1C5 US Technological Economic Development: IT Spillover, Value-chain Restructuring, Technoloy Standards and Demand Management

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Introduction:

The following work offers a brief snapshot of the current US economic situation coupled with a discussion of key areas including information technology (IT) spillover, value-chain restructuring, technology standards as technology strategy, and demand management. This analysis exemplifies the fact that in the midst of globalization, or economic interconnectivity, no single factor can account for techno-economic dynamism [3,4]. Therefore, in order to understand current US economic development four factors have been selected and highlighted. The first section will illustrate the current US economic situation. The second section will show the growth of IT spillover in manufacturing. Section 3 will add to this discussion the continuing changes in value-chain restructuring largely resulting from IT growth. Section 4 discusses the case of Intel to demonstrate the use of technology standardization as a strategy. The Intel case demonstrates that this strategy has both acute advantages and disadvantages as well as its critical link to demand as opposed to the supply-side. Finally, with the increasingly dynamic role of consumer and market demand in mind, section 5 will briefly highlight important changes in demand dynamics.

The Current US Economic Situation:

The latest economic figures included in Figure 1 indicate that the US economy is remaining stable even with the chain reaction of economic crises abroad. Real GDP growth has been very strong since 1994 and shows particular strength in 1996 and 1997. The second quarter of 1998 shows some retraction due to the impact of the Asian/Russian crises, but there are some positive indicators. The Consumer Price Index indicates a relatively low inflation in current conditions and Industrial Production shows steady positive change over the last two years with negative change evident in recent months of 1998. Interest rates are at an all time low and the unemployment level is also extremely low. A closer look shows that whilst inventories are high, the inventory-sales ratio is down and that Real Final Sales were up in 1997 from a drop in 1996 and have reached a plateau in the first 2 quarters of 1998. Particularly telling is the contribution of components to Real GDP Growth (Figure 2). This graph indicates that in all quarters of 1996 and 1997 consumption, exports and investment played the largest role in GDP growth. Furthermore, government contribution is minimal and shows up only in the second quarters of 1992 and 1998.

IT Spillover:

