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Taking Apart the 'Roads Ahead': user power vs. the futurology of IT[1]
GRAEME GOODAY

How often have futurologists ever succeeded in making accurate global predictions? Bell's utopian vision of a leisure-laden 'Post-Industrial' society now seems hopelessly naive;[2] Fukuyama's 'End of history' thesis was arguably just a fleeting Reaganite delusion about the stabilization of post Cold War politics.[3] Notwithstanding the failure of such widely hailed prophesies, and despite the lack of any well-attested laws about the historical development of information technologies,[4] a brazenly upbeat futurology pervades many debates on new IT. This is most obviously the case in Bill Gates' recently updated *The Road Ahead.*[5] To challenge Gates' prognostications about the future of information technologies, I will argue for the importance of users (vis-à-vis producers) in the social shaping and 'consumption' of IT, especially the power of many (if not necessarily all) such users to resist falling into futures that others prescribe for them. I contend that the non-passivity of IT users undermines the cogency of any claims about the inevitability of technological change, and helps to explain why so many past 'futures' of IT have never fully materialized.

1. The unpredicted and the badly predicted in the history of IT

Technologies have often ended up being used in ways that their inventors and engineers did not foresee or perhaps did not actually wish. No one person ever seems to have foreseen all the possible ways in which a technology could be used, nor the social effects that its use might bring. Indeed the sociologists of technology, Trevor Pinch & Wiebe Bijker,[6] have pointed out that the social function of a technology is not uniquely determined by its material construction: it is subject rather to 'interpretive flexibility.' On this view, different social groups characteristically see different possibilities in the usage of a given technology and thus develop divergent social meanings and expectations for it - leaving the direction of its subsequent deveopment somewhat contigent. Looking at the early history of information technologies reveals for us just how haphazard their fate has proved to be.

In the late 1860s and 1870s the submarine telegraph was heralded as the great peace-maker, allegedly destined to prevent future wars by enabling rapid and harmonious communication between nations. This technology was, however, appropriated by governments who harnessed it to their own belligerent ends, using the telegraph to create at least as many new conflicts of power around the imperial world as it helped to resolve.[7] When the telephone was first marketed in the

late 1870s and 1880s it was as a speaking form of telegraph for businessmen, a parlour toy for the wealthy, or (in Hungary and France) as a one-way device for point to point 'broadcasting' of opera.[8] American telephone companies were actually irritated when women at home 'trivialized' this technology by used it for daily social conversation - until realization of the profitability of this unforeseen gendered usage![9] Marconi's development of point-to-point 'wireless telegraphy' of 1896 only came to be used for mass 'radio' broadcasting over two decades later as wireless manufacturers sought to create new audiences for their products after military demand fell away at the close of World War I.[10]

The crucial problem for the futurology of any given technology revealed in these examples is that culturally important and lucrative uses for it are initially far from obvious to the makers and promoters of that technology. Consider the 1960s: who predicted that the computer might ever become a personalized vehicle of entertainment or communication? Computers are nowhere to be found in Marshall McLuhan's pychedelic speculations about a technologically- wrought future democracy.[11] The common view then was that a small number of centralized mainframe computers, with many peripheral terminals, would meet all computing needs - in programming, calculation and business data processing.[12] If this mainframe-centred expectation of the future was not borne out, it was surely not due to the obtuseness nor unimaginativeness of computer specialists in the 1960s.[13] It owed more to the unforeseen, and probably unforeseeable, way in which electronics manufacturers in the 1970s constructed new audiences and technologies for personal computing on the back of a craze for personal digital (and programmable) calculators.[14]

The most striking recent development in the history of information technology is the spectacular growth of the Internet. Yet this too was hardly predicted by users of its predecessor, the ARPANET in the 1970s, nor the WWW when it was created in 1989.[15] Perhaps most remarkably of all, the sudden burst of interest in the Internet in the mid 1990s was contrary to the predictions of the most successful IT merchant of all time: Microsoft's Bill Gates. In 1996 Gates had to rewrite his quasi-autobiographical volume of *The Road Ahead*[16] a mere year after it was first published in order to tell the story of how Microsoft had been forced to restructure its entire software business around the Internet during 1995-96. It would appear that the growth in importance of this most striking of all recent developments in information technology was not obviously predictable for IT experts at least until the major changes in public usage were actually underway anyway.

