Beyond Servicization: The Rise of Digital Hybrids

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INTRODUCTION

In the past fifty years services have come to dominate the U.S. economy. Measured by GDP, government, education, and health care have grown by multiples at the same time that manufacturing and agriculture have contracted. Such global giants as AIG, Citigroup, and HSBC (all ranked in the top five of *Forbes*' Global 2000) rely on services exclusively, while GE (number 2) has managed to transform its primary emphasis from manufacturing to services – even in sectors where it still makes products.

Because services are so common and yet so diverse – the word itself has 38 meanings, according to the *Oxford English Dictionary* – much about them remains difficult to codify. Service can be an experience or a repair. It can be co-created, as when a tennis pro gives lessons and the student needs to practice to benefit from her investment, or delivered from a provider: haircuts are the archetype here. Service can be rendered by a person such as a barber, or delivered as utilities like dialtone.

Rather than attempt to differentiate among the many kinds of services, our focus is on the "both/and." An emerging category of economic offers blends products and services into hybrids. Furthermore, while combining such services as financing and maintenance with a product purchase is relatively common, a newer type of hybrid is being built from a variety of digital assets.

Before we can discuss this new type of hybrid, it is useful to review the traditional definition of services to see how far the digital world is moving from conventional wisdom. Four traits are typically taken as axiomatic.

- **Inseparability**
  Many services are produced and consumed at the same moment and are thus *inseparable* in time. A haircut is inseparable; legal research is not.

- **Heterogeneity**
  Because services derive from providers working outside of a standardized industrial structure, they can vary in their quality and predictability and so are *heterogeneous*. Service quality will vary across hotels in a given chain, but also from the same desk clerk on different days.

- **Perishibility**
  Following Adam Smith's logic, the trait of services to be in the moment and not able to be inventoried makes them *perishable*. Seats on trains and airplanes count as classic examples of perishibility, as do billable hours in professional services.

- **Intangibility**
  Finally, the most commonly cited distinction holds that services cannot be touched or held in the ways a product can; this makes them *intangible*. The economic output of schoolteachers or nurses is notoriously difficult to measure, in large part because of intangibility.[1]

A Maturing Services Economy

Particularly because of digitization, services are transcending many of their previously assigned characteristics. Telephone service is created in heavily capitalized facilities much like factories and is not easily called heterogeneous: automobiles vary in quality far more than modern landline telephony. Voicemail makes telecommunications less inseparable in time. Offshore programming and call centers belie the notion that services lack portability. Financial instruments, called products in that industry, are neither necessarily inseparable nor heterogeneous.

At the same time, previously obvious distinctions between goods and services have multiplied in kind and blurred in character. Figure 1 illustrates one way of organizing the outputs of a modern economy at an abstract level.

Commodities		Products			Hybrids		Purchased Services			Public Services
Standard	Engineered	Capital	Inter-mediate	End-user	Standard-Izedd	Custom-izable	Standardized Delivered	Custom Delivered	Co-created	Government
Coal, wheat	Farmed salmon, genetically modified seed corn	Pizza oven, crane, oil drill, city bus, milling machine	Ball bearing, micro-processor, upholstery fabric, sheet metal, newsprint	Sweater, motor-cycle, apple-sauce, television	"Power by the hour" jet engine contract, office furniture lease-back, fast food, safe deposit box	Anti-virus software, iPod/ iTunes, home mortgage, chemo-therapy	Car wash, train ticket, stock purchase, security guards, movie theater, electricity	Haircut, surgery, house painting, site survey, furniture movers,	Tennis lessons, corporate audit, enterprise software imple-mentation	Road building, meat inspection, drug approval, military, police, public education, driver licensing

Figure 1: Beyond the Product-Service Duality. Digital product-service hybrids can be understood as a subset of customizable hybrids.

The implications of this change matter for many modern businesses. Entire legal and managerial structures have been built up over centuries, refining such concepts as assets, liabilities, depreciation, and various types of risk and risk mitigation. Patents, which formerly protected manufactured items, now apply to "business methods" and other intangibles, and underpin an intellectual property infrastructure widely acknowledged to be broken. As old definitions lose their precision and relevance, investors, regulators, and managers are faced with the need for new tools and measurements to monitor and shape this economy.