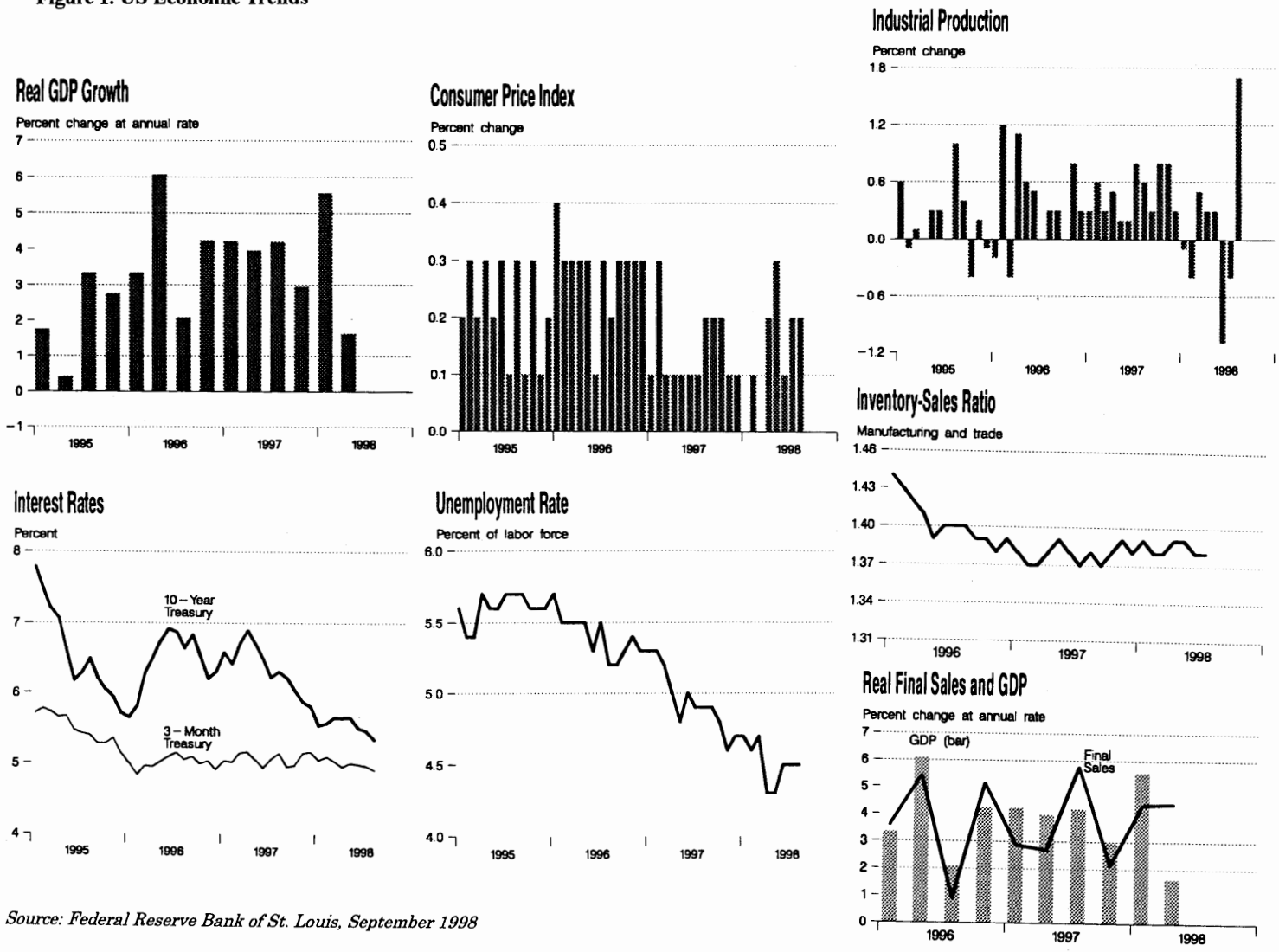
One of the reasons postulated for increased productivity and resilience is IT spillover into manufacturing [1,3]. Figure 3 shows the number of patents in manufacturing and software compared to the convergence of the two represented by jointly filed patents.

Figure 4 shows a similar rising trend in the convergence between expert systems and manufacturing. It is important to point out that IT is also creating entirely new industry sectors which may in fact equal or surpass manufacturing in fueling economic growth.

Restructuring of Value-Added

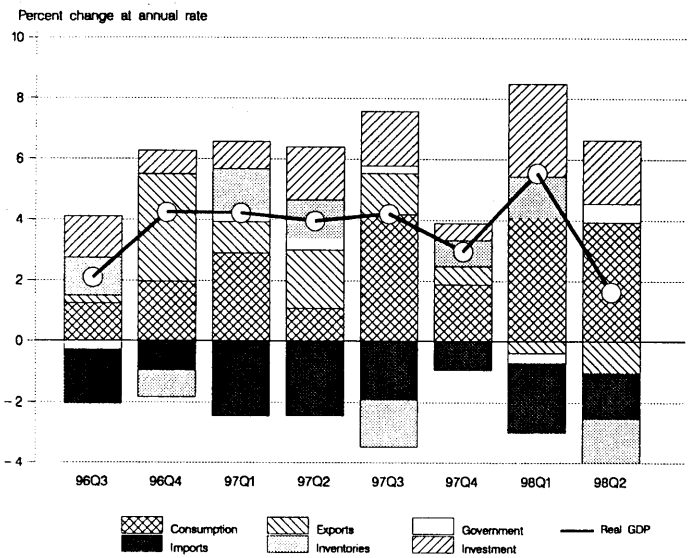
Industry Value-Added Services (IVAS) are components in the primary value chain (research and development, engineering, logistics, distribution, subcontracting) and the support value chain

