

**Eating 1s and 0s: Interactive Digital Media
and the Weightless Economy**

by

Danny T. Quah

CEP and Economics Department LSE

D.Quah@lse.ac.uk

<http://econ.lse.ac.uk/~dquah/>

December 1997

A keynote address delivered to “The Artist, the Citizen, and the Entrepreneur,” an international seminar for the Council of Europe (organized by ARTEC and CICV in collaboration with the Arts Council of England)

FOR DELIVERY (26 NOVEMBER 1997)

When hard-nosed, battle-weary policy-makers and economists look at the digital media industry, it is often with skepticism, sometimes with wry amusement, other times with downright antagonism.

My confession: I am, by training and by profession, one of those skeptics. Our traditional view is, We are concerned with the really large, substantive, important economic and social issues: We work out how things are put together just so, in order that societies can put food on the table for billions of people. We make the right connections, so that workers can weave material to clothe millions of children. We cobble together big iron and heavy metal to move machinery across the globe, so that buildings and highways can be built, so that life for entire societies is improved. This is heavy metal. It is the stuff of economic progress and increasing prosperity.

Digital media technology—the 1s and 0s that entertain and inform: You want us to promote that because you claim it is part and parcel of economic growth and social prosperity? You say that elements of digital media and communications technology might even constitute part of an engine of growth for the economy? Yeah right, in which parallel universe? No one eats 1s and 0s.

Some might argue that digital media—like the rest of culture, literature, and the arts—should not be subject to the same treatment as the crude, unsubtle things that are the domain of economic analysis and policy-making. Perhaps so, but I would like to argue here that it should, and that, contrary to the traditional views described above, it shows up not at all unfavorably.

1 RECONSIDERING THE TRADITIONAL VIEWS: SUCCESSSES AND FAILURES

The force of recent events together with the development of fresh economic ideas is a good place to begin in re-examining those traditional views. For the public, a striking feature of the modern economic landscape would be the well-known large software publishing houses. These have grown, in the last ten years, from shoestring operations to global powerhouses. They have shown spectacular performance on the world's stockmarkets, even as almost everything else around them undergoes a crash-and-burn. Those financial successes are not necessarily an evil empire. Instead, they reflect in part how well the companies concerned have been able to provide what consumers and businesses want. The strength of those successes mirrors the fast-paced technical improvements and innovations that drive competition in the information technology or IT industry. And what else does high-tech IT make but, precisely, 1s and 0s.

In 1991, Japan's most successful corporation was a company

called Nintendo. It began life making playing cards but by the 1980s had switched to producing digital media. Nintendo generated in 1991 profits exceeding US\$1.5m per employee, higher than that produced at Toyota the car manufacturers, and leaving far behind any heavy-metal company elsewhere in the world.

What could be more convincing evidence for success and economic viability than these examples I have just described?

Of course, the battle for hearts and minds is never easily won or lost. The suspicion with which many economists look at all of high-tech IT—not to mention digital media and communications technologies—stems, in part, from something known as the *productivity paradox*. This paradox is the following. Over the last three decades (*between 1970 and 1996*) business investment in IT hardware as a fraction of total investment increased six-fold from 7% to 40%. Combined with software expenditures, this fraction has grown to exceed (the share of) investment in all physical machinery. Ones and zeroes, and the pipes that they run in, have come to be a large chunk of what businesses spend in order that they might grow for the future. And the measured returns to this optimism? Total factor productivity growth in the G7 countries averaging 3.3% per year from 1960 through 1973 has fallen to less than a quarter of that (0.8%) since the 1970s. Performance has been dismal.

In other words, the reorientation of business away from their traditional heavy-metal way of doing things has negatively affected how productive business is—and severely so, it seems. For the traditionalists, this is a powerful message, and is an outcome that was foreshadowed in the famous quip made in 1978 by Robert Solow, “You can see the computer age everywhere but in the productivity statistics.”

It remains unresolved whether these statistical calculations might be misleading or inaccurate due to some artifact in official data.

Regardless, even if they were right, their big-picture social-analysts' pessimism has not held back the lone private IT entrepreneur—out there on a limb—going ahead and seeking to make profits, as well she should. Last year (*in 1996*) the world traded US\$500b worth of IT. Compared with US total exports of manufactured goods to the OECD of about US\$250b—only one half that—the traded IT figure more than holds its own as a big number.

Total US spending on computers, telecommunications, and peripherals, together with net IT exports now contributes over 5% to total Gross Domestic Product. This contribution is greater than Agriculture's; it exceeds that of Construction; it is more than one-third of all of traditional Manufacturing. US software products and services now earn more than US\$300b a year. The significance of digital and IT industries in the modern economy is apparent.

And while we might worry if, overall, businesses are getting value for money from IT, the ground troops in this field are doing better than all right. Thus, even though since the beginning of the 1990s, the median wage of US workers (*after correcting for inflation*) has fallen, wages for computer programmers have consistently risen—those for male programmers now by 13%; those for female programmers by 20%.

Finally, while Europe looks enviously at the US's 4.8% unemployment rate—with France's at 13% and Germany's at over 11%—we might also note the 190,000 high-tech job vacancies currently going begging in the US, where secondary-school teenagers trained in computer animation or network administration earn starting salaries more than two and a half times the UK's annual average income. Worldwide, the number of vacancies in high-tech is now about half a million. And in the US, even with additional workers streaming in (whether in real life or by digital bits over the Internet) from Ireland and India—traditional strongholds of the key desired combination

of the arts, English language skills, and engineering—IT companies continue to cite skilled labor shortage as the greatest obstacle to growth.

To conclude, anyone who thinks this 1s and 0s digital stuff doesn't lead to jobs, growth, and economic prosperity just isn't looking in the right places, where real-life successes have been happening.

