The CoEvolution of Organisations and Information Society

Ian Miles

ABSTRACT

Information Society is a sociotechnical formation that has evolved from early configurations of industrial society. What makes it distinctive, and justifies the use of the label "Information Society", is its use of new Information Technology. Information Society itself evolves through various configurations of the technological knowledge, organisational structures, and social practices that are constituent of industrial societies. Three phases of Information Society-"island", "archipelago", and "continental" phases can be characterised in terms of the type of IT equipment and services that are employed, and, equally importantly, in terms of the styles of use and applications to which they are put, and the sorts of organisational embedding and strategy that evolve in and that help shape these contexts. A future phase can also be outlined speculatively.

In the "island" phase, up to, say, the late 1970s, IT facilities were typically small (in terms of processing power, by current standards), and detached from one another; organisations used them in a centralising way, with IT facilities concentrated in data processing centres.

In the 1980s, the "archipelago" is characterised by a proliferation of IT devices on a more human scale, with limited (two-way) communications between them being the norm. Despite public fears about the impact of IT use on employment and concern about "deskilling", the trend was more one of upgrading of work, with the decentralised use of PCs (mainly as stand-alone devices) causing problems for corporate DP managers. Equally, economists were puzzled by the lack of reflection of IT investment in productivity statistics (the "Solow paradox"). In the 1990s, a continent of IT devices is crossed by "information superhighways", with networks increasingly linking islands of automation. The Internet becomes a near-universal medium for computer linkages, and mobile systems of many sorts becoming prominent for voice and data communications. Late in the decade, when access to the Internet was widespread, and the Web provided a familiar design paradigm for information exchange, many businesses and government organisations became active in the online transfer of transactional and related data. By the turn of the millennium, there were arguments that Solow's productivity paradox was beginning to be overcome-perhaps because of the increased networking, and associated organisational
learning, finally effecting substantial performance improvements.

The opening years of the twenty-first century see the further consolidation of the “continent” phase of Information Society. Two significant evolutionary steps look likely to be peer-to-peer networking, and “ubiquitous computing”. With many potential applications in education, healthcare, consumer services, and business organisation, it seems likely that the next decade will see the emergence of a new phase of Information Society characterised by at least some elements of such an ecosystem vision.

Introduction

A term such as “Information Society” is bound to arouse controversy. After all, all human societies have depended upon exchange of information between people, and we found ways of representing and storing information - and of communicating it over long distances - in the remote past. Specialised “information workers” predicted the change of seasons and built up a vast working knowledge of which plants were safe to eat, which had medicinal properties, and so on. Much more recently, the social and political changes associated with the development of the printing press, and with the growth of mass media over the last few centuries, are subjects that have fascinated historians. An interesting book entitled Information Ages (1998) considers major information “technologies” such as writing, numeracy and mathematical models, and convincingly demonstrates their coevolution with new ways of thinking about and transforming the world.

But the fact that so many commentators did begin talking about “Information Society” (henceforth IS) in the last decades of the twentieth century suggests that something distinctive was happening. Alistair Duff’s Information Society Studies (2000) charts the origins of the term in Japanese analyses, and the diversity of interpretations that it was given as the 1980s and 90s wore on. During the 1980s, in the UK, a major social science research programme was set up - PICT, the Programme of Research into Information and Communication Technologies2 - which established a central line of research on “mapping and measuring the information economy”. Within the programme there was lively debate as to whether the terminology was simply presumptuous (the present age self-glorifying itself and undervaluing its predecessors), a matter of mislabelling (really we should be using a more precise term such as “post-Fordism”), or a surrender to technological determinism (ideas such as “post-modernism” capture the essence of the epoch far better). But there was also a line of analysis that argued that it did make sense to relate IS to the emergence of new Information Technology (IT). This does not mean denying that a wide range of important cultural and economic trends are shaping contemporary societies (the roles of signs and symbols as pointed to by post-modernist analysis, the growth of information sectors and occupations charted by some economists). But the argument is that to use the term IS to connote something distinctive about these societies, we need to look for a really new set of changes.

This approach is sociotechnical. It sees the development and accumulation of knowledge dealing with how human beings can reshape

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1 Hobart and Schiffman (1998)
2 Major collections stemming from this programme are Dutton (1996, 1999) and Robins (1992).
their environments as a major factor in economic and social development. Technological revolutions require the development of particular kinds of technological knowledge, and application of this knowledge to social and economic purposes. New IT is such a revolutionary technology, and IS is a useful way of signifying the transformations in social and economic affairs associated with the development and application of the underlying knowledge behind new IT - and the elaboration of further new knowledge concerning its possible uses and styles of use. These developments are more than an incremental continuation of established social trends. In a report drawing on the PICT research, Miles (1990) argued that what makes IS distinctive is that new IT's radical ways of storing, communicating, and processing data (qualitatively different from those enabled by earlier information technologies) were being applied across broad swathes of economic and social life. The uptake of new IT is motivated by expectations as to how costs can be reduced, product quality enhanced, new markets captures, convenience obtained, and so on, and informed by the belief that any risks or social problems associated with it can be avoided or contained. It implies changes in products and processes, in working practices and interfirm relationships, in everyday life. These changes are not "impacts" of the technology; rather they are the results of action and counteraction in the application of the new knowledge.

