occurring in revenue or business models, delivery models, and target customers. Ten years ago, we would have seen nearly all software product companies selling software through the upfront license fee and doing a local installation on the customers hardware. Now we have many different business models — subscription, advertising-based, transaction-based, and several kinds of “free, but not free.” And we have software delivery models going all the way to the remote web-based or even bundled as a hardware product. This trend toward potentially cheaper software, combined with less costly ways of delivering software over the web, also have made it possible for firms to target not only mainstream customers but small businesses and leading-edge early adopters. In addition, a lot of software companies are now turning themselves into hardware companies, which is sometimes called the “appliance model.”<sup>7</sup> If you put the software in a box, it is not so likely that the price will fall to zero. People will pay more for a box, usually, even though they may not want to pay much for software or digital media on its own.

Another element behind this entrepreneurial activity is that it may not take as much money as it once did to start a software company. Of course, it was always possible for “two guys in a garage” to launch a software or computer hardware company, and many started that way. But today, many critical enterprise components – the operating system, database, web applications server, etc. – are available as free and open-source software. You can write some applications code and then hire another firm to host the software and, with relatively little expense, launch an enterprise software company! Data from this recent survey suggests that about 37 percent of the new web-based enterprise startups were self-funded by the entrepreneurs (bootstrapped) and only 36 percent relied on venture capital.<sup>8</sup>

As we look back at these trends and new developments in the software products business, a question occurs: Is this rise in services and new business models a temporary or permanent phenomenon? Permanent here in my mind refers not really to “forever” but to a trend lasting at least one and probably a couple of decades. The temporary argument goes back to that chart of the S curves. It would say that, essentially, we are now merely in between platform transitions and probably in a bit of a plateau in terms of product revenue growth. If some major innovation occurs, such as for a new computing platform, then individuals and enterprises will again start buying new products, both hardware and software, in large numbers. By contrast, the permanent argument says that software may have experienced what computer hardware did in the past: Investments from Intel and other firms along the lines of “Moore’s law” helped dramatically reduce the price of computing power and bring powerful computers down to the level of commodities. In other words, the permanent argument suggests that maybe a lot of software now is also commoditized, just like hardware, and prices will fall to zero or near zero for any kind of standardized product. In this scenario, the future is really free software, software as a service, or “free, but not free software” with some kind of indirect pricing model, like advertising — a Google-type of model. And it is possible that other commoditized high-tech industries, especially those with lots of value coming from software, are likely to follow.

## **What the Data Say**

Perhaps we have experienced changes in the software business that are very long-term, and not temporary. But what does the data say about this question? We have a database of all publicly listed software product companies (approximately 500 in all) with an average of about 10 years of data for each firm (totaling over 3200 annual observations). As seen in Figure 10, software product firms in our sample had an average of about 70 percent of their revenues coming from product sales in 1990 and less than 50 percent since around 2003, when the “crisscross” first happened for the industry as a whole. If we remove game software companies from the sample, the crisscross happened in 2002 and is a bit more pronounced. Also note that we do not separate maintenance from other services because only a minority of companies – less than 10 percent of our sample – break this out. Firms treat maintenance as a type of service because, unlike product sales, companies can recognize these revenues only over time, as they deliver patches or upgrades or technical support. Some firms, such as SAP and Oracle, are now trying to re-label maintenance fees as product revenues in the sense that they represent product renewals. This makes some sense because maintenance has profit margins closer to product sales (though a bit lower because of routine technical support costs usually included in the maintenance agreements), but maintenance revenues are still derived from the installed base of customers and recognized over time, like other services.

The data indicates that product revenues have dropped but they have not continued to fall to zero; rather, they have stabilized at just over 50 percent of total revenues. So perhaps software product companies have reached a sort of equilibrium point as a business – more service (including maintenance) revenues from their existing customers than new product revenues, but products are still holding significant value, at least for the publicly traded companies. Even without including game software companies, we see this stabilization trend.

We can also look at how common it is for software product companies to sell only products as well as have different “hybrid” mixtures of products and services. In 1995, Richard Selby and I published a book that held Microsoft up as the ideal model for a software company – 100 percent product revenues and those wonderful gross margins.<sup>9</sup> But the data suggest that these kinds of companies are relatively rare historically and becoming fewer over time. Excluding software game firms and some other firms (mostly, they did not break out products versus services and we could not confidently classify their revenues), the total number of firms in our sample peaked at 300 in 1997 and stood at merely 111 in 2006 (Figure 11). The number of firms reporting 100-percent product revenues went from 12 in 1990 (14% of the total sample) to 14 in 1996 (5%) and only 1 in 2006 (1%). We can also look at the data in other ways. For example, Figure 12 breaks our 3401 data points (one firm’s revenue reporting times the number of years) into quartiles. Between 1990 and 2006, the number of software product firms reporting between 75 and 100 percent product revenues peaked at 86 in 1996 (representing 31% of the 274 firms we have for that year) and fell to 21 (19%) in 2006. At the same time, the number of software product firms reporting between 0 and 38 percent of their revenues from products increased from 10 in 1990 (12%) to 79 in 2001 (32%) to 49 in 2006 (44%).

Our preliminary analysis also indicates that, while the average level of product revenues has dropped over time to less than 50 percent for the software product companies, the optimum mix for operating profitability (again, excluding games and some other firms) seems to be at about 70 percent products and 30 percent services. There are also some companies in our database that have reported 100 percent service (including maintenance) revenues in a given year and no product sales, even though they are nominally software product companies. If this happens to you, you are likely to be a very weak performer and a candidate for a takeover or bankruptcy.

