After decades of debate, studies have started to show how IT spending can dig out hidden productivity ...

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After decades of debate, studies have started to show how IT spending can dig out hidden productivity and profits, writes Simon London.

Think of it as the new productivity paradox.

In the 1990s, when companies were investing like crazy in information technology, many economists remained sceptical about the link between IT and business productivity. Yet now the economics profession has reached a broad consensus that, yes, technology is driving a productivity revival in the US economy, many business leaders appear to have lost faith.

What better time to survey what we know - or at least think we know - about bits and bytes, productivity and profits?

To recap. In 1987, Robert Solow famously coined what came to be known as "the productivity paradox" when he quipped that "you can see the computer age everywhere but in the productivity statistics."

The Massachusetts Institute of Technology economist was spot on. The first commercial computer had been installed in the early 1950s by General Electric, the US conglomerate. Companies had since invested heavily in successive generations of Univacs, IBM 360s and Digital Equipment minicomputers.

Yet far from accelerating, productivity growth in all the developed economies slowed alarmingly.

In the US, the annual rate of increase in output per hour during the 1960s was 2.6 per cent. From 1973 to 1995 it dropped to only 1.5 per cent, notwithstanding the spread of computers from data centres into departmental offices and eventually on to every desk.

But then, in the mid-1990s, almost as suddenly as it had slowed, the pace of US productivity growth quickened. From 1995 to 2000, the annual rate averaged 2.5 per cent.

Technology enthusiasts - especially salesmen with servers and switches to sell - were quick to claim credit. Business investment in IT had reached "critical mass", they claimed, while "network effects" provided additional leverage by linking computers via the new-fangled internet.

After all, they pointed out, capital investment in computers and telecommunications equipment was on a rising trend throughout the decade, peaking in the US at nearly 50 per cent of all business capital spending.

But while circumstantial evidence was strong, sceptics pointed out that there was no proof of a causal link between technology investment and the productivity growth revival.

Prof Solow remained unconvinced. Robert Gordon, at Northwestern University in Chicago, pointed to a number of alternative explanations - such as normal variations in the pace of productivity growth through the business...

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Such was the state of play in 2000, when the dotcom bubble burst, technology stocks tumbled and "new economy" rhetoric started to look as dated as Aeron chairs.

During the last three years, however, something strange has happened. While business investment in IT fell sharply, and economic growth slowed, the rate of US productivity growth has accelerated still further.

Output per hour increased by 5.3 per cent in 2002, and has maintained a scorching pace so far in 2003. The annualised rate for the third quarter was 9.4 per cent, the highest for 20 years.

The search for possible explanations has led many doubters to reconsider. It has also started to reveal the all-important causal link between IT investment and productivity.

In the vanguard of this work is Erik Brynjolfsson, a young economics professor at MIT’s Sloan School of Management. "We've done a lot of work at the level of individual firms and we've found a lot of evidence of IT-related productivity," he says.

Sitting in his ramshackle office on the MIT campus, Prof Brynjolfsson talks with the confidence of a man who staked his academic career on an idea - and won.

As a young graduate student he risked the disapproval of his elders (including Nobel laureate Prof Solow and then-dean Lester Thurow) by being an early proponent of idea that an IT-driven productivity miracle was unfolding. Now, as the old guard come round to his point of view, he finds himself hailed as a seer.

Arguably the most important development from his work with individual companies is a coherent explanation of why productivity gains can take as long as five years to show through after big IT investments are made.

"IT is just the tip of the iceberg in terms of the investment that goes into these projects," he explains. "Ninety per cent of the investment - literally, 90 per cent - goes into creating new organisational and human capital."

For example, Prof Brynjolfsson and colleagues found that of the $20m total cost of an enterprise resource planning (ERP) system, only about $3m goes to the software supplier and perhaps $1m towards the acquisition of new computers. The $16m balance is spent on business process redesign, external consultants, training and managerial time.