Business leaders, public bodies, and even hobbyists, have sought ways of applying the new knowledge to effect useful transformations of the world. Many unsuccessful innovations are developed as well as many successful ones; there are often many different solutions to similar problems. A framework of understandings and expectations about the opportunities offered by new technology (and associated markets) has been developed; in some cases this leads to a concentration of efforts along particular lines, creating similar designs and technological trajectories.

The argument does not necessarily imply that IS constitutes a radical break away from industrial society. Much of what we now see represents an intensification of industrialism, rather than its overturning. In the future we may create societies so thoroughly transformed as to have little continuity with everything that has gone before - dramatically reduced working hours, new patterns of social life, humans accompanied by cyborgs, nanobots, artificial intelligence agents, etc. But the changes we have so far witnesses, dramatic though they are, have remained largely within the confines of established social, economic and political systems.

Furthermore, the argument about when societies start being Information Societies is somewhat redundant. The process is more one of evolution along a series of parameters, rather than a sharp break (when, say 50% of firms, homes, or whatever are using PCs or networks). Nor is it appropriate to consider that all Information Societies share the same basic features. Industrialisation has been (and still is) a long process, evolving through several distinct phases of development, and taking very different forms in different countries and regions. Informatisation is a similar process (indeed, an element in the process of industrialisation), and can be characterised as undergoing its own evolutionary phases. These phases reflect the development of new technological knowledge, and the social and organisational learning processes that have informed its application.
Information Society's Evolution

We here summarise an account of three phases of Information Society—"island", "archipelago", and "continental" phases - that has been developed elsewhere.3 These phases are characterised in terms of the type of IT equipment and services that are employed, and, equally importantly, the styles of use and applications to which they are put, and the sorts of organisational embedding and strategy that evolve in and that help shape these contexts. The accounts given below draw particularly upon my experience in observing the UK and European scene, and I would be grateful to learn of parallels - and divergences - in Japan and elsewhere.

"Islands"

This covers the earliest periods of the introduction of IT based on microelectronics - the core technology for the IT revolution. Computers and of course telecommunications systems had existed for a long time, but in the 1970s the microprocessor was introduced. It would eventually be used in practically all information processing applications. But up to roughly the late 1970s,4 talk of "convergence" was very rare, and computer, telecommunications, and broadcasting systems remained highly distinctive. Governments, seeing the growing importance of the computer sector, had long sought to promote the growth of strong computer industries. In the US this was effectively supported by military programmes, in Europe by national plans for the IT industry. These were generally oriented toward aims such as consolidating small-scale firms into a few large companies who could compete on world markets, and supporting national champions by government procurement and other means. The national companies typically produced their own designs of computer, with their own particular "standards".

IT facilities during this early phase of IS mainly consisted of islands, in the sense that these were by our current standards few and small (in terms of power, if not physical size), and detached from one another. Mainframe and minicomputers were used mainly in government and very large enterprises; computers were encountered by very few of the population. Each computer served a large number of users, but high levels of expertise were required to operate it through what we would now consider to be primitive visual displays and keyboard interfaces. Data processing (DP) tended to be centralised; many users were based at DP sites, while others used fixed terminals at other sites or submitted data on tape or punch cards to computer services. Networking between computers was being experimented with by a small vanguard of (mainly scientific) users, but was remote from most informed users.

Telephone and television use was widespread, but phones were used almost entirely for speech (telex, a business application of telecommunications, was mainly used by large firms) and were far from portable (indeed, in many places they were not even unpluggable!) Telephone exchanges operated on electromechanical or even mechanical principles. Televisions - and especially radios - were moving from being valve - based to being transistorised; they operated mainly by means of terrestrial broadcasts (with some

3 Miles (2001a,b).
4 All dates are approximate: developments occurred at different paces across different sectors, social groups, and regions.
cable TV in certain urban areas, relaying these broadcast channels). Otherwise, public experience with the new technology was low, and attitudes to computers were very mixed. Fears concerned job losses from automation - initially in manufacturing - and threats to privacy associated with large databases. TV and newspaper stories articles about the "micro revolution" were produced near the end of the 1970s. These raised fears that a cheaper and more extensive form of automation would displace huge swathes of the workforce, including "information workers" alongside manual workers. The application of word processors and new telephone systems was expected to lead to the massive displacement of white-collar staff. Politicians were warned also that the competitiveness of their national IT industries, and that of the prospective users of new IT, were under a new threat. But, at the same time, a new emphasis on market forces was being championed by the increasingly influential neoconservatives (Margaret Thatcher came to power in the UK in 1979). This undermined the traditional strategy of shoring up national champions.