Figure 1. US Economic Trends



Source: Federal Reserve Bank of St. Louis, September 1998

Figure 2. Contribution of Components to Real GDP Growth in the US



Source: Federal Reserve Bank of St. Louis, September 1998

Figure 3. IT Spillover in US Manufacturing

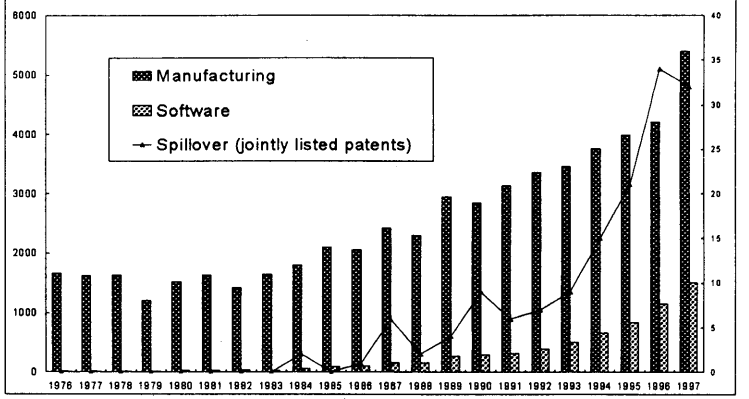
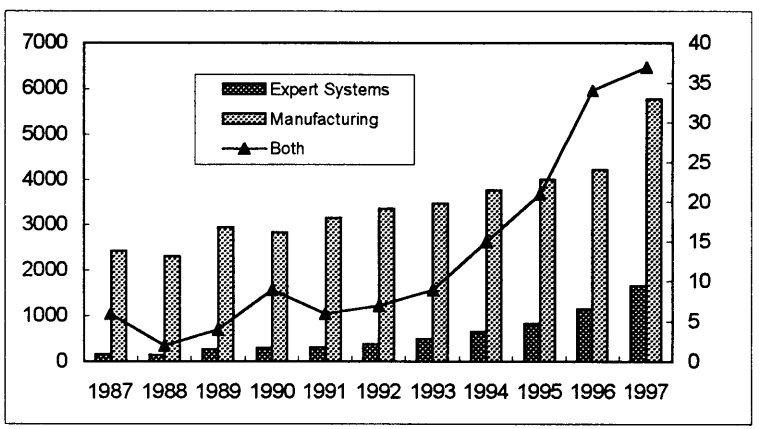


Figure 4. IT Spillovers-Expert Systems and Manufacturing



Source: US Patent Office, January 1998.

(traditional business services, financing, industry vocational training and communications). These services are critical elements of competitiveness and have a direct impact on wealth creation. Whilst many of the elements of the value chain were undertaken within each individual corporation during the 1970s and 1980s, changes in the restructuring of value-added are evident in this period and more pronounced during the 1990s.

Figure 5 shows the evolution of outsourcing in the United States during this period. Particularly notable is the growth of investment in Information Technology and the emergence of outsourcing in information services. The information services area is a critical growth area in the United States and a major contributor to continued economic growth. From the 1980s to 1995 we see components of the value-chain relocating in the economy and some even becoming separate industrial sectors. One newly developing area of this value-chain are intangibles related to market positioning such as *de facto* standards and name brands.