Why the shift toward services? Primarily it is happening because our software product firms are getting older. They creep towards that service crisscross at the rate of nearly 2% a year. The “crisscross point” by age is at 26 years for the whole sample and 22 years if we exclude game companies. In other words, if you are a software product company and you survive for more than 20 years (and do not sell software games), it is likely that your service and maintenance revenues now equal or exceed your product revenues.

According to preliminary statistical regression analyses, this transition is also related to lagging growth in product sales and total sales, and the recession that followed the Internet boom. The appearance of the Internet as a disruptive new platform also generated new service sales, especially for IT services companies. But this factor is statistically less important than firm-level factors for the product firms, such as age and the lag in sales. In other words, the shift toward services for product firms appears to have happened for two reasons. One is that product sales may continue to grow but services grow faster, perhaps because price levels or the number of new customers fall. This situation is still relatively healthy and firms can easily survive as hybrid businesses. The other scenario is that the products business collapses, and that is why firms cross over to a majority of service revenues. This scenario is potentially disastrous because it often means the firm has to reorganize radically and perhaps quickly, as in the case of Siebel or another firm I have written about, i2 Technologies.<sup>10</sup> The firm can no longer support large product R&D groups with large marketing and sales expenditures. It has to transition from designing products for a largely abstract set of customers to building and servicing products for individual customers. Many firms do not make this transition or make it poorly and reluctantly, missing the opportunity to manage services as a strategic area.

### **Implications for Performance and Strategy**

As we began to collect our data, my research colleagues and I had thought that the impact of rising services would in general have a negative impact on profitability and market value for a software product company because services tend to have lower profit margins and signal lower growth prospects. What we are seeing, however, is that the relationship is more complex, particularly if we exclude game software companies and their relatively simple business model – sell products.

For most software product companies, services generally contribute positively to their profits, but not in the linear manner we had expected. More specifically, there seem to be “sweet spots” at the low end and the high end of the spectrum. We can roughly say that, for the average

software product company, services contribute positively to profits until they are about 20 percent of total revenues. After that point, services become a drag on profitability until they reach about 60 percent of revenues (Figure 13). Then services begin again to have a positive impact. One possible explanation for this curvilinear effect is that product companies might sign most of their customers to simple maintenance contracts for up to 20 percent or so of the retail price of their products, and these kinds of services are very profitable for them as long as technical support costs are minimal. But as the product companies get deeper into labor-intensive services, such as product customization and complex integration work, or strategic consulting and training, then services can become a drain on profits until the product companies gain enough scale and experience to perform these services efficiently. Then they begin again to make money from services, much like dedicated IT services companies do. SAP and Oracle would fit this model. Both are very profitable and have only about one-third of their revenues coming from new product license sales.

Market value, which generally tracks growth rates as well as profitability, follows a similar non-linear curve – seems to be positive until about 20 percent, then negative until about 80 percent, and then positive again. However, there is also some indication in our data that, even in years when services are positively contributing to profitability, market cap can drop as services rise. This suggests that investors still do not understand how important services have become to the revenues and profitability of software product companies.

The positive impact of services on profitability and market value differs somewhat by product category and we are still in the process of sorting these differences out. But the general conclusion seems to be that many or most software product firms can and should take advantage of services, especially maintenance, and not just let services “happen” because their product business declines. This means that software product firms and probably many other high-technology firms should treat services as a strategic area and target of opportunity for the firm to increase revenues and profits – especially when the product business is suffering. Another preliminary analysis we did suggests that, for every 10 percent increase in maintenance as a percentage of total services, services gross margins rise about 5 percent. In other words, if your products business is declining and shifting to services, try to sign every customer to a maintenance agreement and you will minimize the impact on profitability. By contrast, too many product firms seem to treat services as a necessary evil and manage them as a cost center, without much creativity or effort to grow this part of the business. In fact, though, most firms can look at their past trends and predict when they will hit the crisscross and take some strategic responses, such as to try to rejuvenate the product lineup and sell more licenses, or launch a major campaign to sell more maintenance and other services, as firms such as SAP and Oracle have done over the past decade.

The shift toward services for the product companies may be bad news for IT services companies. Firms such as IBM Global Services, Accenture, and Infosys are historically partners of the enterprise software product companies like SAP and Oracle, and gain a lot of revenue by installing, integrating, and customizing enterprise systems. But services are really money “left on the table,” to some extent, by product companies, in the hopes that services partners can help them sell more products. If the product revenues are disappearing, however, then we have former partners competing for the same money.



We also have found that this trend toward services is not limited to the software business, though it seems to be less of a lifecycle phenomenon and more a strategic move in other closely related industries, such as computer and telecommunications hardware and equipment. For example, as shown in Figure 14, IBM's service revenues have grown from less than 30 percent of revenues to more than 50 percent over the past decade. Sun Microsystems, Hewlett Packard, Cisco, and even Dell have shown major increases in services and this seems to correspond to the commoditization trend in hardware.