A small group of proponents of "computer liberation", developed visions of mass access to IT based either on newer, smaller computers, or vastly expanded opportunities to network with mainframes. Towards the end of the 1970s, hobbyist computers appeared - one of the first was sold as a self-assembly kit - and these soon became known as microcomputers or Personal computers (PCs). They gained a first in the business world via the invention of the spreadsheet as a way of easily and rapidly manipulating data. This freed company accountants and financial analysts from the lengthy wait for analyses to be produced from DP centres: they could rapidly produce their own results, explore different strategies, etc. In contrast with a model based upon giving many people terminals to access large corporate data resources, the trend was toward local, decentralised IT power: this trend became the PC explosion of the 1980s.

"Archipelago"

In very general terms, the 1980s are characterised by a proliferation of IT devices of many sizes, usually with limited (two-way) communications. (Though a few systems had advanced data communications, networking capacities were fairly rare - thus fax use took off over this decade, while email use only grew gradually. The story is instructive, and we will amplify it later.)

Neoconservatism continued to extend its political grip: and one consequence was that the control of public telecommunications and broadcasting companies was relaxed. "Deregulation" began to be adopted as a principle, especially where there were new media such as mobile phones and direct broadcast satellite television. Early in the 1980s, the Japanese announcement of the "5th Generation" Programme of IT R&D, shocked Western countries into establishing their own R&D programmes; the European Commission launched ESPRIT and RACE (significantly, still separate programmes for computers and telecommunications respectively!). These stressed collaboration across European coun-

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5For instance, the UK model was highly influenced by the "BBC micro" featured in educational TV programmes, widely adopted in schools, and an entry point for many community activists and self-employed people into word processing, desktop publishing, and similar applications. The BBC micro (like many other home computers) did not conform to the IBM standards; it was not really until the 1990s that these market niches were brought into conformance with IBM or more rarely Apple Macintosh-standards.
tries, and between industrial and academic research: a succession of programmes have followed in their wake.

The political initiatives were hastened by the visible pace of technological change. Microelectronics were being rapidly introduced into telephone exchanges (digital exchanges coming to replace electromechanical ones), into TV sets, and indeed into a wide range of consumer appliances, with controls, displays, and internal systems mediated through the new technology. Knowledge of microelectronics enabled the continued improvement and cheapening of microcomputers. An important lesson of the 1980s was the power of standards: a wide range of quite distinctive systems in the early part of the decade came to be replaced by a much smaller range of models. Those conforming to IBM’s standards achieved dominance in business applications - more because of the market power of the IBM brand than because of any technical superiority. The patterns of uptake of “home computers” (PCs aimed at consumer markets) varied considerably across countries, in part reflecting the promotional efforts of governments and mass media. The dominant use of home computers turned out not to be housework or even education (though this was important): instead it was a novel games device. There was a great deal of hobbyist experimentation, informal sharing of ideas within user communities, and self-education with new products. The importance of software and peripherals became evident, with many success stories being circulated about teenagers who were wizards at writing computer games, small firms who had made (for instance) musical instruments or security systems that could be connected together through computer media.

There was widespread discussion of the possibility that IT use would have effects on work quality as well as on the quantity of employment. The 1980s saw a huge debate around “deskilling”, with many expecting that capitalist management strategies would lead to IT application overwhelmingly result in a degradation of work. Jobs would be routinised, with decision-making and other higher functions taken away from humans and embodied in the new equipment. Some political leaders feared that IT use was being inhibited by negative public attitudes along such lines, and after Margaret Thatcher raised this possibility at a Versailles summit of European leaders a set of major studies theme was launched. These actually established that attitudes to new IT were generally very positive: workplace conflict over its use was confined to a very few sectors (e.g. newspapers - where the technology was indeed strategically used to dispense with a powerful group of craft workers). More generally, it was management rather than the general public or workforce that inhibited IT use: there was fear of introducing too much ill-understood change into executive functions, and reluctance to engage in the sorts of organisational re-engineering advocated by IT experts. Microelectronic systems were being introduced into manufacturing industry and larger offices at a remarkable rate, justifying the view that here was a revolutionary and practically pervasive technology. But (with exceptions in high-tech applications like Computer-Integrated Manufacturing systems) they tended to be used in a rather piecemeal way. Parts of the existing division of labour were frequently automated, but there was much less systematic reorganisation of work structures and integration of different functions. Thus the phrase “islands of automation” was applied to
much of the application of IT: networking was very partial and incomplete.

PCs were available on a one-to-one or one-to-few basis, at the user's own home or workplace. The proliferation of PCs within companies caused problems for corporate DP managers, who fretted about the challenges of "end-user computing". They had to deal with increasingly informed and demanding users, who were importing their own choice of equipment and software, and requiring help with maintaining and supporting them in diverse premises.