HYBRIDIZATION

More immediately, digital hybrids are responsible for important economic sectors characterized by scale, profitability, and growth. Innovators including Craig McCaw, Steve Jobs, and Peoplesoft founder Dave Duffield are capitalizing on this new class of offer, and in the process are disrupting traditional industry practice.

Hybrids are not new. GM builds cars and trucks but makes most of its profit on the leasing and financing of those vehicles. Something as basic as office furniture can be structured into complex financial instruments such as leasebacks as customers seek to exploit interest rates, tax treatment, or a line of credit. GE, another hybrid company, has responded to customer demand by selling not only jet engines but, in essence, thrust as a service. Defense ministries and departments in multiple nations are contracting for capabilities rather than assets in their new procurement programs. As a result, both the product purchase and leasing models are being eclipsed in some markets by performance criteria that include parts, maintenance, and other ancillary duties.

However well discussed in the literature,[2] servicization typically connects material assets to existing activities such as replenishment, maintenance, spare parts provision, or financing. Automobile leasing, which in the U.S. accounts for about a fifth of the overall market but over 40% of transactions in luxury brands, has yet to substantially alter automakers' perception of themselves as producers of cars. If GE did not manufacture suitably advanced and high-performing jet engines, the services bundles would be largely irrelevant. The hybridization of manufacturing and maintenance, repair, and financing, then, joins a conventional product with traditional physically and temporally delimited services.

Apple's iPod Platform

A new category of hybrids, enabled by the Internet, constitutes an important departure from the common form of servicization. Bill Gates highlighted this trend in late 2005 when he told Microsoft employees that "This next generation of the internet is being shaped by its 'grassroots' adoption and popularization model, and the cost-effective 'seamless experiences' delivered through the intentional fusion of services, software and sometimes hardware."[3] While the memo was widely understood to refer to Google, Gates no doubt had in mind a variety of successful hybrid models, none more visible than Apple's iPod and its associated components. This platform blends products and services in an unprecedented way, the success of which suggests that other companies will follow Apple's lead in the future.

Released in April, 2003, the fifth-generation iPod has transcended its hardware category (MP3 player) and become a highly profitable element of a three-legged platform. In addition to the hardware, Apple offers content in the form of downloadable music and video files for which users pay 99 cents and up, depending on a particular licensing arrangement. These transactions are conducted by Apple's iTunes Music Store, also launched in April 2003. The final facet of the platform is interlinked software for managing the device, its relationship to a host computer, and the user's rights to purchased content.

In general terms, the company has to date done three things well. First, Apple's innovation leads rather than follows both competitors and the user base: new products and services are launched before old ones get tired. Second, product releases (and shutdowns) are carried off with precision: old models are removed from the channel

quickly rather than showing up at reduced prices, and new models are usually available in ample supply.

Third, Apple has managed its suppliers expertly, negotiating not only the rights to an extensive music catalog but locking up a large percentage of the market for various components: in mid-2005 Apple reportedly bought 40% of Samsung's total output of flash memory, which both cut supply and raised prices for competitors. That deal later came under investigation, so Apple prepaid $1.25 billion for future purchases of flash memory from five suppliers in late 2005. Such long-term planning translates into lower component prices and therefore higher margins at the same time that it avoids product shortages.

Mass Adoption

The iPod's success can only be partially conveyed in numbers. In less than three years, over a billion songs had been downloaded from the iTunes Music Store; a billion were sold in 2006 alone. After 21 million iPods were sold in the fourth quarter of 2006, the installed base is approaching 100 million units. Another way of valuing the platform derives from market capitalization. At the end of calendar 2002 and thus about a fiscal quarter before the hybrid's launch, Apple stock sold at a split-adjusted price of just over $7 a share. By January 13, 2006, Apple's share price had peaked at $85.59. With over 800 million shares outstanding, the iPod era coincided with a growth in market capitalization of approximately $60 billion. For a brief time, Apple as a company was more valuable than Dell even though the former reported about three times Apple's revenues for 2005.

Digital Hybridization

The conventional literature analyzing the computer industry asserts that hardware components and software elements define a platform. A representative discussion states that "Computer systems are comprised of many components. . . . The contours of these products – what is included or excluded from the bundle of components – are determined by business and design decisions."[4] Little attention has been paid to *services* as an element of a platform strategy, however.[5] Accordingly, numerous case studies of the iPod fail to note the powerful complementarity between product and service, as opposed to product and product.