### **The Three-Fold Challenge**

There is a three-fold challenge for managers of software product companies and other firms that are experiencing this shift toward services. First, is how can you manage this crisscross? Managers need to figure out in their particular business segments what is the best mix of product revenues (hardware and software, if appropriate) along with service and maintenance revenues, and how to impact these percentages. Services seem especially complementary in some business segments, like enterprise applications, and potentially more of a drag on other segments, although recurring maintenance payments are good for every product company. Another point which we tend to forget is that, for most product companies, their products are the engine that drives service and maintenance revenues. Products and services are coupled for most firms, even though IBM and perhaps other companies such as General Electric have managed to become a relatively neutral vendor of services. Most product firms should want to maintain strong product lineups that keep customers paying for implementation or strategic services as well as long-term maintenance contracts or subscriptions.

Second, managers need to think about how they can “servitize” their products – that is, create service offerings that add value to their products. Services wrapped around products can make the products less commodity-like as well as generate new revenues and profits, even as the product business declines. In some industries, there is evidence that services over the lifetime of the product can generate several times the initial profits on the sale.<sup>11</sup> Some day in the near future, for example, companies will give away various devices for free and just sell service or content subscription contracts. The cell phone industry is well on the way toward this path. The automobile industry may follow as well. Even today, General Motors and Ford make little or no money from their products business and nearly all their money from financial services – loans and leasing. Other ecosystem players make even more money from insurance and other services. What GM and other distressed automobile companies should do is give away cars at cost and sign customers to an all-inclusive services contracts – not only loans or leases, but also insurance, maintenance and repair, and telematics services like GM's OnStar – for the lifetime of the product.

Third, managers need to think about how to “productize” their services so they can deliver them more efficiently. Productization of services can come from computer-aided tools and standardized process frameworks and training, as seen in past Japanese software factories such as at Hitachi or Toshiba, or in present Indian IT services companies such as Infosys. But productization can also come through automating services, such as the way Google, eBay, Expedia, eTrade, Lending Tree, and other Internet companies deliver their software-driven products – or services. In fact, fully automated services should be able to generate the same level of gross margins as a traditional software product company. It is why web-based delivery of software supported by

different business models is such an intriguing change for how producers distribute, deploy, and receive payment for (or do not receive payment for) their software products and services. It is also why Google now rivals Microsoft in profitability, market value, and leadership in the ever-changing software business.

Figure 1

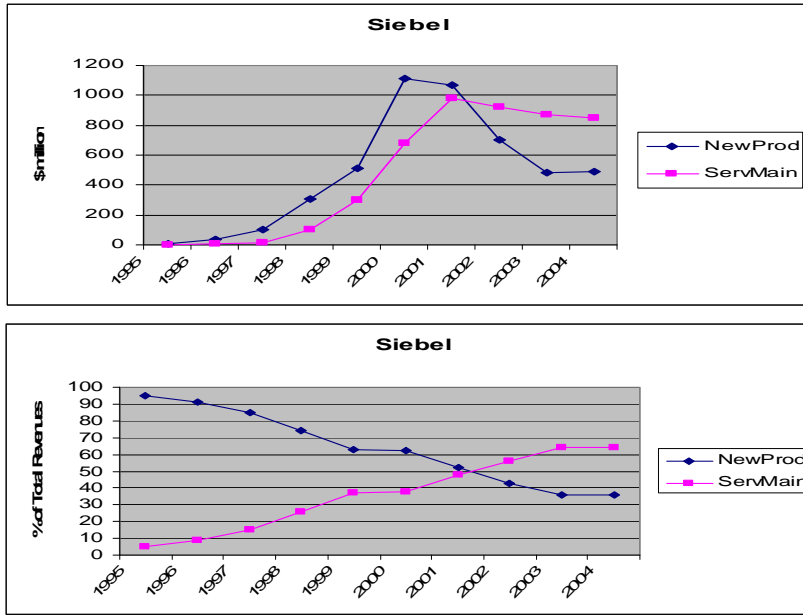


Figure 2

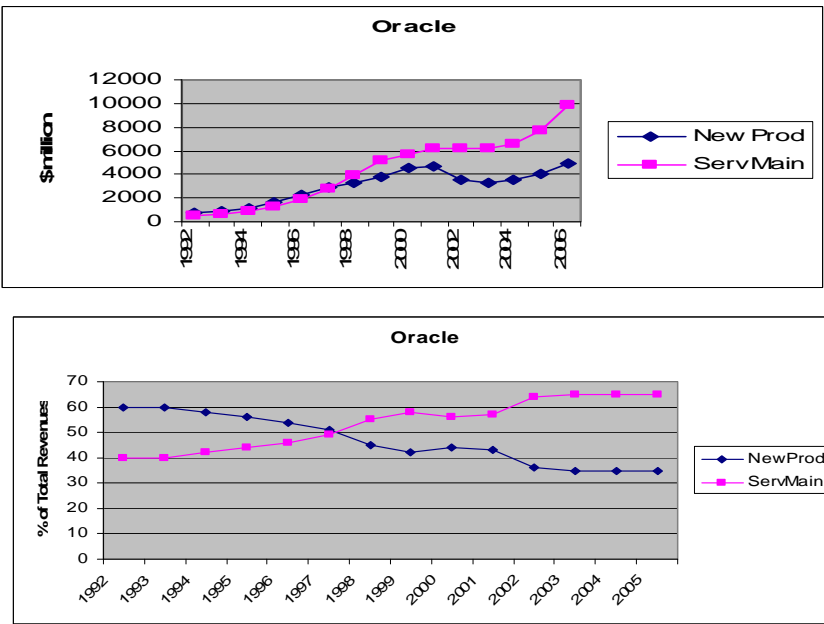
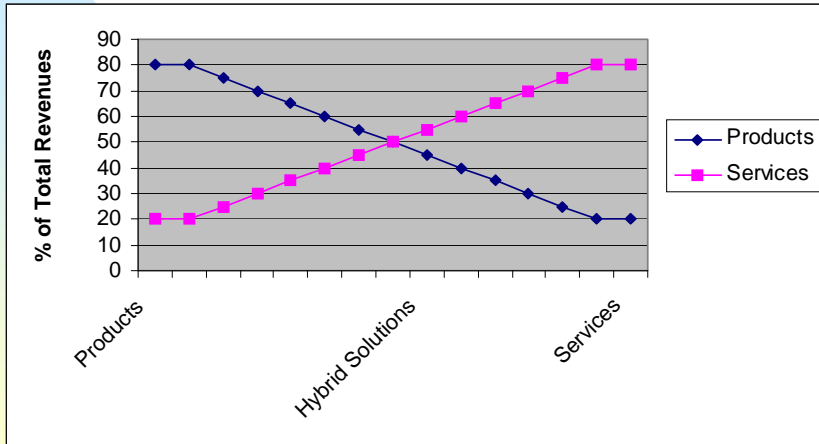