2. Laying down the Road Ahead: three incompatible approaches to IT forecasting

The persistent fallibility of forecasts concerning information technology is often obscured by the ways in which bad predictions are often just quietly forgotten or quickly displaced by newer predictions. Such forecasts are rather like horoscopes: so long as a future - indeed *any* future - is available to give consumers or financial backers some clear sense of what can be achieved with a technological innovation, it hardly seems to matter how accurate the prediction turns out to be in the long run. Such predictions generally try to convince anxious customers that there is a single clearly laid out path into the future that can only be accessed by purchasing the most recent products - and those who do not take this path will be left behind by the rest of the field. Manufacturers and marketers seem to assume that, if these self-interested pronouncements are repeated sufficiently often, the response of credulous IT users will actually make such predictions come true.

As Gates' *The Road Ahead* is the most widely read of such attempts to merchandise potentially self-fulfilling predictions of IT's future, it is *prima facie* important to disentangle its rather divergent messages. Gates himself is notably inconsistent about both the viability of this futurological enterprise, and even to what extent he himself had ever been a successful practitioner of it. In his Foreword he comments that the 'personal computer revolution' had led he and Paul Allen to places they had 'barely imagined' back in the mid 1970s.[17] Nevertheless, Gates soon claims that when he was 19 years old 'I caught sight of the future and based my career on what I saw... I thought we could have "a computer on every desk and in every home"' and that then became Microsoft's long term 'corporate mission.'[18] Strangely, no evidence is cited to support the latter claim, and none can be found in any serious history of computing. Like so many autobiographies, *The Road Ahead* retrospectively imposes an artificial teleology on its principal author's life, giving his career more predestined directionality than he could conceivably have experienced in arriving at his current fame and fortune.

This book is also a very Microsoft-centred almanac of where computing will go next - allegedly taking lessons from history of the alleged 'PC revolution' to predict the course of the 'Internet revolution' so incongruously unforeseen by Gates. In his Foreword, he is again more modest about his capacities to discern the coming developments: of the next 'great journey' on which we had now all embarked, humbly contending that 'We can't be sure exactly where this one will lead either.'

And yet much of *The Road Ahead* is devoted to offering us three incompatible visions of where this next virtual trip will be taking us.

i) **technological determinism**: One of Gates' contentions is the technological determinist claim that the 'revolution in communications' that he expects in the next few decades will be 'driven' by new developments in IT. These yet to be created tools - miniaturized hardware or so called 'killer' software applications - will meet needs, claims Gates, that we don't foresee now.[19] Thus we should undertake whatever new activities are made possible by new technology and show a passive deference to their capacities and constraints. To support this vision of how the future arrives, he argues from historical precedent that the new possibilities for communication created by the fax machine, portable video camera and the Cable news network were important in bringing about the fall of communism - and even of reducing the importance of national boundaries in making countries 'more alike.'[20] Yet his language about the agency of technology is often ambivalent. Gates is often less than clear about whether new IT applications will actually *dictate* the changes that will bring about a pre-given future, or whether these new applications will just create the possibilities of new futures in the hands of imaginative and strategic users. Thus, for example, he is less than forthright about whether his proposed wallet PC will be the cause and mediator of social change or just the product of it.[21]

Gates says rather Calvinistically in the first chapter: 'We don't have the option of turning away from the future' - as though the future were inescapably predestined by every newly arrived technology. Yet he fails to note that the vast majority of technological innovations rapidly disappears into obscurity;[22] indeed, it is not clear in his account why a small handful of 'successful' innovations in IT could have such a decisive 'impact' every year whilst thousands of others do not. Equally deterministically Gates adds that 'No one gets to vote on whether technology is going to change our lives' - as though human beings were incapable of judging how - or even whether - any given technology *should* be deployed to change the operations of the world.[23] Yet it is at just this point in his account of the inevitability of technology-induced change that Gates argues in a completely different vein that 'No-one can stop productive change in the long run because the market place inexorably embraces it.' This leads us to another line of Gatesian futurology viz. that the future of IT is somehow determined by the consumer 'market' - rather than by the innately progressive nature of technology.