By contrast, Apple's downloadable songs are functionally nearly[*] equivalent to the files pressed on music CDs, but as a service they have important distinctions which make them fail the product definition.

- They are not held in inventory.
- They are intangible in that there is no physical medium of exchange.
- They can be moved to the point of purchase almost anywhere in the world in seconds.

[*] The downloads are searchable and more portable; CDs are not compressed in the same way so the larger files translate to higher audio quality.

Each of these attributes, in the iTunes context, constitutes a source of advantage rather than a liability.[6]

Unexpected Consequences

Two success factors have developed in the hybrid environment that would have been difficult to create elsewhere. First, virtualization of inventory facilitates one of digital commerce's most striking characteristics, what *Wired* magazine editor Chris Anderson has called "the long tail." Graphic representations of Internet traffic exhibit power law behavior first noted by Harvard linguist George Zipf with regard to the frequency of words in use: "the" and "and" are used far more frequently than "oxymoron" and "diatribe." Internet-watchers later noted this as "winner-take-all" behavior, in which the Yahoos and AOLs of the world accounted for the vast majority of all traffic, which drops quickly from the heights of the mega-sites to a long-running asymptote (see figure 2). [7]

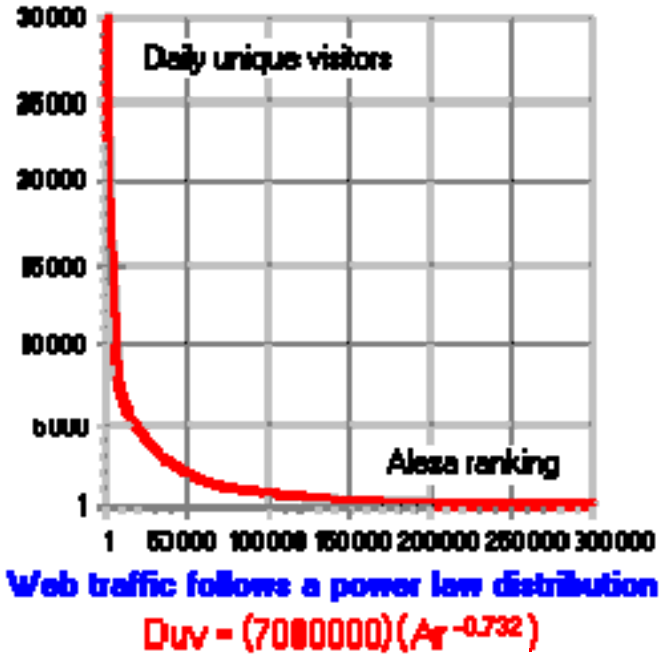

Figure 2: A small number of web sites attract the vast majority of site visitors, and the majority of sites each attract very few visitors.

Anderson's insight, by contrast, was to watch buying behavior in stores with virtual inventory. Rather than 80% of purchases being represented by 20% of the inventory, he found that content in the long tail of the distribution, the onesies and twosies, makes online retailers profitable (see figure 3). More than half of Amazon's book sales, for example, come from outside its top 130,000 sellers, which is what a typical big-box bookstore can carry.[8] Apple does not release sales figures, but the iTunes Music Store's inventory of 3.5 million titles testifies to the eclecticism of its listeners' tastes. The state of the physical music chains such as Tower Records further indicates the shift away from hit albums that this platform has helped facilitate.