Figure 3

## Business or Life Cycle Models?



Source: M. Cusumano, *The Business of Software* (2004), p. 26

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Figure 4

*Different Evolution Curve –  
Product, Process, and/then **Services?***

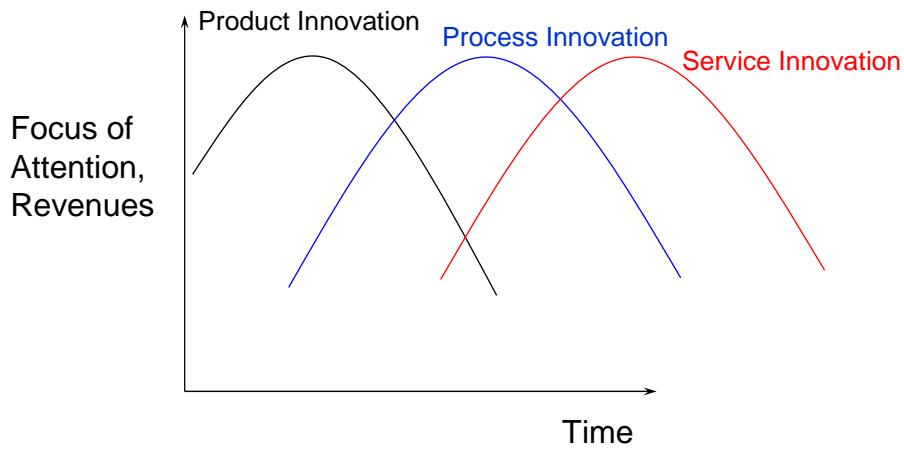


Figure 5

*Or Different S-Curve Dynamics –  
Platform Disruptions Generate New  
Services & New Business Models?*