ii) **the hegemony of the market**: A prominent theme of Gates' account, and one that is not easily reconciled with the first, is that the fate of information technologies is determined by the operations of the 'market. He argues that since 'de facto standards' are developed by the marketplace rather than by law, they get chosen for the 'right reasons' and are later replaced for similarly good reasons when 'something better' shows up.[24] Interestingly he contends here that 'killer applications' do not automatically win over IT users - as his account in i) would suggest: in fact he redefines a "killer app" as a use of technology so attractive to consumers that it 'fuels market forces' and makes the underlying invention on which it depends 'all but indispensable'.[25] Gates thus concedes that it is only the efficacy of consumer market forces that transforms potential killer applications from being mere 'curiosities' into 'money-making essentials' - not their inherent technological virtues.[26] Tellingly, he concedes that the difficulty of predicting consumer take-up of new products might conceivably lead to Microsoft ceasing to be top software company unless it keeps innovating its way to stay on the front-line[27]. Thus on this account, the state of future IT is very much in the hands of human beings, not in the technologies that they use (see more below).

iii) **implementing justice**: Further complication is generated for the reader of *The Road Ahead* by Gates' pronouncement that *everyone* should have a say in how IT is developed and for whose benefit. He proposes that 'broad groups' of the population, not just technologists and IT specialists, should be able participate in the debate about how this new technology 'should be shaped' and how it will in turn 'shape society.' This proposed inclusiveness is difficult, however, to reconcile with his claim[28] that those who resist new forms of technology will inevitably cave in and learn to accept whatever IT manufacturers produce for them. Critical readers can bit wonder at his claims that new developments in IT will bring about greater democracy and freedom - indeed apparently at first only to the English-speaking world.[29] Although he dismisses the naive utopian view that IT will eliminate 'all barriers of inequality and prejudice,' he nevertheless rather idealistically claims that we are 'all created equal' in the virtual world, and that we can accordingly use this to redress some of the inequalities in the physical world.'[30] In particular he is concerned that there is still a considerable 'gender imbalance' in computing: his response to this is that we must pay 'particular attention' to increase the number of women participating in professional computing. Quite how this moral intervention in IT promotion is to be reconciled with a deference to the market forces creed he advocates as in (ii) above and also

the determining power of technology to propel us into a better future as advocated in (i), is not at all easy to see.

If Gates is serious in his claim that there ought to be a mechanism for implementing social justice by mass social consultation in the development of IT, the future would be governed entirely by what IT users wanted. However, not only does Gates *not* offer a mechanism by which such justice might be implemented, he does not even begin to consider the problems of achieving any consensus about technological needs for the future when a vast number of diverse users are consulted. Without an encyclopaedic knowledge of the interests and concerns of different social groups, it would surely be exceedingly difficult for anyone to predict *which* (or perhaps *whose*) future of IT would be engendered in any confluence of different perspectives. Again we find here no cogent means of establishing accurate forecasts of information technology. Interestingly, though it is Gates' concession to the importance of IT *users* that gives us some hope that responsible technological forecasting might still be a possibility.

3. The power of users to select the Roads Ahead

Any viable futurology would have to undertake something potentially disturbing to the vanity of those who work in the IT industry. We should disaggregate the homogenizing fiction of the 'market' and look in detail at the heterogeneous range of present day *users* of IT as the major determinant of IT's future - albeit within the constraints of what software and hardware is commercially available to them. In order to see how the future of IT might be created, we should thus look more closely at the socio-cultural dynamics of diverse technology users.[31] Mackenzie and Wajcman's account of the social shaping of technology shows how human decisions - which make little reference to engineering merit - are crucial to selecting which technologies ever get beyond being mere 'promising' innovations.[32] In their more radical programme of the social construction of technology, Pinch and Bijker have argued that contingent social decision-making goes on at *every* stage in the making of a new technology. They argue, for example, that the success of the equal-wheeled, pneumatic tyred, rear-driven bicycle in 1890s Britain cannot be explained by the conventional claim that it was the uniquely best technical solution to which all rational cyclists adapted; they claim rather that this design was developed over several decades to incorporate enough versatility to meet all the resiliently different needs of cyclists of both sexes, all ages and all social classes.[33]