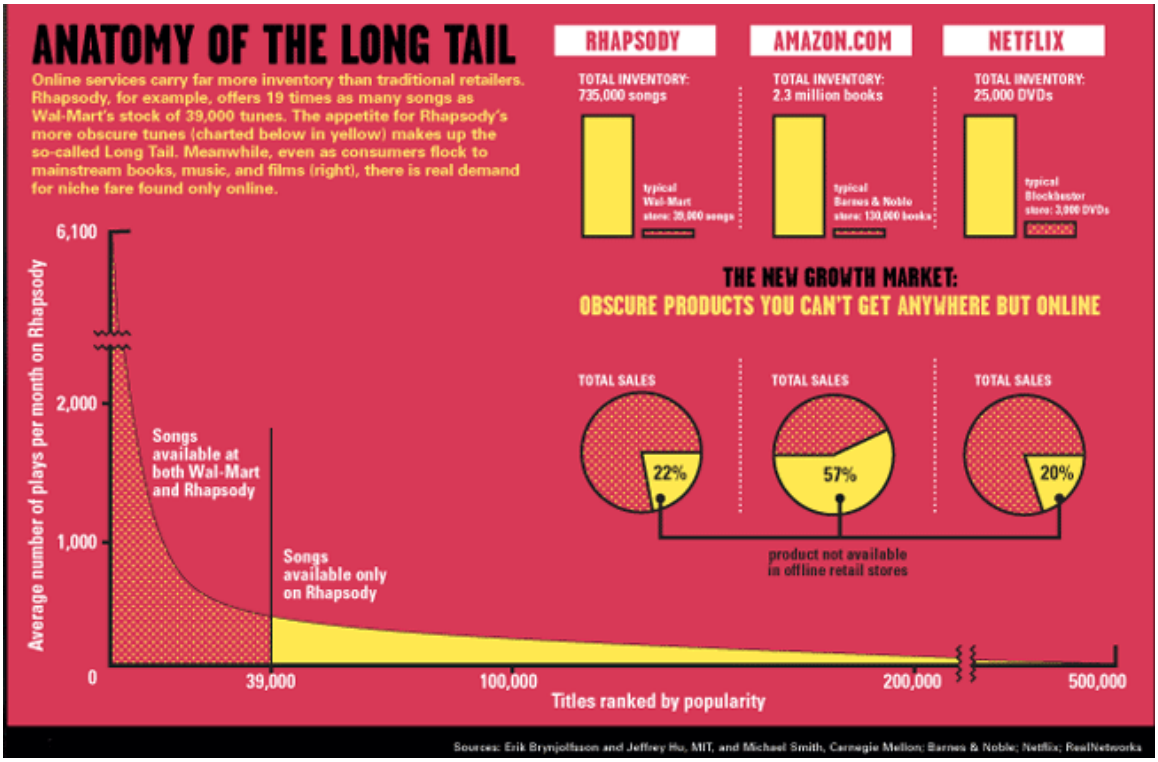

Figure 3: In contrast to bestselling books, hit songs, or blockbuster movies on the left side of the power law distribution, many titles, songs, and movies each attract a small following. Physical channels cannot economically supply small numbers of units to widely distributed audiences, but digital networks are effective in doing so. (source: *Wired* magazine)

A second "long tail" factor driving the iPod's success is the creation of a distributed content-distribution platform for non-music material: anyone with a microphone and a PC could enter a communications market formerly built by capital-intensive broadcasters. Talking books and later audio broadcasts created with mobile, time-shifted listening in mind – "podcasts" – helped fill the devices' drives and thus spur more demand. It's difficult to view a podcast, whether done professionally or otherwise, as anything but a service, but once again it's neither perishable nor inseparable. As for heterogeneity, the wide variety of topics and perspectives is not a shortcoming with regard to traditional broadcast media, but their complement.[9] For all these emergent signs of market robustness, however, little experience or theory explains such a model of customer participation in a technology platform.

Unanswered questions

Standard notions of complementarity that have applied to product scenarios fail to explain digital hybrids' value. Apple makes its profit on the devices rather than the song downloads. The standard practice, from the days of King Gillette to HP's inkjet printer division, of selling devices near cost to make annuity profits on replenishment supplies does not fit in this instance. Neither does the iPod appear to fit notions of servicization as exhibited by the transition of aircraft engine transaction structures or other linkages of physical products and services.[10]

Even given all of these advantages, the digital hybrid model raises questions. In such a complicated set of relationships (among hardware manufacturers, users, performers, content companies, and network carriers for starters), a change in any party's role could change the balance of competitive advantage. A given firm's ability to maintain such a broad, delicate network over time cannot be assumed. Proprietary barriers to entry could fall, either to government anti-trust pressure or to technology innovation. Finally, the competitive environment will continue to evolve. Apple has sold over 90 million iPods, which is a huge number of units in the computer industry. The consumer electronics world, however, operates at a different scale: Nokia alone sold about 88 million cell phone handsets in the fourth quarter of 2006. For Apple to compete with Dell and Microsoft is one thing; confronting Samsung, Motorola, Vodaphone, and other global giants in a what is rapidly becoming a mature market will require more resources and new capabilities.

Wireless Data Services

With the iPod, Apple successfully integrated existing MP3 player technology with better design, an improved interface, and an extensive library of licensed content. This proprietary hybrid of networked content, devices, and access software is a closed system controlled by Apple in California. In contrast, the wireless data market is continuing its gradual evolution from origins in cellular telephony, handheld computing, and digital photography and music distribution. It is a highly heterogeneous collection of devices, access networks, applications (ranging from games to delivery truck and parcel tracking), and content.