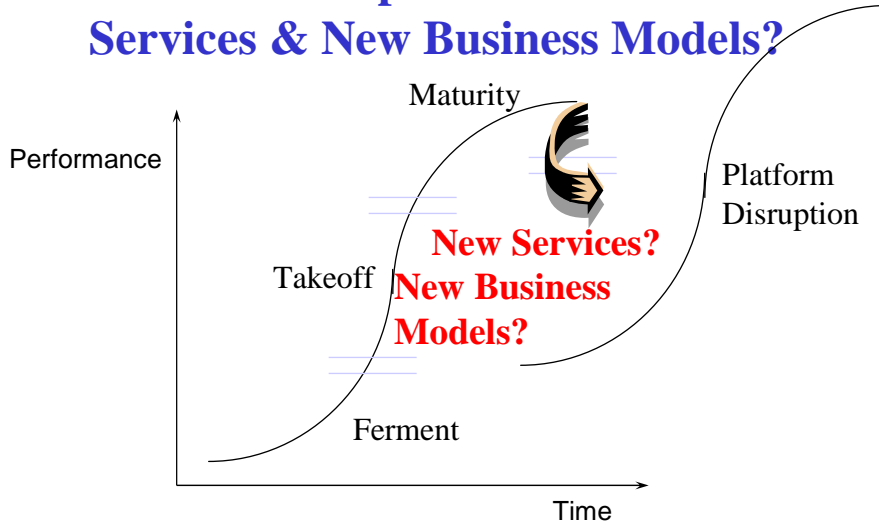


Figure 6

## Public Software Product Firms Listed on US Stock Exchanges (SIC 7372)

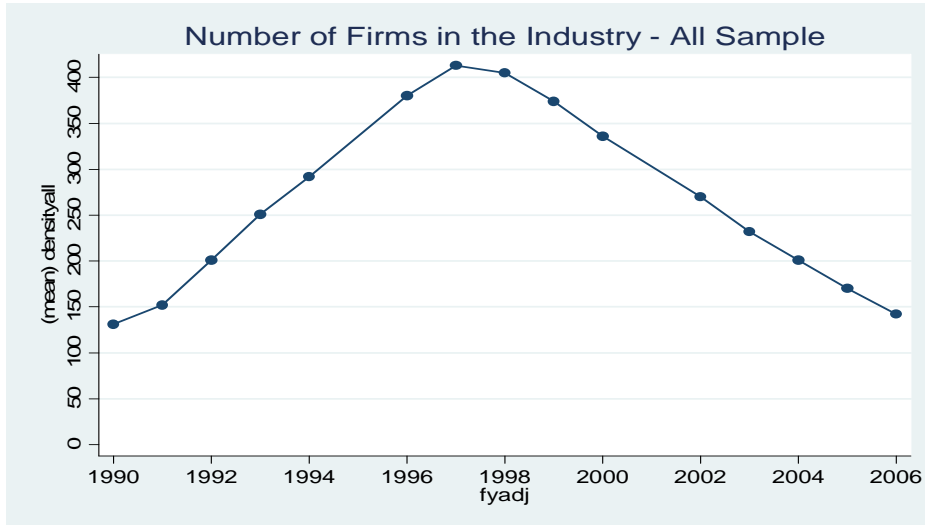
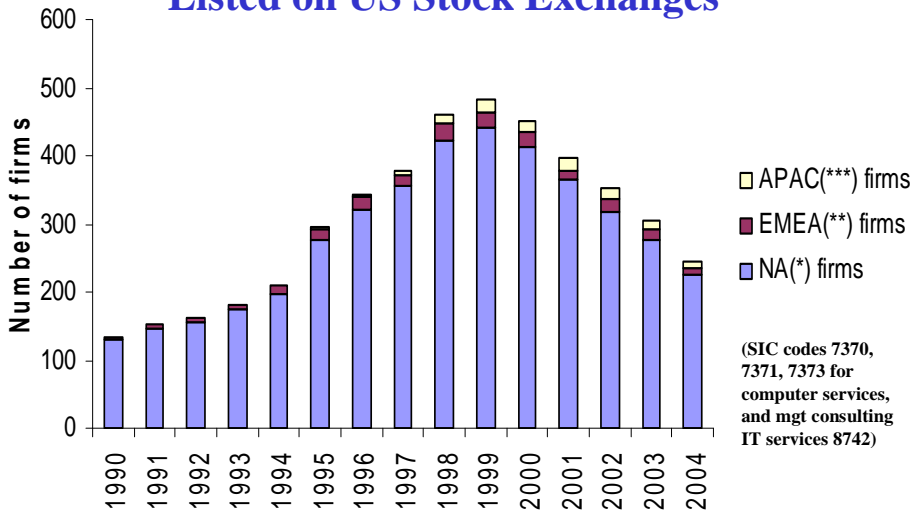


Figure 7

## Public IT Services Firms Listed on US Stock Exchanges



\* North-America including Caiman islands and Bermuda. \*\* Europe and Middle-Eastern. \*\*\* Asia-Pacific

Source: Francois de Laigue, "Identifying performance levers in the IT services business models" (Cambridge, MA: Unpublished M.S. thesis, Massachusetts Institute of Technology, Technology and Policy Program, 2006).



Figure 8

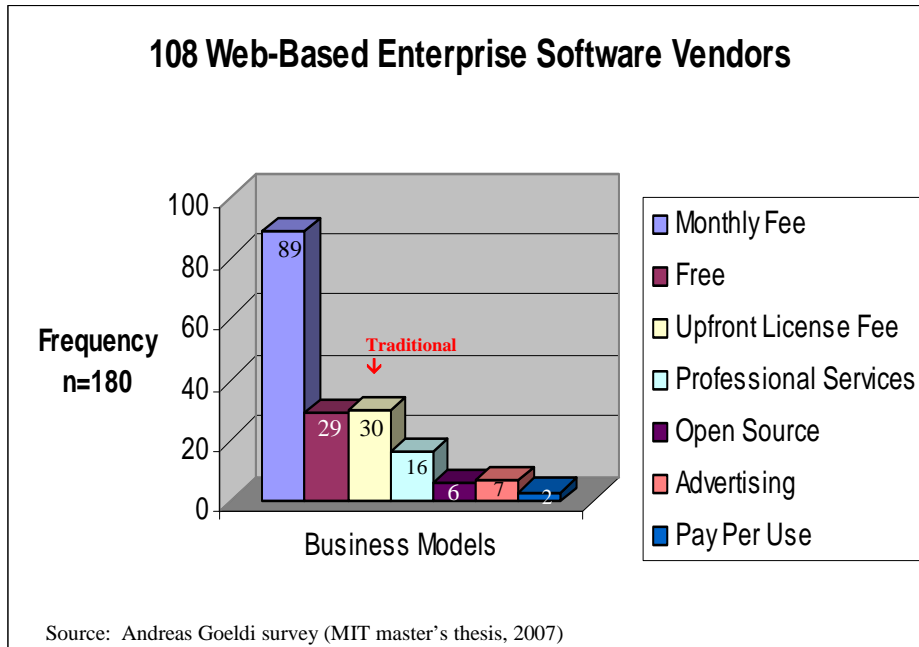
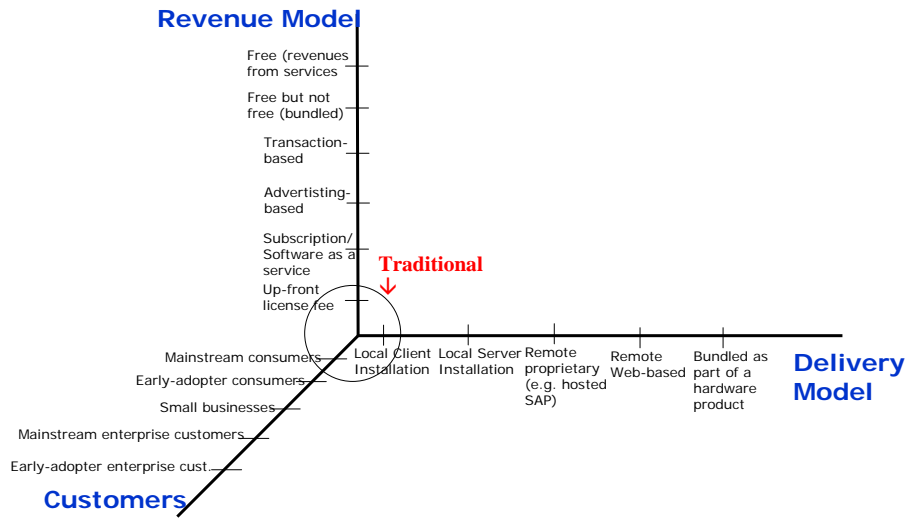


