

Creating Value in a Digital Era: The Next Chapter in the IT Revolution*

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The talk today considers the IT enabled service revolution as the next chapter in the information technology revolution.¹ We will consider four core issues.

- How has the problem of creating value been changed in the global digital era?
- Why the IT enabled Services Transformation is so critical?
- Whether the Service Transformation changes the process of innovation,
- Whether the Service Transformation changes the dynamic of trade and competition.

“Tools for Thought”, as my colleagues Steve Cohen, Brad de Long, and myself have labeled the IT tools set, sit at the core of the Information Technology revolution. We should conceive of information technologies, data communication and data processing technologies as “tools for thought that amplify brainpower in the way the technologies of the industrial revolution amplified muscle power....They are tools to manipulate, organize, transmit, and store information in digital form. ...At each point in the last 40 years the critical step in the transformation of technological potential into economic productivity has been the discovery of IT users of how to employ their ever greater and ever cheaper computing power to do the previously impossible.”² These tools for thought have been central to growth over the past decade. Demand for the tool set has made Information Technology the leading sector in the economy. The pervasive application of information processing has transformed the economy and how it operates.

Let us situate the current chapter in the IT story, the Algorithmic Revolution in services, by briefly setting the historical context and tracing the evolution of competition at the end of the 20th Century.³ Mass production, really an American innovation, was a core part of American industrial primacy. That industrial primacy was challenged by the Japanese innovation of lean production in which volume production was reconceived and reorganized. The Japanese innovation gave considerable advantage in global markets to

¹ Zysman John and Abe Newman, eds. *How Revolutionary was the Digital Revolution? National Responses, Market Transitions, and Global Technology*. Stanford: Stanford University Press, 2006.

² Cohen, Stephen S., Bradford J. DeLong, and John Zysman, "Tools for Thought: What is New and Important about the "E-economy" Berkeley Roundtable on the International Economy, January 1, 2000 <http://repositories.cdlib.org/brie/BRIEWP138>.

³ Zysman, John. “Creating Value in a Digital Era: How do Wealthy Nations Stay Wealthy.” *How Revolutionary was the Digital Revolution? National Responses, Market Transitions, and Global Technology*. Ed. John Zysman and Abe Newman, Stanford: Stanford University Press, 2006. 23-52.

Japanese producers, particularly in complex mechanical and electro-mechanical goods. An American comeback followed. That comeback was built on the emergence of new consumer electronics, digital electronics from PCs through mobile phones, and a reconfiguration of industrial production. Component driven competition facilitated vertical deintegration of companies and gave decisive market power to suppliers of critical elements in final products. It was a period in which the winners were companies like MicroSoft with its Windows operating system and Intel with its processors, hence the designation as the Wintel era. This Wintel era was a transition to a global digital era.

The Global Digital Era:

The fundamental feature of the current era has been that the unexpected, constant disruption has become routine. The levers of competitive advantage have shifted constantly and new mechanisms of value creation have appeared. In the 1980s the strategic focus of major corporate consultants was on definable sectors with clear targets for creating advantage and value. Today the clarity is gone. There is an ambiguous language of “spaces”, a word from the dot com era, and “domains”, a more recent word expressing the ambiguity of the competitive playing field.

The Global and the Digital developments combine to generate new products and services, new entrants, and new strategies. Consider the global. One classic view of the global is that the world is flat, that IT tools have radically reduced costs of communications and coordination, facilitating operations spread across the world. In fact, the story really is one of national innovations, such as Japanese production systems, played out on a larger stage. There are then a series of national stories, each changing the terms of competition for all the rest. Could the Finnish firm Nokia have reached its stature without European and global markets? No, but Nokia’s success was part of the broader Finnish move away from supplier to the Soviet Empire to technology based innovator in a global economy. Similarly, China and India could not succeed without global markets and production systems, but each is a separate and powerful national story. The sequence of national stories produces a sequence of challenges in the form of new competitors and new competitive strategies for companies and countries. The result

Zysman, John and Abe Newman. “Transforming Politics in the Digital Era.” *How Revolutionary was the Digital Revolution? National Responses, Market Transitions, and Global Technology*. Stanford: Stanford

is an enduring tension between the dislocations and challenges of the global against the adaptations and adjustments of particular firms and places.

Consider next the digital. The bloc of plastic with electronics we carry as a cell phone could just as easily be a television or a PDA or an MP3 player.⁴ Services make the story messier. Is the iPod a product or a vehicle to deliver a service? The leverages of marketplace advantage are constantly being reshuffled. Is the advantage in the product? Is the advantage in the service? Which functions can be outsourced as commodities? Which functions are central strategic assets? The answers will vary by sectors and across the lifetime of the product. The objective is to avoid the realm of the commodity the undifferentiated good or service that competes principally on price. The classical strategies for differentiation endure; for many goods, digital tools facilitate quality design or branding as well as market segmentation. The decisive corporate edge then lies in systems integration and innovation, the national advantage in the fluidity and flexibility to adjust to the shifting terms of competition.

Services: The Next Chapter in the IT Revolution.