Adoption patterns vary widely across the world. Horoscopes, sports, traffic, and weather services are popular, but so are text messaging, wallet functionality, and map-based services such as locating and providing reviews for nearby restaurants. Not surprisingly, the wireless data market is extraordinarily dynamic, marked by both rapid change and rapid growth.

Wireless data adoption has occurred at a stunning rate. Text messaging across the world quintupled in 18 months, from 4 billion messages in January 2000 to 20 billion in June 2001. In 2003 the average Filipino sent 2300 text messages. Cameraphone sales exceeded the sales of digital cameras in 200X. Mobile video is rolling out over broadband networks in Korea and elsewhere. The Blackberry, a relatively expensive enterprise e-mail device, has over five million users.

It is not difficult to see why wireless data constitutes a true digital product-service hybrid. No matter how basic or complex the physical device, it is literally worthless without access to a wireless data network. Conversely, no matter the reach or bandwidth of the network, the service only delivers value in conjunction with the appropriate device: a Blackberry for e-mail versus a handset with a high-resolution screen for pictures or video.

Software as a Service

While it is still emerging and thus not as easily described, the market for software as a service – rather than as a product – is exhibiting similar signs of hybridization. In the case of anti-virus software, for example, much of the value derives from the vendor's speed in responding with protection against a newly identified threat. An annual transaction covers both the base application and, more important, automatic or semi-automatic updates as necessary. Product and service thus merge into a seamless market offering. The market is getting more crowded by the month: startups like Salesforce.com, Workday, Glovia, and NetSuite see incumbents including Microsoft and SAP mounting major efforts to enter what is variously called the hosted, on-demand, or SaaS market.

This model means that users access functionality from their location by connecting to the service provider's infrastructure, removing the need for server hardware, dedicated data centers and reliability infrastructure, and large numbers of IT personnel at the company deploying the software package. These companies' employees are accustomed to using software as a service: search, webmail, and mapping services have each displaced or complemented premise-based software products. The very ubiquity of webmail and online gaming lowers subsequent barriers to adoption in other categories.

Inversions as advantages

Much like the iPod platform, software as a service takes the traditional shortcomings of services relative to products and transforms them into advantages. First, because no assets are changing hands, services can be purchased out of operating budgets rather than being capitalized. Furthermore, in a hosted environment, upgrades can usually be continually rolled out in a fashion more homogeneous than any product environment can attain. Rather than grouping updates together into annual or less frequent upgrade releases to premise software, which challenge the customer organization with retraining and other issues, software as a service provides a gradual upgrade path with no maintenance charges or internal MIS expenses.

Finally, the intangible quality of software as a service means that it scales up and down with the customer's needs: painlessly adding and subtracting users, and their proportionate costs, represents a sharp contrast to the high costs of deployment and difficult economics of contraction in a traditional software installation. Once sized, premise-based software deployments are hard to increase and harder to shrink, given the dependencies among software, infrastructure, and support personnel.

Risk mitigation as an embedded service

Within the enterprise computing landscape, software as a service delivers two benefits. The first is functionality that, in the case of customer relationship management, helps customers manage sales forces, customer service, and other outward-facing processes. This functionality can be directly compared to that of a premise-based product. The second benefit is risk management: installation is a matter of days rather than months or years, upgrades are the vendor's problem to manage, and the service can be terminated at any time for any reason with no sunk costs beyond what was actually "consumed."

Because enterprise software vendors earn high margins on upgrades and maintenance, an expensive deployment often includes surprisingly high costs in the years after installation.* The subscription model reduces the volatility and dissatisfaction caused by such charges.[11]

The fact that Salesforce.com had unplanned downtime should, and does, concern investors and customers, but the frame of reference is not, realistically, a Bell operating company where downtime is measured in minutes per year. Rather, anyone who has managed corporate infrastructure knows that Salesforce's performance is generally better than most IT shops can document. Thus the service (or, as we argue, hybrid) that is being sold should not be compared to a product vendor only on the product-centric basis of features and functionality. Pricing the risk mitigation into a product-service hybrid, whether for jet engines or customer profitability software, marks a departure from both product (cost-based) and service (value-based) price models.