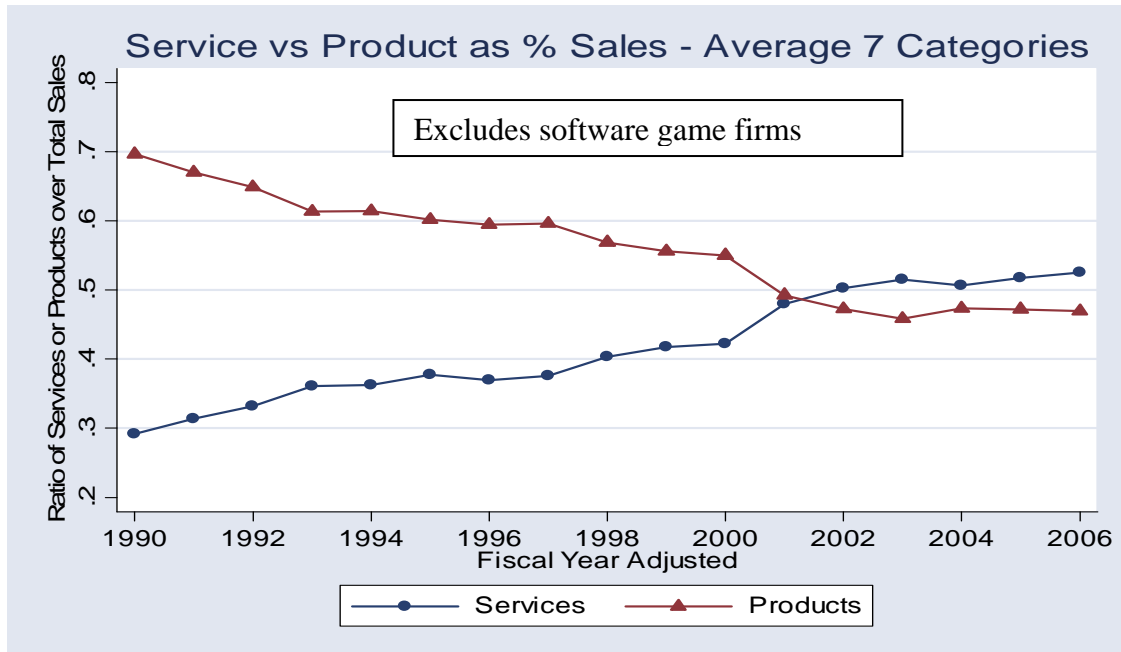
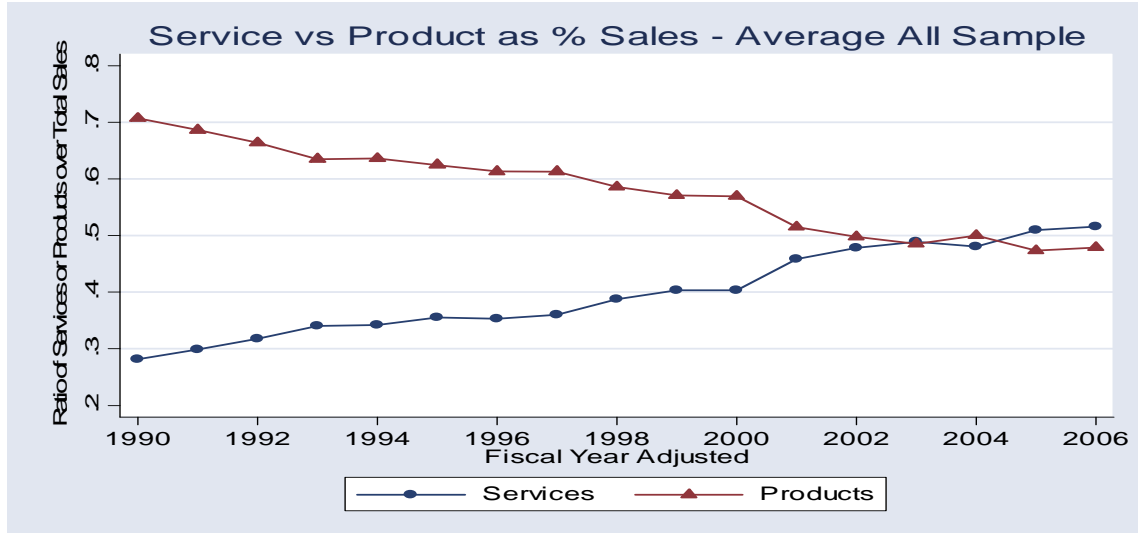
Figure 9

# New Business Model Dimensions



Source: 2006 MIT student team Krishna Boppana, Andreas Göldi, Bettina Hein, Paul Hsu, Tim Jones (Cusumano, The Software Business, 15.358)

Figure 10



Note: Services include maintenance, which we estimate to be 55-60% of total service revenues for those firms that break this out.