As the technology diffused, it became apparent, from several sources that, despite the dire warnings, IT was rarely associated with large job losses. Furthermore, it was more often associated with demand for new skills (even among secretarial staff) than with deskilling. The picture was uneven, with examples of job loss and deskilling - but these were on the whole outweighed by the opposite tendencies. The centralising of DP in large organisations that was common in the "island" phase was now contested by the decentralisation of computing power associated with PCs in the "archipelago" phase. Some influential commentators expected this decentralisation to be reflected in organisational design - discussion began of "virtual organisations" and (home-based) teleworking. The latter idea is that much of the workforce could work out of their own homes or from local telecottages, rather than make time-consuming and pollution-generating journeys to work. There has been a steady growth in such modes of work, but much less than anticipated. In practice, what we have seen much more of is a growth of mobile work - but this has depended upon more networking of IT than was typical of the "archipelago" phase.

Another limitation of networking was revealed by one of the surprise failures and one of the surprise successes of the 1980s. With PCs appearing on many desktops, industry analysts foresaw a boom in electronic mail. They reasoned that the increasing dominance of the IBM PC standard was evidence that people wanted to share data across computers. Surely they would want to be able to communicate more rapidly than by exchanging floppy discs! Surely they would see the advantages of being able to transmit material that collaborators could use directly without having to reinput it! Email was forecast to take off, and to displace older technologies like fax and telex.

Well, telex did begin to die off. And the levels of use of email did grow steadily through the 1980s. However, difficulties in locating people's addresses and in sending messages across different email systems meant that much email messaging was confined within large corporations, and used by specialised communities like academics and scientists. The older and apparently less technically sophisticated fax technology took off explosively, in contrast. The fax machine, now incorporating microelectronics, was substantially reduced in cost and in quality (and was smaller-sized than bulky early machines). It used telephone lines, and required no particular

6 There were some cases of "data factories", with a high division of labour in office work, and some clerical staff relegated to extremely repetitive data entry. Sometimes these tasks would be moved geographically to lower wage areas - even to developing countries. But the threatened deskilling of most secretaries failed to materialise. Instead, even as managers and other white-collar staff themselves entered much of their own raw data and/or undertook their own IT-assisted analyses, secretaries were requested to undertake new functions in preparing presentations and desktop publishing, in reformatting material for new uses, and the like.
skill in keyboard use. It fitted well within existing office routines, where few managers were using keyboards of any sort, and could request secretaries to prepare and send faxes just as they did letters. There was no need to subscribe to an email service. These factors outweighed fax’s drawbacks when data needed to be manipulated. And this helps throw light on one of the (supposed) mysteries of the IT revolution - the Solow productivity paradox.

The economist Robert Solow (1987) brought to public attention a point that many industrialists had been worrying over for years. Despite major investments in new IT for well over a decade, standard economic statistics (and company accounts, in most cases) showed little evidence that the investment had achieved much impact. Some commentators pointed out that IT investment is still a low share of overall capital investment: we should not be misled by the visibility of computers. Others were more concerned: perhaps this paradox was a failure of statistics, as many IT advocates argued: the data undervalue the huge quality improvements in all types of products (but especially IT products and those of the intensive IT- using service sectors). Sceptics tended to argue rather that the new technology is oversold, being far less efficient and effective than claimed, prone to failures and requiring frequent upgrades and staff retraining, and providing endless opportunities for time wasting.

These arguments are actually all quite plausible, and probably each contains more than a grain of truth - the statistics are inadequate, and the technology is used to less effect than it might be. But other factors also look to have been important, as we have already hinted. First, a long learning process is typically required for organisations to identify the new divisions of labour, new functions, new management practices that can take full advantage of the new information processing capabilities. Even the management structures required to make informed choice about the acquisition and deployment of IT are inadequate: appropriate investment, application and evaluation are also weak. The necessary learning is required for gains from IT investment to be anywhere close to their potential. Furthermore, with IT largely introduced in “islands of automation”; the networking capabilities of IT have yet to be exploited. These can allow more than the automation and speeding-up of existing information processing activities, and enable substantially new ways of conducting business.

The existence of a productivity paradox during the “archipelago” phase is not so paradoxical after all, then. We return to the paradox shortly: for now let us stress that while islands of IT use were generally isolated one from another in terms of connection via data communication networks, there was a high level of social networking required for the rapid diffusion of IT in the 1980s. IT users were not only reached by government awareness programmes: hobbyist magazines, computer clubs, and the like flourished.

With this high level of excitement about IT, and high uptake of PCs and other equipment at workplaces and in homes, it seemed hard to fail with a new IT product. But one IT appli-

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7 Such a statistical failure would have serious implications for estimating economic growth and other important indicators - with likely consequences for the validity of policy decisions.