Unanswered questions

Just because software as a service departs from premise-based models and exhibits some apparent structural advantages, however, does not guarantee any given firm market success. The recurring revenue model, for example, is new enough that projections are made on the basis of limited experience, and the behavior of the cost structure at scale is still being discovered. A heavy reliance on small and medium enterprises means exposure to an inherently high rate of business failure in the customer base. The projected benefits of infrastructure-sharing may not materialize as the business scales up and factors such as cost of customer acquisition or support have an impact on margins.[12]

IMPLICATIONS

As the success of the current digital hybrids inspires further efforts, new entrants will reshape an increasing number of markets. Several examples should provide insight into the wide swath of unknown territory for investors, managers, and policymakers as they encounter the hybrid model in more situations.

Accounting and taxation

The U.S. tax code still revolves around products and their production. As servicization of products grows more common, revenues will shift toward predictable subscription fees and away from unpredictable spikes (from expensive capital sales) and dips (from unexpected maintenance or other expenses). The deduction structure will need to be revised. Depreciation raises multiple questions, as does the expense structure associated with both human capital service providers and virtual resources such as intellectual property. In different ways, the shift from physical inventory to effectively infinite and virtual distribution licenses and infrastructures will also require a rethinking of the costs and benefits of each mode.

Business Strategy

* Larry Ellison, the CEO of Oracle, has stated that the company's recurring maintenance revenues deliver 90% margins. "FT interview with Larry Ellison," *Financial Times*, April 18, 2006.

At least four strategic issues emerge as both the digital world and the services economy evolve. First, opportunities to find profitable businesses models will co-evolve with them. Online advertising, for instance, is reshaping media industries at the same time that widely predicted micropayment models failed to materialize. Second, barriers to entry and exit will change in number and in kind. For example, European regulators continue to attempt to get Apple to open the iTunes platform to competing players, raising the possibility that Apple may have to leave that market or else share core intellectual property.

Third, competitive threats come in new shapes. Online content businesses still must compete with free, if illegal, alternatives – a rare state of affairs in product markets. (Software as a service, meanwhile, keeps the "crown jewels" of intellectual property secure in places like China where physical software distribution invites unlicensed copying.) Finally, the nature of the firm will change with new kinds of workforces and geographic presence. The open-source development model, for example, presents software users with entirely new competitive alternatives as vendors compete not only with other firms but with loosely knit systems of relationships.

Pricing

Services pricing typically relates more closely to supply and demand than does product pricing, which often begins with costs rather than customer perceptions. Apple's decision to profit from devices and not content, for example, reflects a realization of the product's place in a platform ecosystem. Google, by contrast, employs a sophisticated auction mechanism to price its advertising keywords. As the number of relationships among digital product, service, and hybrid providers grows, the art of pricing will become more complex at the same time.

As an example, some wireless data carriers initially struggled with the hybrid issue as they priced their offerings. Demonstrating a distinct inward-looking perception, some American carriers attempted to price wireless Internet access not by a unit of time but by the volume of content transmitted. Customers accustomed to knowing how long 600 voice minutes was were stymied as they signed up for 10- or 20-megabit service, having no idea what benefit (2 e-mails? 1000 e-mails? Three songs?) such tiers would deliver.

Similarly, deciding how, if at all, to subsidize handsets has been difficult. Because devices with better keyboards, displays, cameras, and so forth use more bandwidth, the potential service revenue may justify an increased subsidy of the initial device purchase. At the same time, carriers in countries where handsets are not subsidized (Italy and Finland for example) have historic customer defection, or churn, rates roughly half that of England, where handsets are subsidized heavily and in which 30% of customers change carriers in a given year.[13]

CONCLUSION

At the most elemental level, digital product-service hybrids redefine some of the most basic words in the business vocabulary. As an example, what constitutes an asset?

Physical goods and structures might occupy one category for auditing purposes but can be liabilities for long-term corporate health. As we have seen, the four traditional shortcomings of services relative to products – inseparability, heterogeneity, perishibility, and intangibility – often constitute points of advantage in a digital, multimedia environment.

The shortcomings of current vocabulary and concepts reappear regularly as citizens, scholars, and managers work to limn a services-centric economy. If people made *things* in a factory (from the Latin for "oil press"), where do they create or perform *services*? One answer might be, in networks. Thinking of health care as an example, the graph theory and other models used to understand networks appear to be more promising than previous attempts to apply industrial workflow management to hospitals, public health, and so on. At the same time, while networks can be more flexible than vertically integrated firms, they also are probably less stable.