Figure 11 **Software Product Company Analysis**

<b>Year</b>	<b>Firms with 100% Product Revenues</b>	<b>% of Total Sample of Firms by Year</b>	<b>Total Number of Firms in Sample</b>
1990	12	14	84
1991	12	13	96
1992	14	11	133
1993	10	6	170
1994	11	5	202
1995	9	4	227
1996	14	5	274
1997	13	4	300
1998	11	4	296
1999	10	3	287
2000	7	3	265
2001	6	2	247
2002	4	2	217
2003	4	2	190
2004	5	3	166
2005	1	1	136
2006	1	1	111
<b>Total</b>	<b>144</b>	<b>4</b>	<b>Data points = 3401</b>

Figure 12 **Software Product Company Quartile Analysis**

<b>Year</b>	<b>100% - 75%</b> <b>Product</b>	<b>% of</b> <b>Total</b>	<b>74% - 58%</b> <b>Product</b>	<b>% of</b> <b>Total</b>	<b>57% - 39%</b> <b>Product</b>	<b>% of</b> <b>Total</b>	<b>38% - 0%</b> <b>Product</b>	<b>% of</b> <b>Total</b>	<b>Total (100%)</b>
1990	36	43	25	30	13	15	10	12	84
1991	44	46	22	23	19	20	11	11	96
1992	56	42	32	24	24	18	21	16	133
1993	62	36	40	24	35	21	33	19	170
1994	64	32	54	27	49	24	35	17	202
1995	65	29	70	31	54	24	38	17	227
1996	86	31	75	27	57	21	56	20	274
1997	86	29	87	29	70	23	57	19	300
1998	68	23	95	32	71	24	62	21	296
1999	68	24	83	29	72	25	64	22	287
2000	56	21	86	32	56	21	67	25	265
2001	32	13	66	27	70	28	79	32	247
2002	30	14	37	17	75	35	75	35	217
2003	27	14	26	14	62	33	75	39	190
2004	27	16	21	13	56	34	62	37	166
2005	23	17	16	12	40	29	57	42	136
2006	21	19	15	14	26	23	49	44	111
Total	851	25	850	25	849	25	851	25	3401

Figure 12A

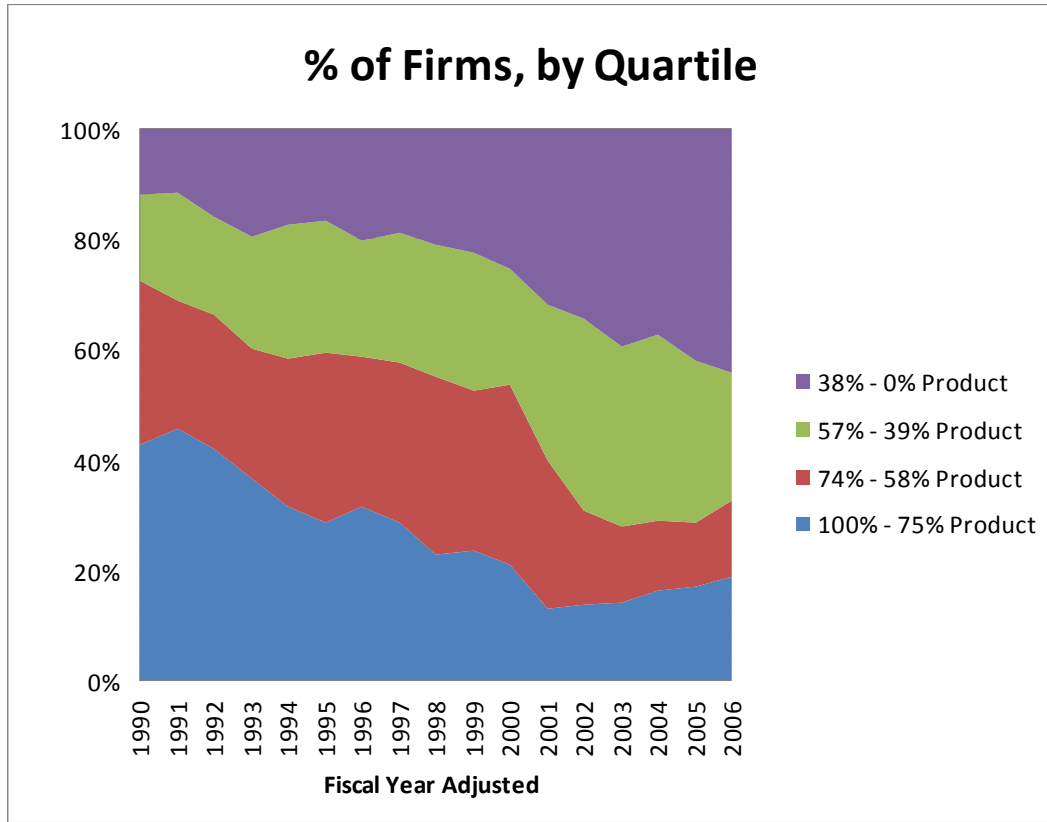
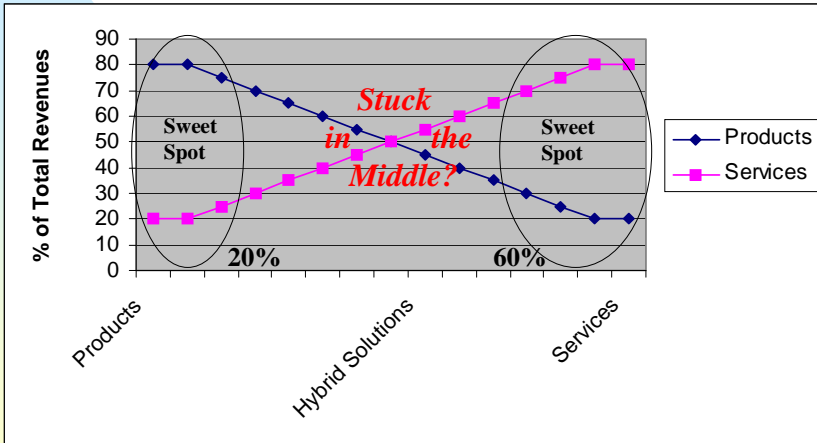