8 Not all brands of IT succeeded equally well. As in the business world “standards wars” led to the market decline of PCs that were not compatible with IBM’s standards, so in consumer technologies videorecorders that did not meet VHS standards were undermined. Many such battles over standards and formats have taken place.
cation failed to find mass market success in almost all countries - and it too involved networking. IT users in the 1970s had been familiar with the notion of large computers being accessed by fairly feeble peripherals, through special communications links. Researchers - especially those in telecommunications industries wondered whether ordinary telephone systems could be used to offer such links to a wider public, linking simple terminals via phone lines, to databases that would be useful and user-friendly for people unfamiliar with computers. (Relevant information services could be news, timetables, public service information, and some consumer-oriented financial, legal and business information; and transactional services from retailers and possibly professional services could be delivered via such systems). The vision of extending mass access to information resources, beyond the research and business (finance, law) communities prepared to pay big bucks for information was at the heart of efforts to establish videotex in the 1980s (in Europe, Singapore, Canada).9

It was hoped that the Information Society would rapidly nurture new content industries supplementing the computer and telecommunications sectors. But the market had been misjudged: videotex generally failed to achieve the expected public acclaim. Hopes of millions of users evaporated in the UK, for instance, where it was hard to muster one per cent of this number. It did find success in some business online services, especially in sectors like travel and insurance. Videotex was widely adopted as a consumer medium in one country, France, - in part because terminal equipment was distributed free of charge, in part because the system was particularly well-designed. (E.g. it featured dedicated terminals and fast data communications, whereas most other videotex systems relied on connecting a TV set via slow links to the telephone network). Furthermore, the success of videotex as a consumer medium in France, and the niches of consumer and hobbyist use of videotex and similar systems elsewhere, very largely involved not access to databases, but rather interpersonal messaging. Text messaging took many forms-virtual communities, many-to-many chat, specialised services, anonymity, and other novel features were exploited. Some of the most popular activities involved sex and other taboo subjects. These tendencies were to be manifest on an even greater scale once the Web became established, in the following phase of IS.

**Continent**

In the 1990s, a growing mass of IT devices became less like islands of automation, as they are linked by networks and "information superhighways". The Internet became a near-universal medium for computer linkages; alongside it, mobile systems of many sorts becoming prominent for voice and data communications. Networking remained very unevenly diffused - many computer systems remained stand-alone, many users would have a networked PC in the office and a laptop machine for use on the move with no networking capabilities. An important issue is that networking was often harder to achieve than its proponents claimed. Linking to the Internet was not always easy or cheap. Many organisations required new skills in the form of network administrators and managers, web-

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9 See Thomas and Miles (1989).
10 Other sorts of information access system - sometimes centred on home computers, sometimes on TV, were also experimented with in Japan, the US, and elsewhere.
site authors and editors, etc. Effective business use required considerable change in organisational practices.

For example, though Electronic Data Interchange (EDI) technology had long been in place (though bedevilled by proprietary standards), and rapid take-off was expected, growth in the '80s and early '90s was at levels far below those forecast. A major factor is that the restructuring of internal databases and procedures was too costly in terms of time and skills it involved too much learning. It was not until late in the '90s, when access to the Internet was widespread, that the Web provided a familiar design paradigm for information exchange. Only then did a large number of businesses and government organisations get involved in the online transfer of transactional and related data. Existing services "migrated" to the Internet Web format's new design paradigm en masse. Firms who had rejected the Internet as too frivolous or insecure, now discovered (or invented) new business opportunities, reaching out to broader and less specialised user bases than previously. At the end of the decade there was a "dot com frenzy", as stock markets were enchanted by the prospects of huge fortunes waiting to be made out of e-commerce and related Web activities.

Despite the hyperbole and overenthusiasm, and the subsequent stock market shake-outs ("dot bomb") electronic commerce, applying new IT to the transactional elements of economic activities, did represent extended networking across the islands of automation of factory floor production, warehouses, offices, etc. Ecommerce can be used in very routine ways, of course, but it also offers scope for new modes of doing business, for integration of internal and external processes, and restructuring of supply chains. This can involve substantial shifts in business relations. 'Disintermediation' can take place, for example via direct sales from manufacturers, service providers, and wholesalers to purchasers. (Automobile manufacturers are seeking to restructure their supply chains, and to sell directly to consumers, bypassing garages.) 'Reintermediation' also evolves, with new "infomediaries", and other new agents arising to support ecommerce. For example, some institutionalise systems of e-money, who authenticate the credentials of businesses on the Web (these are known as "trust services"). There are others whose roles are to support web hosting, or who deliver physical goods (since even IS cannot live on data alone). However, though Web-based ecommerce may be easier to initiate than Electronic Data Interchange, the achievement of the full range of benefits from it is also liable to require considerable organisational learning and re-engineering.