The ratio between IT investment and this "supporting" expenditure varies across projects and companies. But, over a range of IT projects, Prof Brynjolfsson believes that a 10:1 ratio is about right.

Moreover, he believes that this spending should be treated by economists - though perhaps not by investors - as investment. After all, by redesigning processes and retraining workers, companies are creating intangible assets that they hope will yield a return for years to come.

"It is as if we actually created thousands of invisible factories in the 1990s that were not documented," says Prof Brynjolfsson, warming to his theme. "These are intangible assets from which we are now able to get output. The way that translates at a macroeconomic level is that it looks like a tremendous productivity surge."

This elegant theory explains why it took until 1995 for the IT investment boom to show up in productivity statistics: the "invisible factories" were still being built on foundations of hardware and software.

It also explains why the productivity surge has continued beyond the peak of IT investment: companies have stopped buying boxes and bandwidth, but they are reaping the rewards of prior investments in intangible capital.

Importantly, the Brynjolfsson theory also carries a message for managers - that IT contributes to productivity gains only when combined with big investments in process redesign, attention to human resources and a willingness to innovate.
This has the ring of truth. Companies that prospered mightily during the 1990s - think Wal-Mart Stores and Dell - combined extensive use of technology with managerial innovation of the highest order.

Vendor managed inventory. Adaptive supply chains. Build to order. These management innovations were enabled by technology but created by flesh and blood managers.

A sector-by-sector analysis of productivity gains carried out by McKinsey Global Institute, the research arm of the management consulting firm, adds supporting evidence.

MGI found that the step-change in US productivity growth in the 1990s had been concentrated in just six industry sectors: semiconductors, wholesale, securities, retail, computer manufacturing and telecommunications.

What made these sectors special? In each case, IT investment was accompanied by vigorous competition, with few restrictions on products, services, distribution and prices.

These competitive pressures, concluded MGI, forced managers to innovate around IT.

The next frontier for research, says Diana Farrell, MGI’s director, is trying to understand the “performance levers” that matter for each company. Only then will managers be able to select IT projects with the potential to have a significant positive impact.

For example, using IT to substitute capital for labour could be “the killer app” for some companies. Others might benefit more from IT projects aimed at reducing non-labour costs.

Wal-Mart made great productivity gains by developing electronic data interchange (EDI) links with its suppliers and managing its warehouses in real time. In low-margin, high-velocity discount retailing this worked well.

Does this mean that high fashion retailers should follow suit? No, because the high-margin, low-velocity nature of the business suggests that IT would be better deployed elsewhere. Forecasting demand and maximising average selling prices are probably better uses of IT dollars.

Back at MIT, meanwhile, Prof Brynjolfsson is collecting data to map the correlation between IT investments, productivity gains and “enlightened” work practices, such as self-managing teams and pay-for-performance.

His conclusion from an early study: “Companies that made IT investments without changing their work practices were no better off. The same goes for companies that changed their work practices without making the IT investment. Companies that do a little bit of everything seem to do the worst of all.”

The winners were companies that pursued vigorously the IT and “human capital” agendas in tandem.

The bad news is that this kind of transformational effort requires backing from across the company. Chief information officers can not hope to achieve it on their own.

The good news is that, if you can pull it off, this kind of IT-enabled management innovation is very, very difficult for competitors to replicate.

This is important because, as every manager knows, there is a world of difference between productivity and profits. An increase in productivity means simply that a company is producing more output for every unit of input, principally capital and labour. Whether this falls to the bottom line is a separate issue.

Productivity gains that are easily replicated across an industry usually end up in the hands of customers. Only when gains remain unique to a company do managers get a say in how to distribute the spoils - between customers (in the form of lower prices or higher quality), shareholders (higher profits) and workers (increased pay).

If the name of the game is productivity plus profits, then the only winning strategy is to innovate around
information technology in a way that creates lasting competitive advantage. The question is how many companies have the management talent to play this way?

Think of it as the productivity paradox for the decade to come.

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