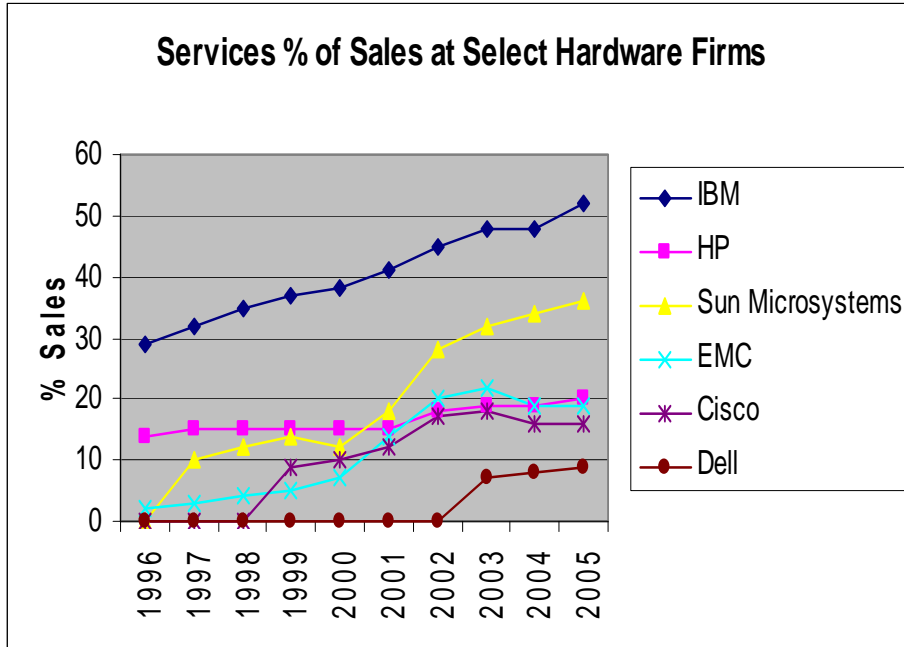
Figure 13

## Services Impact on Profits & Market Value: Sweet (vs. Sour) Spots



7

Figure 14





## Endnotes

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<sup>1</sup> See Michael A. Cusumano, The Business of Software (New York: Free Press/Simon & Schuster, 2004).

<sup>2</sup> For more discussion of the change in software pricing, see Michael A. Cusumano, "The Changing Labyrinth of Software Pricing," Communications of the ACM, July 2007, vol.50, no. 7, pp. 19-22.

<sup>3</sup> The original product-process life cycle idea comes from work by William Abernathy and James Utterback in the mid-1970s. For a more recent discussion, see James Utterback, Mastering the Dynamics of Innovation (Boston: Harvard Business School Press, 1994).

<sup>4</sup> In addition to Utterback, see also Clayton M. Christensen, The Innovator's Dilemma (Boston: Harvard Business School Press, 1997).

<sup>5</sup> My collaborators in this project are Professors Fernando Suarez of Boston University and Steven Kahl of the University of Chicago. I could not have produced the analyses and figures in this article without their collaboration.

<sup>6</sup> Andreas Goeldi, "The Emerging Market for Web-Based Enterprise Software" (Cambridge, MA: Unpublished M.S. thesis, Massachusetts Institute of Technology, Sloan Fellows/Management of Technology Program, May 2007).

<sup>7</sup> Bettina Hein, "0+0=1: The Appliance Model of Selling Software Bundled with Hardware" Cambridge, MA: Unpublished M.S. thesis, Massachusetts Institute of Technology, Sloan Fellows/Management of Technology Program, May 2007).

<sup>8</sup> Goeldi thesis.

<sup>9</sup> See Michael A. Cusumano and Richard W. Selby, Microsoft Secrets (New York: Free Press/Simon & Schuster, 1995).

<sup>10</sup> Cusumano, pp. 19-23.

<sup>11</sup> See Thomas Knecht, , Ralf Leszinski, and Felix A. Weber, "Memo to a CEO: Making Profits *After* the Sale," McKinsey Quarterly, Winter 1993, no. 4, pp. 79-86