Still, by the turn of the millennium, the view was gaining ground that Solow's productivity paradox was beginning to be overcome. Performance improvements were reported in statistical studies of IT-using firms, and new trends in US productivity indicators suggested that changes were underway on a wide scale. Perhaps organisational learning and networking capabilities were underpinning this.

The emergence of the Web and Internet as major vehicles for information exchange, in business and consumer markets, achieved in practice what videotex and other early telematics systems had tried to do. The systems had finally been established for enabling relative-
ly user-friendly access to information and communication resources. Email became much easier across organisational boundaries, as simple Internet addresses became standard; searching for information was facilitated by browsers (even if the problem of information overload and quality control became a massive one). Importantly, access was provided to material that just about anyone with moderate amounts of money, skill and time could put online. Instead of hosting authenticated databases from large information utilities, the Web became a free-for-all-alongside public services and major corporations are religious cults, hobbyists, pornographers (creating a massive market, again). The wider the variety of material, the more users were drawn in - though the more effort was put in, too, to developing “filtering” software to prevent young people being exposed to salacious material, and to applying legal and other threats against publishers of defamatory, copyright-infringing, or politically incendiary material.

Mobile telephony was a huge success in the ’90s, with the popularity of text messaging taking suppliers by surprise. It is notable that the IS prophets of the 1980s placed very little stress on these developments, though the technological prospects for mobile voice and data communications had long been understood. What had not been anticipated was the mass consumer demand that could emerge for communication while on the move. Indeed, the success of the Web was also found surprising, since the lesson that had been drawn from videotex was that consumers are uninterested in networked IT. Now the tables were turned, and efforts to create a “mobile Internet” via WAP, I-Mode, or other means were underway - with very different patterns of market development around the world greeting the first of these ventures.

There were many stories of unexpected success - the realisation of the vision of networking through the Web, the explosion of mobile telephony. But some developments eagerly anticipated in the 1980s failed to materialise in the 1990s. Some were failures of technology - speech and handwriting recognition systems were dogged by high levels of inaccuracy, and gained a bad name in consequence. Other failures were less a matter of technology pure and simple-notably the extremely slow development of “smart houses”, as they were known in the US, where an ambitious programme had hoped to roll out millions of such homes over the ’90s. European notions of “home automation”, or “interactive home systems” similarly made little headway. This may have been due to the limited progress toward and adoption of standards; only in the present century did a standard seem to be mobilising a sufficient range of industry actors to suggest that it would be widely adopted, and allow for easy networking of all sorts of consumer and business devices.

What are the lessons? And what of the future?

One lesson of the above account is just how easy it is to be taken by surprise by the development of IS: how the development of technical potentials may meet with little uptake until social dimensions have been addressed, and how

12 Bluetooth, available on cheap chips, allows for short-range wireless communication between devices of all sorts. However, other types of system are also being marketed, and it is hard to predict the immediate outcome of these standards wars (other than probably consumer confusion).
social requirements may lead to patterns of use of new technologies being extremely different from what the innovators envisaged. Remember this lesson when this paper concludes by making some perhaps rash speculations about future phases of IS.

A second lesson is that IS is very heterogeneous. Even during one phase of IS, we see very different patterns in different regions, countries, cultures, social groups. And different phases have such distinctive configurations of technology and social practice that it is very difficult to generalise about the Information Society. The productivity or employment trends that are displayed in one phase (or one country) need not be manifest elsewhere - simple extrapolation is insufficient, and what is required is much more sustained analysis of underlying relations and processes.

A third lesson, or implication, of the above is that there is considerable scope for choice. This is not to say that we can control the future - far from it - but we can play more active roles in shaping it. Because our knowledge is very imperfect, and because our choices will interact with those of numerous other parties, we cannot be sure of the consequences of our choices. Indeed, we can be pretty sure that they will have unintended consequences. But this need not lead to a state of paralysis; it can instead encourage an open and experimental attitude, it can be seen as a rationale for engaging in more intensive and extensive processes of learning. The opportunity is there - facilitated by the development of IS itself - for much more rapid exchange of intelligence about good and bad practice, winners and losers, emerging problems and challenges, and so on.

Organisational strategies (and structures that can facilitate such learning) remain crucial in the shaping of future phases of IS, as they have been in the past. The awareness of the potential significance of information and IT strategies is liable to grow for organisations of all sorts. This implies increasingly wide participation in IS - and in the shaping of IS. It is easier to predict this than it is to anticipate the approaches that will be adopted, and the winners and losers.

But, even if there is much scope for choice, it is still possible to think about what may lie beyond the "continent" phase of Information Society, which continues to be consolidated in the opening decade of the twenty-first century.