The rise and proliferation of the personal computer can also be told as the incorporation of pre-existing social interests and practices into an extraordinarily versatile technological entity. It is well-known that the esoteric Altair 8800 electronic kit computer of 1975 used only by self-indulgent hobbyists was the ancestor for the sophisticated mass-produced IBM compatible, Windows-operating multi-purpose PC of the 1990s. Recently Aspray and Campbell-Kelly have refined this story to emphasize that entrepreneurs and whizz-kids such as the young Bill Gates, Steve Jobs and Steve Wozniak had to draw heavily upon popular culture and commerce to find useful purposes for the proto-PC to serve. Going far beyond the calculational and programmable functions that had been the stock-in-trade of the electronic mainframe computer since World War II, the extremely protean microcomputer was subsequently moulded by them into whatever multiform role could be marketed to fit in to the daily social existence of businesses, educational establishments and affluent populations. All these computer usages related to existing social practices for which there were well-defined - albeit predominantly male, middle-class and able-bodied - consumer audiences in the late 1970s: word-processing, spreadsheets, education, electronic games, graphic design, etc. [34]

Only when this sort of multi-user versatility for the micro-computer was established as commercially viable in 1980 did IBM need to bother to join the game of constructing futures for this device.

Despite Gates' claims to the contrary, the question remains: could anyone really have predicted that the stolidly unentertaining and self-referential Altair computer could have been so effectively wedded to so many extant social practices - or indeed guessed to *which* social practices - and sold to so many millions of people within two decades? Surely not even the shrewdest polymathic expert in cultural anthropology, electronics, advertising and the sociology of business could accurately have predicted the extraordinary global take-up of the constantly re-invented PC as long ago as 1975. We can conclude that prudent IT futurologists should perhaps restrict themselves to short-range prophesy.

Yet even with regard to the imminent future, Aspray and Campbell-Kelly conclude cautiously 'What will happen is hard to predict. Nothing is certain but change.'[35] Nevertheless, the general thrust of their argument is that the future of computing is tied up closely with the outcome of *corporate power* rivalries between Microsoft, Apple, IBM and some of the newly emerging IT companies. Whilst understanding the dynamics of 'corporate' power is doubtless important, any

deep analysis of it must surely explain how such power is necessarily rooted in a company's ability to enrol the contingent interests and sympathies of IT users. One important genre of such scholarship lies is the feminist analyses which point to the decades of predominance of men among those who have shaped the forms and uses of IT products - despite the very close involvement of skilled women as the programmers of several of the first computers in the 1940s and 1950s.

Gill Kirkup thus asks whether the computer need be a self-indulgent 'hammer' for battering away at male-orientated problems: could its potentialities not be better fulfilled as that of a creative harmonious 'harpsichord'?[36] She concludes her piece with some optimism that a new set of intellectual and emotional values might be invested in future social (re)constructions of the computer that will turn it into a more positive, sensitive and creative instrument. Certainly if hitherto marginalized social groups come in the future to have much more power in setting the agendas for both the design and *usage* of information technology, the 'Road Ahead' for information technology might very well take a different path from that envisaged by Bill Gates. Do futurologists have any option therefore but to recognise that the fates of information technologies lie not in the minds, spreadsheets nor marketing tactics of their creators, but rather in the shifting power relations of their active and diverse users?

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Author's Address: Division of History & Philosophy of Science, School of Philosophy, University of Leeds, **LEEDS   LS2 9JT.   E-mail: g.j.n.gooday@leeds.ac.uk.**

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[1] An early version of this piece was given at ESRC-sponsored workshop 'Informed or Forewarned: the social implications of new information technologies' held at the Institute of Communication Studies, University of Leeds, on 30th January 1997. I would like to thank Robin Lane, Steven Lax, Peter Reffell and Peter Millican and the editors of <u>Convergence</u> for their helpful comments on earlier drafts of this paper.

[2] Daniel Bell, *The coming of post-industrial society : a venture in social forecasting*, (London : Heinemann Educational, 1974).