The latest chapter in the IT revolution is the Services Transformation. Let us properly frame the story. The story is not the growth in the quantity or value of the activities we label services, nor a shift from agriculture to industry to services, as Steve Cohen and I argued two decades ago. The issue is service transformation driven and enabled by the application of rule based Information Technology tools. The crucial issue is the reconfiguring of service sectors and the recreation of value creation in services as a result of the global and digital developments.

Services were once seen as a sinkhole of the economy, immune to significant technological or organizationally driven productivity increases.⁵ Now the IT enabled reorganization of services, and business processes more generally, is seen as a source of dynamism in the economy that will change the structure of employment, the division of

University Press, 2006.391-411.

⁴ Thanks to Erkki Ormilla and Emilie Lasseron who, very differently, made this point to me.

⁵ Baumol, William J., "Macroeconomics Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," *American Economic Review* 57 (1967), 415-426.

labor, the character of work and its location.⁶ Firms are being reorganized, markets reconfigured, business models transformed, and entirely new service offerings generated.

The conventional discourse emphasizing the importance of services in the economy often conflates and confuses four interconnected stories.⁷ The *first service story* is an accounting error, or perhaps better a matter of financial engineering. Activities outsourced from manufacturing were relabeled as services; it is a transformation in where the activities were housed.⁸ The *second story* is about changes in what consumers buy and what businesses use to produce and distribute their products and services.⁹ The *third service story* is about household outsourcing, the transformation in and changing role of women in the workforce and, with that, the conversion of unpaid domestic work – washing floors, watching babies, and delivering groceries – into commercial services bought and sold in the market.¹⁰

The *fourth service story*, our focus here, is the digital transformation. Service activities themselves are changed when they can be converted into formalizable, codifiable, computable processes, processes often with clearly defined rules for their execution. Much of the innovation then is around the adoption and effective implementation of IT tools. This IT enabled service transformation is driven by the advantage that can be captured from private and public entrepreneurs reorganizing firms, administrations, reconfiguring markets, inventing new business models, reconstructing existing services and generating entirely new service offerings. Certainly business processes from finance and accounting through to customer support and CRM are altered when they can be treated as matters of information and data management. Routine and manual functions are automated, and fundamental reorganization of activities is enabled. Likewise, sensors and sensor based networks change many personal services. For

⁶ Bosworth, Barry P. and Jack E. Triplett. *Productivity in the US Services Sector: New Sources of Economic Growth*. Washington DC: The Brookings Institution, 2004.

⁷ Zysman, John. “The 4th Service Transformation: The Algorithmic Revolution.” *CACM Special Issue on Services Sciences*, July 2006.

⁸ Cohen, Stephen S. and John Zysman. *Manufacturing Matters: Myth of the Post-Industrial Economy*. New York: Basic Books, 1987. The argument Cohen and I made twenty years ago hinges on the beginning of outsourced services and the blurred lines between many products and services.

⁹ This is show clearly by per-capita income and personal consumption figures constructed from U.S. Department of Commerce, Bureau of Economic Analysis July 2001

¹⁰ For a complex and interesting analysis of this transition see: Thistle, Susan. *From Marriage to the Market: The Transformation of Women’s Lives and Work*. University of California Press, 2006.

example, with sensors and communications, some services such as the monitoring aspects of the home care for the ill, the convalescent, or the elderly can be transformed fundamentally from highly personal activities requiring a continuous presence to a distance activity with sensor data signaling a need for attention. As service activities are conducted by and with IT tools, the worker skills required change as well. Long-term nursing in a home is rather different from data monitoring and intervention, and even more distant from the skills to develop the systems in the first place. Different people in different places trained different ways will be involved. And of course, as information moves, many activities which were previously tightly linked to particular places can be moved.¹¹

Assume that for services there are then two sets of IT developments. Envision two technical stacks, one defining networks and one defining the evolution of the tools that result in service applications. The first data network revolution with the creation and liberation of the control layer meant the emergence of virtual private networks and their innovative application by sophisticated corporate users. Bar and Borrus proposed a generation ago, that the network stack consisted of an infrastructure layer, a control layer, and an applications layer.¹² As networks migrated from analog to digital a generation ago the possibility of multiple functions on a single network and an independent control layer became critical. Their research at the time involved a systematic comparison of major users in a set of sectors in different countries.

The current service revolution involves both the continued evolution of networks and the maturation of the “services” stack. That tool set results in the significant and radical reorganization of work as well as the diffused ability of small users to build content and value for both non market and market applications. The “services stack” can be imagined as a platform, middleware layer, and a layer of direct applications tools.¹³

Of course the core of information technology tools is the information that is being gathered, processed, stored, and transmitted. The crucial matter then is often not the IT

¹¹ Cohen, Stephen S., and John Zysman. *Manufacturing Matters: Myth of the Post-Industrial Economy*. New York: Basic Books, 1987.

¹² Bar, Francois and Michael Borrus. “Why Competition is Necessary in Telecommunications and How to Achieve It: The Experience of the Advanced Economies.” BRIE Working Paper 102. September 1997.

tools, or precisely how they are deployed, but the information on which the service activities are based. And the question is often then is definition and control of the information.