Two significant developments may represent important evolutionary steps. First is the idea of P2P - peer-to-peer-networking as an organisational principle. Various forms of P2P have proved highly successful-with the music-sharing systems of Napster and its numerous counterparts being most prominent at the time of writing. The appeal of such systems to mass markets may to date largely reflect the lure of free access to copyrighted material. But the scope for using P2P models for file-sharing

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13 Knowledge is (one form of) power, and knowledge (and other forms of power) is very unequally distributed in our world. But many forms of knowledge are nevertheless widely dispersed in sociotechnical systems. Using their knowledge, social agents act on assessments of costs and benefits, and confront other social agents with their own assessments and interests. Not only corporate actors and governments, but also labour forces and social movements, informed by their understanding of IS and the potentials of new IT, generate their own strategies (or, often, adapt and adapt those they see others wielding).

14 Consider the range of aggressive activities underway on the Internet-viruses, hacking, denial of service, and so on. Few of these were dreamed of until recently: now teenagers can initiate them.
within corporations and communities of various kinds as powerful tools for information management, meant that P2P attracted a great deal of interest within the technological vanguard. Other vanguard users have been exploring distributed “hypercomputing”, with huge tasks shared among large numbers of computers (where the operations can often be conducted in the background, or at times of idleness) rather than taking up expensive time on supercomputers.\(^{15}\) While use within corporations is easy to envisage, it remains unclear exactly what profitable business models could be developed around such decentralised computing paradigms - but that is not stopping active exploration of the possibilities.\(^{16}\) Whether a completely new style of business, or a modification of familiar patterns, it is likely that organisational use of P2P will grow substantially -perhaps extending the distributed nature of the Internet even further than it currently goes.

A second important idea is termed “ubiquitous computing” (or “pervasive”, “disappearing computing” and even “ambient intelligence”). The notion here is that IS is gradually evolving towards a situation where there will typically be many computing devices per user. This embedded IT will not just be in computers and consumer electronics. It will be in informed and communicating equipment of all sorts. It will be in things we do not consider as equipment, such as walls, furniture, clothing. It will be in disposable items as well as in valuable ones. Information-processing and networking power will be part of the environment instead of being something that has to be carried around or travelled to. The technology would need to be user-friendly, capable of responding conversationally to speech and even gestures. The devices will need to know a great deal about their users, their environments, their social contexts - which naturally raises concerns about privacy and data protection, but which also suggests that P2P models could be used to allow for rapid location and exchange of needed information, and often be used more effectively than traditional centralised databases.

With information systems pervading the social world, we suggest that, for want of a better term, we may label this vision of the coming phase of IS the ecosystem phase. It confronts formidable technological challenges, and there are likely to be substantial issues over standards, proprietary systems, and data ownership to be resolved. Perhaps even more problematic will be the questions of law and ethics, of social acceptance and social relations, that are involved.\(^{17}\) We can anticipate that the styles of use of the new technological capabilities will feature some of the traits so annoying to futurologists. On the one hand, people and organisations will be a lot slower to adapt their routines to make use of some of the clear benefits - clear, that is, to proponents of the technology - than these proponents advocate. On the other hand, some patterns of application that will prove to be major areas of future activity, and shaping points for further technical development, will be unexpected. (Though looking at the lessons of earlier phases of IS we might begin to venture some guesses about what these might be...) Networking has taken a long time to take root, and

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\(^{15}\) See Oram (2001).
\(^{16}\) See the special issue of *Red Herring*, no 86, December 4 2000.
\(^{17}\) Ducatel et al (2001).
the same is liable to be true of ubiquity. But even if only a few of the features of the ecosystem are realised in the next decade, there are likely to be many partial realisations of the vision in education, healthcare, consumer services, and business organisation. Sooner or later, a new phase of IS will be apparent.

The Information Society and the business opportunities, cultural challenges, and demands on our social intelligence that it poses, will thus continue to evolve. Hopefully our understandings of "just what IS is" (as Bill Clinton nearly said) will be able to evolve at a sufficiently rapid pace, too.

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「組織と情報社会の共進化」についての拡張要旨

イアン・マイルズ

情報社会は、発展段階の初期に形成された産業社会から進化する新しい社会技術構造とみなすことができる。さらに情報社会はそれ自身、様々な形態をとる技術知識、組織構造、社会慣習を通じて進化する。本論文では、情報社会を3つの段階、すなわち「孤島」、「群島」、「大陸」という3つのフェーズに区別して論じる。これらは、使用されるIT機器とサービスのタイプによって特徴付けられる。また同じくらいの重要さで、それらのIT機器やサービスが使用かつ応用されている状況や、進化しながら上記の区分の形成を助ける組織的な体系と戦略の種類によっても特徴付けられる。本論文ではまだ、将来のフェーズの展望を考察するが、ここではそれを「生態系」と呼ぶことになる。