[3] Frances Fukuyama, *The End of History and the Last Man*, (London: Penguin, 1992)

[4] Herb Brody argues that this unpredictability applies to all technologies in 'Great Expectations: Why Technology Predictions Go Awry,' in Albert Teich (ed.), *Technology and   the Future,* 7th ed., (New York: St Martin's Press , 1997), pp. 107-116. There are some exceptions, notably 'Moore's law' viz. that the number of transistors on a microchip would double every one-two years, although it is materially obvious that this phenomenological law cannot hold into the indefinite future. See David Manners & Tsugio Makimoto, *Living with the Chip,* (London: Chapman & Hall, 1995), pp 38-9 and 78-9.

[5]Bill Gates (with Nathan Myrhvold and Peter Rinearson), *The Road Ahead*, 2nd edition (London: Penguin, 1996)

[6] Trevor Pinch & Wiebe E. Bijker, 'The social construction of facts and artifacts: or how the sociology of science and the sociology of technology might benefit each other' in Bijker, Pinch & Hughes(ed.) *The Social Construction of Technological Systems*, (London: MIT Press, 1987), pp.17-50

[7] Daniel Headrick, *The Tentacles of Progress: technology transfer in the age of imperialism,* (Oxford : Oxford University Press, 1988) p.107.

[8] Asa Briggs, *Victorian Things,* (London : Batsford, 1988)

[9] Claude Fischer, *America Calling: a social history of the telephone to 1940.,* (Oxford : University of California Press, 1992)

[10] Andrew Crisell,, *Understanding Radio*, 2nd edition, (London : Routledge, 1994)

[11] Marshal McLuhan, *Understanding Media: the extensions of man*, (London: Routledge & K. Paul, 1964)

[12] William Aspray & Martin Campbell-Kelly, *Computer: A History of The Information Machine*, (New York: Basic Books, 1996), 207-229.

[13] Paul, Cerruzzi, 'An Unforeseen Revolution: computers and expectations, 1935-85', in Teich (ed.), pp.117-131

[14] Leslie Haddon, **'**The home computer: the making of a consumer electronic'*Science as Culture*, 2(1988), pp.7-51

[15] Aspray & Campbell-Kelly, pp. 283-300.

[16] Gates, *The Road Ahead* (London: Viking, 1995). See the review of this first edition by Will Straw in *Convergence*, 2, Number 2(1996), 132-34.

[17] Gates, 1996, pxiii.

[18] Gates, 1996, p.4.

[19] Gates, 1996, p.xiv.

[20] Gates, 1996, p.298.

[21] Gates, 1996, pp.80-85.

[22] See David Edgerton, 'Ten Eclectic Theses in the Historiography of Technology', forthcoming in *Annales,* 1997, and Graeme Gooday 'Rewriting the Book of Blots: Some critical reflections on the historiography of technological "failure"', forthcoming in *History and Technology,* 1998.

[23] Gates, 1996, p.11.

[24] Gates, 1996, p.6 & p.50.

[25] Gates, 1996, p.74.

[26]Ibid.

[27] Gates, 1996, p.69.

[28] Gates, 1996, p.7.

[29] Gates, 1996, p.298.

[30] Gates, 1996, p.294.

[31].Roger Silverstone, & Eric Hirsch (eds.), *Consuming Technologies: Media and Information in Domestic Spaces*, (London : Routledge, 1994); Paul N Edwards, 'From Impact to Social Process: Computers in Society & Culture', in Sheila Jasanoff *et al., The Handbook of Science and Technology Studies*, (London: Sage, 1995), pp. 257-284.

[32] Don Mackenzie & Judy Wajcman , *The Social Shaping of Technology*, 1985, (Milton Keynes: Open University Press, 1985).

[33] Pinch & Bijker., pp.44-47

[34] Aspray & Campbell-Kelly, p.240

[35] Aspray And Campbell-Kelly, p.282.

[36] Gill, Kirkup 'The social construction of computers: hammers or harpsichords?' in Kirkup & Smith Keller(ed.s) Inventing Women , (Cambridge: Open University Press/ Polity 1992. Also useful for the domestic environment is Carolyn S. Tinnell. 'An Ethnographic Look at Personal Computers in the Family Setting', *Marriage and Family Review*, 8, part 1(1985), 59-69; for the office environment see Juliet Webster,'From the Word Processor to the Micro' in. Eileen Green *et al.,* Gendered by Design: Information Technology and Expert Systems, (London : Taylor & Francis, 1993), pp.111-126.