Technology Standards: The Case of Intel

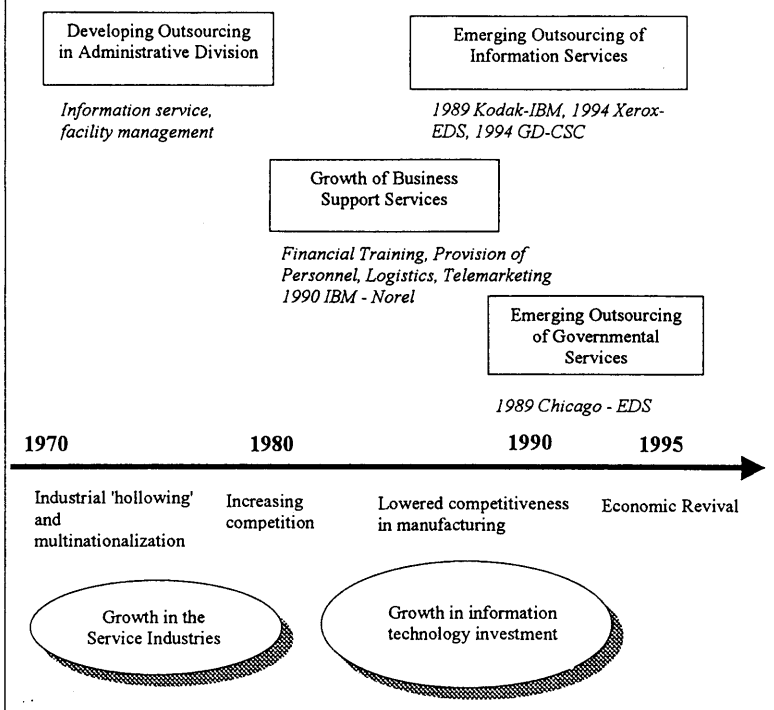
"Technology Lock" or developing a *de facto* industry standard is another contributor to technological economic development in the US [2]. In the case of Intel, using a "technology lock" strategy demonstrates both the advantages and disadvantages of this strategy as well as its crucial links to appropriate demand management.

Intel is currently the world's largest maker of computer chips including the Pentium II, Pentium and 486 all of which enabled the firm to earn in excess of US$1.6 billion last quarter. Over the last two years, its share of the market has jumped from 21%-72% according to Mercury Research. One of its most powerful strategies has been the control of standards and 'brand' creation. However, recently this strategy has received a great deal of criticism from the marketplace.

In this context, Intel has been accused of artificially inflating CPU prices because of its domination of the industry standard. Opponents point out that prices suddenly declined when competitors such as AMD and Cyrix entered the marketplace. In 1997, Intel was also accused of unfairly blocking access to critical CPU components when three companies who had previously announced "core logic chip sets" using the Pentium II were blocked by Intel from doing so. In May 1997, Intel mapped out and claimed as proprietary the P6 bus which enables interface between parts of the motherboard and the processors. This meant that PC makers who want to use the Pentium II must buy the P6 bus and therefore Intel's more expensive chip sets as opposed to those the "blocked-out" competitors were offering. It is felt that this strategic move is a form of hyper-competitive diversification in order to protect the company's domination of the chip market with the advent of increased competition. The final step in the dominance strategy was to diversify into other critical areas in order to capitalize on its supremacy in the chip market. In keeping with this strategy, Intel strongly entered the graphics accelerator market with its Intel 740 chip on 12 February 1998.

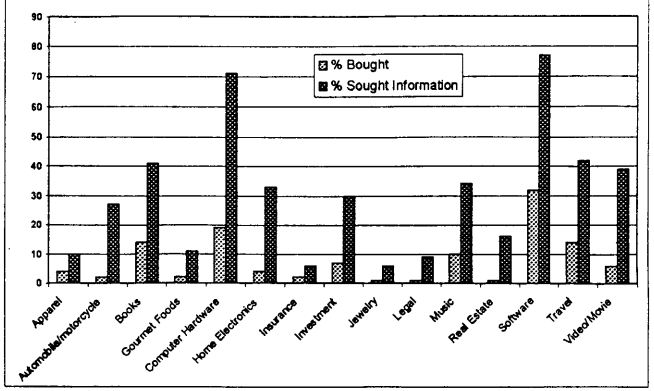
However, the process of "technology lock" is critically linked to demand management. This is demonstrated by Intel's problems with the launch of the MMX in 1997. Instead of executing a smooth shift by allowing demand for non-MMX processors to decline steadily, Intel marketed the MMX too soon. The marketing exercise not only was premature, but occurred before enough of the product was manufactured to bring down prices. The results were an instantaneous arrest of non-MMX machines because the consumer was not going to purchase "outdated" hardware. In addition, since the prices were still high, consumers rejected the few available MMX machines and opted to wait until prices declined. The result was that Intel managed to almost completely eliminate demand for all of its products (from the 486 to the MMX) just by not managing demand effectively in the context of its current standard dominant situation. Consequently, during the summer and winter of 1997 it had to reduce drastically the price of all of its products in order to decrease inventories.