概ね1970年代後半までは「孤島」フェーズであり、コンピュータ、電気通信、放射システムは、高度に分割された状態にあった。コンピュータはほとんど存在せず、
またリモート環境にあり、利用には高いレベルの専門知識が必要であった。「孤島」という用語は、またIT機器が（現在の基準に比べて処理能力の見地から）典型的に小さく、かつ互いに分離していたことも意味していた。新しい技術に対する社会的な一般的な態度は、混沌していた。大規模データベースの持つ非人間的な影響に対する恐怖が、コンピュータに対する畏怖と共に存在していた。政府は国策として、（独自の設計と規格を）国家的なサポを支援した。組織は、データ処理センタに集約されたIT設備を用いて、集中システムの最もITを使用していた。

1980年代に現れた「群島」フェーズは、当時一般的に標準であった限定的な双方向通信を伴う多数のIT機器の増殖によって特徴付けられる。電気通信分野の規制緩和及び戦略的考え計画への支援をもって、衛星放送が多くの国々に導入された。同時にマクロテレコノラクを用いた多数の新しい産業機器と消費者向け製品が発売され普及した。2000年ITは、非常に成功を収めたが、その一方で大衆に目を定めた初期のオンラインシステムは、それほど普及しなかった。使用することが技術に関連するという社会的な恐怖、「単純作業化」についての間隙の高まりと共に顕在化してきた。実際、職場における仕事のアップグレードにおいてその傾向はより顕著であり、特にスタンドアロン環境ではあるが）分散環境下でのPCの使用が企業の人事担当者に進化を引き起こした。同様に、経済学者は、IT投資の効果が生産性統計に顕著に反映されていないという事実（「Solowのパラドックス」）を当感した。

1990年代になると、IT機器の「大陸」は「情報スーパーハイウェイ」により交差し始め、自動化された孤島群は、ネットワークにより次第に経済化されてきた。インターネットは、コンピュータ間を結ぶためのより普通的な媒体となり、音声やデータ通信機能を有する多種類のモバイルシステムが登場してきた。しかし、ネットワークが個別に普及したというわけではないが、多くのコンピュータシステムが原則としてスタンドアロンの状態のままであった。またそれらを使うことが特に容易と言うべく、多くの組織にとって、ネットワーク管理者、Webサイトの作者や編集者等といった新しい技能を有する労働者が必要であり、効果的に使いこなしていくのは、組織慣行を変革しなければならないことであった。例えば、電子データ交換の使用は、予測をかなり下回るレベルであったが、新しい手段を習得し、内部データベースと手順の再構築を行うには、コストがかかりすぎた。最近10年間の間で、インターネットへのアクセスが広く普及し、またWebが情報交換のために、よく見られていたデジタルパラダイムを与えることによってはようやく、より多くの企業と政府組織が業務データ及びその関連データのオンライン移転に積極的になった。90年代の移展を通じて、インターネットのWeb形式は、オンライン情報交換のためのデジタルパラダイムである伝手手段になり、既存のサービスは、これらの媒体に移行した。それは、しばしばそこには利用し得る新しいビジネス機会があり、そのために以前より広い市場を手にすることができなかったからである。Webを用いたネットワークの形成、携帯電話の予期せず急速に普及といった成功の傍らで、1980年代に発熱に曝されされた技術開発のいくつかは、1990年代には実現できなかった。ここで注目すべきことは、「コンピュータ化した高機能住宅」「ホームオートメーション」、あるいは「多方向住宅システム」についての技術開発が非常に遅れていることである。これは、規格化の採用とそれに向けた進展が限定的であることが原因と考えられるが、今世纪にはある規格が広く採用されるであろうと見られていた。合理的アップデートで利用可能なBluetoothは、短距離ではあるが裝置間の無線通信を実現するであろう。

西暦2000年の節目を迎えて、Solowの生産性パラドックスは克服され始めたのではないかという議論があった。IT使用企業における業績の改善とアメリカ経済における新しい傾向が、その証左であった。恐らくネットワーク能力の使用の増大とそれに関連した組織的学習が、最終的に目に見える形で業績に実質的な変化をもたらした。電子商取引は、工場での製造工程、図書、オフィス等の自動化による島々の地域に異なるネットワークが有意味に拡張したものである。それは内部プロセス及び外部プロセスの統合、及びサプライチェーンの再構築のために、新しいビジネス方針の機会を提供する。これには例えば製造業者、サービスプロバイダー、卸売業者から購入者への直接販売による「金融関係者離れ」を引き起こす。さらに新しい「情報メディア」という形として、「再仲介業務」や電子マネーのシステムを制度化し、「信託業務」として知られているWeb上のビジネスでの信用状を認証する他の新たな代理業者の出現がもたらされる。また、Webを主催することを支援する役割を担い、あるいは高度情報社会は情報のみでは成り立たないため、物理的な財配達を行う役割を担う業者も出現する。このようなビジネスにおいて利益を達成するためには、かなりの組織的な学習とリエンジニアリングが必要となるであろう。

（宮崎久美子）