2 LOOKING AHEAD: DEMOCRATIZATION AND DEVELOPMENT

But then perhaps that is all this is: IT and digital media technologies are elitist, and benefit only the already well-off in global and local society. What about the millions now unemployed in Europe? In fact, let's take it further: What about the 1 billion people in the world who live on less than US\$1 a day? How are these people supposed to benefit from digital media and communications technologies?

In the framework developed above, the problem of unemployment is naively if easily solved. Get the unemployed not jobs, but skills and opportunities. The former treats only the symptom; the latter, the underlying disease. The labor markets identified earlier are themselves already naturally vibrant, showing high growth and strong activity.

That digital technology markets increase, not reduce, the demand for skilled workers is a puzzle only to those who argue that progress in technology lowers the price of information, and thus elevates the demand for unskilled gardeners and hairdressers. The price of *codified* information has certainly fallen with modern technical progress. We see this in the increased accessibility and dissemination of isolated pieces of data. But that then only raises demand for those, like yourselves in this industry, who possess *tacit* knowledge—the ability to weave together data and ideas into a useful and appealing web of

colors, sound, and information.

Now what about those 1 billion very poor in the world? For decades, institutions like the World Bank viewed the problem of economic development as being a problem of the shortage of physical capital. Once enough heavy metal earth-moving machines were moved into the developing countries and turned on, all would be well.

This development strategy has worked exactly nowhere in the world. Private economic agents, to their credit, have never seen its wisdom; and they do not put their resources behind it. When governments and aid agencies have tried it, failure after spectacular failure has occurred.

The World Bank now views itself as a knowledge bank. It seeks to disseminate ideas, information, and knowledge. The Bank studies how new technologies can empower the poor in developing countries to take themselves the actions that will improve their economic condition.

It is an unlikely mix of characters that have picked up this line. Singapore and Malaysia are countries whose governments are not exactly what one might think of as freewheeling exploratory new media types, open to ideas about throwing overboard censorship and subverting established culture. Yet, they too have jumped on the IT digital media bandwagon.

Official government policy in Singapore banks on the country's becoming a wired, intelligent island by early in the next decade. Singapore is already the world's largest exporter of computer disk drives, and the island is blanketed with some of the best high-speed broadband information infrastructure anywhere in the world. Malaysia's proposal for a Multimedia Supercorridor envisions a 250 square-mile high-tech city housing over 100,000 IT-savvy inhabitants exploring the boundaries of digital communications and content, a collabora-

tion between state and international commerce: The resulting information free-for-all—Internet access is intended to be available with no censorship—must stretch that government’s authoritarian views on free speech. Whether or not this US\$20b Multimedia Supercorridor actually comes to pass remains to be seen. But, it certainly is serious enough to discuss.

These examples—as well as digital solutions to distance learning in the Antarctica; disease epidemics in the Nuba Mountains in the Sudan and in the Ebola Belt in Zaire and Gabon; environmental preservation projects in the Amazon and in Egypt—seem to me not so distant from what digital media technology does, here in London or anywhere else.

3 A LITTLE ECONOMIC IDEA

In 1962 Kenneth Arrow—who would go on to win the Nobel Prize in 1972—wrote down the first modern rigorous analysis of the economics of knowledge. Of course, writers from Thomas Jefferson and Karl Marx on had already noted the subtleties in economic understanding of knowledge, invention, and scientific progress, but Arrow’s was the first systematic study.

In his paper, Arrow pointed out two things: (1) the economic rewards to owning a piece of knowledge were difficult for the owner to appropriate; and (2) while society should value only the first discovery of an item of knowledge, private economic actors would typically make multiple, closely-related discoveries, and otherwise behave in a way so as not to maximize society’s welfare. In other words, inefficiencies would be rife until a system of intellectual property rights is put in place that correctly acknowledges the peculiar properties of knowledge and ideas. Knowledge and ideas are infinitely expandable; they have properties similar to public goods [always underprovided

by a free market], but are themselves commodities created by the purposeful actions of private economic agents.

Why do I review this little bit of the history of economic research? The reason is simple. A piece of code or software or digital media has exactly the same economic properties as an item of knowledge. It is easy to make perfect copies of code or digital media; the creator relies on a system of arcane and inappropriate copyright and patent laws to protect, imperfectly, her claims to economic reward; truly innovative products get swamped with dozens of me-too close copies.

Since the 1960s, economists have used Arrow’s ideas to study science, research, and invention—surely a tiny fraction of economic activity in even the most modern of economies. We see now that the greatest relevance of Arrow’s ideas is likely, instead, to everyday economic life in societies where value creation occurs in digital media, in software, in code, and in other dematerialized forms—as now routinely occurs in the weightless economy.

The system of intellectual property rights suitable to the proper economic functioning of such a society remains to be worked out and put in place. Instead, in reality now, we continue to have either a system handed down, essentially unchanged, from the 1709 Statute of Anne, or naively hopeful measures of reverence and moral right that just rewards be accorded an author.

For the time being, only governments can legislate laws to respect property rights for knowledge, ideas, code, digital media, and the rest of IT. Putting in place a system appropriate to the weightless economy, and then allowing competitive forces to come into play will be the first-best solution. Until that happens, however, we need in place mechanisms that will correct market failures in the underprovision of digital content, and that will encourage proper development of the skills needed to work in the weightless economy.

4 CONCLUSION

In this talk, I have reviewed why digital media and communications technology, and IT in general, form an important part of growth, employment, and prosperity in the modern economy. I have argued that the benefits are widespread and tangible, but that problems remain of resource misallocation—in particular, in the areas of training and of intellectual property rights.

Those difficulties will be resolved, one way or another. Governments can either decide to help us do so, or get out of the way.