Figure 5. Value Chain Restructuring in the United States



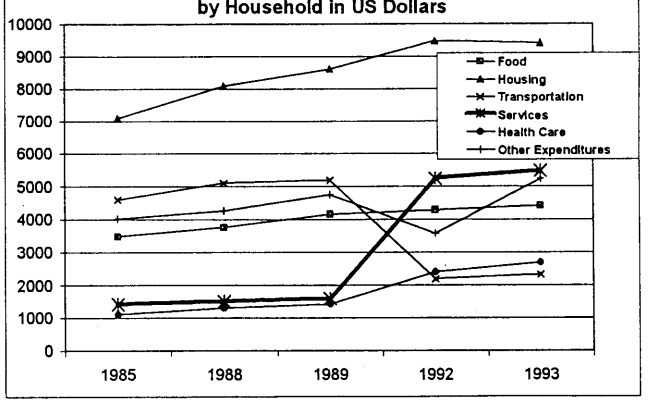
Source: Nissei Basic Research Laboratory

Figure 6. US Consumers Who Sought Information or Bought Products/Services On-line



Source: 5th HERMES/GVU WWW User Survey, April 1996

Figure 7. Average Annual US Consumer Expenditures by Household in US Dollars



Source: 1996 Statistical Abstract, Table No. 721, Dept. of Commerce, USA

Demand Management:

The Intel case demonstrates that demand dynamics are not only critical but are constantly changing as IT alters the relationship between consumers and producers. Additional data suggests that these changes are taking place in the areas indicated in Table 1.

Evidence strongly indicates that this paradigm shift is occurring in the United States [5]. Figure 6 suggests that not only "how" consumers make purchases is changing, but more importantly, the sources of information used to make purchase decisions is changing. Furthermore, Figure 7 suggests that the types of products sought are changing. This trend indicates that there is a tremendous growth in "intangibles" in the value-chain, and that IT spillover is changing the "physics" of demand dynamics.

Table 1. Changes in Demand Dynamics

Change	Description
Power Shifts to the Consumers	Increased competition and greater access to more powerful information tools has meant that consumers are no longer the audience but the drivers of marketing.
Automation of Consumption	Automated transactions with producers are significantly changing the relationship and structure of retail and wholesale.
Fragmentation and Homogenization	Mass production is being replaced by "mass customization". However, this trend does not imply that consumers are always looking for customized products. Well designed standardized products are also important as long as there is a customization of the mix in product, price, advertising message and distribution.
Consumers as Co-producers	Automated transactions with producers are significantly changing the relationship and structure of retail and wholesale.
Greater Value Consciousness	Consumers are now more conscious of non-price value factors such as time, effort, and/or space (inventory).

Conclusion

A brief overview of the US economic situation has been discussed in the context of several contributing factors from both the macro and micro level. The second section demonstrated that IT spillovers have shown a significant increase in manufacturing. Value-chain restructuring is also evident in the US during the 1980s and 1990s. The micro-strategy of standard domination using the case of Intel was also discussed. This analysis illustrated that this strategy is critically linked to demand management and has considerable advantages and disadvantages. Finally, demand management was discussed as an increasingly more significant factor in technological economic development. Evidence was presented which indicated that the demand dynamics in the US are changing dramatically with the rise of the service sector and as the customer and supplier become more tightly linked with information technology.

References

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