The algorithmic transformation is an avalanche of innovation, innovation in the tools behind the service transformation and innovation in the services themselves. But it is both a revolution, and a delusion. Let me explain. IT tools may open possibilities for value creation. But capturing those possibilities, and creating value, means reorganizing social and business activities processes and strategies. The IT enabled Algorithmic *Revolution*, clearly, is that service activities once defined as computable routines with clear algorithms can be automated. Our hypothesis is that the first introduction of tools would be to automate routine processes. Here the notion of an algorithmic transformation is most applicable. The *Delusion* is that the entire process of development and delivery, of value creation, will become a computable algorithmic process.

The subtler understanding, more intuitive and creative, involved in creating new strategic models and generating significant new value comes after the first automation, as it did in the era of early data networks. The creative development and implementation of new strategic directions is a separate process, not an extension of computable routine. It is a story of choices about how information is gathered and deployed, about how knowledge is developed and exploited. Consider two related propositions. First, automation of basic routine will NOT create enduring market advantage. There are two reasons: routinized steps can be copied, or the equivalent steps with equivalent outcomes defined; automated routine involves usually marginal gain on existing arrangements. Second, the real value capture comes in the second step, transforming and reinventing activities, in short innovation in services.

Most powerfully capturing the possibilities of the Algorithmic revolution becomes a story of innovation in business models, organization, and competitive strategies. New possibilities emerge, particularly along the ever blurring line between services and products. We need to note that.

¹³ These layers are available in the presentations of Jonathan Murray, Microsoft, and Stuart Feldman, IBM at the BRIE/ETLA session at the CITRIS/Tekes seminar in Helsinki. They can be found on line at <http://www.citris-uc.org/CITRIS-in-Europe>.

There is an additional twist, though. Services are deeply rooted in social rules, conventions, and regulations; consequently, capturing the value possibilities in the algorithmic transformation inherently means recasting the rules, regulations, and conventions in which the services are embedded. Variations in national or sub-national rules and conventions that shape how services are organized means that the service transformation will follow diverse national paths. Consider that the health care story is different in the United States with its mish mash of payers and providers than it is in Britain or France with more centralized system of payment and provision. The technical problem is not the same in the three places, and hence the question of how to use data, the routines of delivery and accounting will not be the same. The flow of medical information is not a neutral matter. In the US one may want one's doctor to know a potential risk condition, but not if that also means the insurance company cuts you off. In a centralized system early treatment may reduce total system costs, so information about patients leads to preventative treatment not the cancellation of coverage. Or consider that reorganizing services touches the privileges of certain professions and will influence labor markets. Inevitably these will be significant political struggles.

Despite the variety, one might propose, that at a very granular level many of the modules of routine and activities are similar. Or better still one must ask, which issues and modules are common across systems and applications, in the same sectors across countries, and which modules must be unique? Will the national variation in service deployment be a matter of different modules in each place, or a strategy common set of modules orchestrated differently in different places? Thus, for example, how transportable and transferable are the solutions developed in one health care system to another?

Let us express this same question a different way. Will the reality of global suppliers of IT technologies and service tools, of the modules and tools for service, override the reality of enduring national patterns and character of services usage? We know that technological trajectories and patterns of innovation reflect the character of demand in lead markets. Hence the very technologies developed in different national systems for different purposes in banking or health will reflect the distribution of gain and risk to the varied actors from reorganizing particular service activities. Once we

imagined trade between firms in advanced countries to reflect advantage by national firms created by their differences in local markets. One feature of globalization has often been an integration of national markets. In services, those national differences are likely to persist in technology in market trajectories.

Strategy Policy and Trade. Where does this leave us? For the corporation, automating existing processes is just the beginning. Innovation comes in the imaginative reorganization of existing business and reinvention of business models and strategies. It is a matter of automating the routine to leverage existing knowledge and facilitate innovation.

For policy, the task is to create the environment for experimentation and innovation, innovation is what are often fundamental social processes. This is never an easy task; such change always has winners, losers, and political bargains.

And what does this do to the problems of growth and trade? This is a more complex story. Certainly there is trade in the enabling tools of the Services Transformation. We know that leadership in network implementation and network standards, as well as standards more generally, can advantage equipment producers. Global standards are often set as a rivalry of national standards stories, whether that is a market rivalry or a political rivalry or a standards body influenced by both. As important, as we argued, services are embedded in national social processes, rules, roles, conventions, and regulations. The consequence is that national markets remain a potential launching pads for innovative service offerings, and potential traps if the national standards processes lead to isolating the service offerings from the standards in the global market place, or at least the standards in principal trade partners.

In sum, the IT enabled service transformation, the algorithmic transformation, has converted the supposed sinkhole in the economy, services sector, into a potential source of dynamism and of new tradables. Capturing those possibilities though involves imagination and innovation in business models and public policy. As important, even as the communications capacity of “tools for thought” contribute to globally interlinked markets and distributed production, national markets with their distinctive processes, rules, roles, and conventions can be both sources of innovation opening to new global business or potential traps isolating firms in their home base.