Innovation is preceding comprehension: we can see hybridization long before it's described or taught. Based on profitable services including search, various kinds of software, and personal assistance such as direction-finding or matchmaking, it is clear that intermingling the digital and services economies will continue to have commercial impact. Even as they expose the limits of existing mental, legal, and managerial models, the opportunities at the intersection of products and services illustrate the multitude of possibilities created by the technologies at humanity's disposal.

Appendix: Research methodology

According to Thomas Kuhn in *The Structure of Scientific Revolutions*, so-called "normal science" undergoes fundamental change when the dominant theory is confronted with an increasing number of anomalies that it cannot explain. This research began with the realization that many of the most visible features of the digital landscape combined elements of traditional products and services in ways that made conventional characterizations, and the concomitant managerial recommendations, insufficient. Building on previous work we did on the digital music industry, we searched out the hybridization literature of Oliva and Kallenberg, Kerr and Ivey, Davies *et al*, and Cusumano *et al*. We then performed a series of informal interviews with product managers and other executives in telecommunications, hardware, software, and consulting to identify promising instances of hybridization in which digital facets made a difference. From there, we developed three case studies of digital hybridization from public sources -- mobile data, software as a service, and the iPod -- looking for points of differentiation and commonality. We then attempted to create a conceptual model of this important class of goods that allowed for the transcendence of traditional product-service distinctions, and identified managerial issues (among them, organizational, strategic, and pricing-related) that appear to need updated assumptions and tools.

Notes

[1] Valarie A. Zeithaml, A. Parasuraman, Leonard L. Berry**, "**Problems and Strategies in Services Marketing," *Journal of Marketing*, Volume 49 Number 2 (Spring, 1985), pp. 33-46.

[2] See for example C. I. V. Kerr and P. C. Ivey, "A strategic review of the large civil aeroengine market and the paradigm shift to a service," *The Aeronautical Journal* Volume 105 Number 1047 May 2001, pp. 287-293. A more general discussion can be found in Andrew Davies, Tim Brady, and Michael Hobday, "Charting a Path Toward Integrated Solutions," *Sloan Management Review*, Spring 2006, pp. 39-48.

[3] Bill Gates to Microsoft Executive Staff and Direct Reports and Distinguished Engineers, October 30, 2005, published at http://news.com.com/Gates+memo+Brace+for+services+wave/2100-1016_3-5942191.html, accessed 20 February 2007.

[4] David S. Evans, Andrei Hagiu, Richard Schmalensee, "A Survey of the Economic Role of Software Platforms in Computer-Based Industries," CESifo Working Paper No. 1314, October 2004, p. 5. See also Annabelle Gawer and Michael Cusumano, *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation* (Boston: Harvard Business School Press, 2002).

[5] An important exception can be found in Michael Cusumano, Steve Kahl, and Fernando Suarez, "Product, Process, and Service: A New Industry Lifecycle Model," Center for eBusiness at MIT, working paper 228.

[6] For a similar argument, see K. Douglas Hoffman, "Marketing + MIS + E-service," *Communications of the ACM* June 2003 volume 46 number 6, p. 54-5.

[7] Albert-László Barabási and Réka Albert, "Emergence of Scaling in Random Networks," *Science* 15 October 1999: Vol. 286. no. 5439, pp. 509 – 512.

[8] Chris Anderson, "The Long Tail," *Wired*, October 2004.

[9] For an excellent overview of podcasts, blogs, et al, see "Among the audience: A survey of new media," *The Economist*, April 22, 2006.

[10] A widely cited treatment of non-digital service offerings built to address a product market is Rogelio Oliva and Robert Kallenberg, "Managing the transition from products to services," *International Journal of Service Industry Management* 2003 volume 14 number 2, pp. 160-172.

[11] On customer reaction to package software vendors, see for example Marc Songini, "ERP Users Bristle at Upgrade Pressure, Maintenance Costs," *Computerworld*, February 16, 2004.

[12] A more complete discussion of potential drawbacks to the software as a service model can be found in the Salesforce.com 2005 annual report, pp. 40-51.

[13] Harald Gruber, *The Economics of Mobile Telecommunications* (Cambridge: Cambridge University Press, 2005), p. 50.