

Towards the Future

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Introduction

There is a school of thought that the future is yet to be written. Yet, in reality the options for the future depend upon the past. Today our industrial civilisation has developed options that have placed us at the point where our civilisation can progress to the next stage in its development. Like two hundred years ago, there is a combination of options available, economic momentum in society and the willingness to progress that enables the transformation of the lives of future generations of humanity. However, options do not remain open forever, and we owe our descendents the duty to advance towards a world that takes advantage of the opportunities rather than to shy away and retreat into the past.

This paper has been written to provide you with an insight into what is at stake and to ask you to help sponsor the future for the sake of those who follow us. With your support, the barriers to change and resistance from vested interests can be weakened, thus creating the conditions for the future to break into the present.

What is the future?

Many challenges exist with the current world system. There are many challenges to the current industrial model that our civilisation is based upon, such as energy shortages, climatic change, pandemic threat, clash of cultures and financial crises. These challenges are all currently defined through the lens of the Industrial Age civilisation, and the solutions proposed to each problem are also based upon the same lens.

However, if you change the lens, then you change the perception of the problem. The Industrial Age lens is not the only natural lens. In fact, mankind has so far existed in three great ages of social organisation:

- The Hunter/Gatherer Age evolved in early pre-history and still exists in places today, where small bands of people live off the land harvesting animals and plants.
- The Agricultural Age started ten thousand years ago, with the first domestication of animals and plants provided a more reliable and productive food source.
- The Industrial Age had a few false starts, but finally emerged in Britain in the 19th century, with machinery replacing labour and enabling hitherto unforeseeable products and services. This age has produced the world that we now know and understand.

However, immersed as we are in the Industrial Age, we tend to forget how different these ages are from each other. The main difference between two ages is in fact not the technology, but the social organisation required to operate effectively in each age. The age defines both how we work and live, how we understand wealth and the economic unit size for that civilisation.

The two ages that we can best understand are our current Industrial Age and the preceding Agricultural Age. The Agricultural Age defined wealth on the basis of land, as more land meant more food production. People were organised in family workgroups, where all generations worked together in managing flocks/herds and gathering harvests. The village was the economic social size, as almost all economic requirements could be met through trade with neighbours and the village specialists produced any necessary non-agricultural goods locally.

As a contrast, the Industrial Age defines wealth in forms of physical capital, such as factories and machines, and wealth creation is no longer limited by the amount of land in use. People are organised as machine components, with standardisation of tasks specified as jobs, and trained to become more effective parts of the system. The city has become the economic social size, with trade between organisations in close proximity providing greater benefit than if those organisations were physically remote (a source of increasing returns).

The next stage of mankind's development has been clear for some decades now. There is a fourth stage of our civilisation's development that can follow our current industrial form of organisation, and it is already being created by the separation of information from physical goods. This upcoming Information Age has wealth defined in forms of information, and wealth creation will no longer be limited by physical

products – including the technology that processes information. In this age people will be organised into small teams or will act individually, to provide context for information and to be able to create value by extracting knowledge from information. The information network will become the economic social size, to maximise access to data in order to derive information (another form of increasing returns), and with teams and individuals coalescing into groups of common interest for mutual benefit.

This Information Age promises greater wealth per person than the preceding Industrial Age, in a similar manner to the Industrial Age that increased per person incomes by some 17 times compared to the Agricultural Age. It is a time when we can expect unforeseeable wonders to appear. It is a time when our descendants will wonder why anyone would want to live as we do now.

Barriers to the Future

The dawning of this Age is not easy. The transition from Industrial Age to Information Age will not be simple. A number of barriers exist that need to be penetrated in order for the next stage of civilisation to be realised, ranging from resistance from vested interests, lack of knowledge in how to organise for an Information Age and infrastructure designed for the now outdated social methods of organising.

However, like our forebears of the 19th century, these challenges can be overcome if there is the will to proceed into the future. The question to be answered is merely the difficulty of the transition and the cost incurred. However, if we fail to face the barriers, then we may fail to progress altogether and risk throwing ourselves backwards in social development for a future century to redeem – reminiscent of the Chinese civilisation that failed to transit to the Industrial Age a thousand years ago and doomed the human race to wait another eight hundred years for the most recent revolution of human society.

The first and most serious barrier is knowledge. Like people in the early 19th century, we have never seen the next age and so we don't know the best way to organise to take advantage of the new opportunities before us. Charles Dickens described satanic mills in his books, where the Agricultural Age work model using family units was applied to operating factories. It turned out that this was a poor model for industrial production, and the standardised 'job' was created as a more efficient method of organising people. Similarly, it is difficult for the vast majority of people today to conceptualise a better way of organising to take advantage of the opportunities.

So, like the 19th century, the breaching of the knowledge barrier will rely upon innovators acting as pathfinders for the rest of society, and the successful innovators will provide the model that others will copy in order to succeed in the new Age. The second part of the knowledge barrier is the time and cost for distributing this knowledge, but the nature of the Information Age should result in rapid diffusion of knowledge so long as vested interests are not allowed to stall the process.

These vested interests are the second most serious barrier to the new Information Age. A major reason that the transition from the Agricultural Age to the Industrial Age occurred first in Britain was the lack of organised vested interests opposing the changes. In France, for example, powerful guilds succeeded in opposing the innovations and new forms of social organisations that threatened the viability of the guilds themselves. A direct parallel can be drawn today with large business and governmental organisations, whose viability is threatened by an alternative method of creating and managing wealth.

Further, like the guilds of yesteryear, the Industrial Age has fostered professions to support the Industrial organisational form. The accounting, legal, management and ICT (information and communications technology) professions all require members to be trained using standardised models and have professional links transcending their own organisations that encourage endorsed modes of behaviour and tend to standardise performance. Thus these professions provide significant barriers to different ways of organising, and tend to stifle movements towards an Information

Age. This position is particularly serious for the ICT profession, where the commoditisation of information threatens to destroy the profession's 'high priesthood' status and eliminate the profession completely.

The third most significant barrier is a lack of skill in the general population. In the early days of the Industrial Age, a lack of skilled workers led to demands for greater education of workers in order to provide employees for the emerging large companies and governmental organisations. An Information Age will also require skills in its general population, but as the demands are different, different skills will be required. Thus, the familiar education system of the late Industrial era is in many ways acting contrary to the needs of the early Information era.

A fourth barrier is access to capital. This barrier is substantially less significant than one would expect, based upon an Industrial era perspective. The rapid flow of information requires limited physical capital, and has a major deflationary effect upon the price of information-intensive capital. As the Information Age takes effect capital will become surplus and the emphasis will shift towards accessing sources of information for wealth creation. A similar situation exists today with the relative cheapness of agricultural wealth (food) compared with the relatively limited availability of capital for investment.

A further effect is that one can expect the concept of capital to change as it incorporates information as the primary source of wealth, with effects on distribution of currency and the types of methods used for transferring, storing and measuring wealth.

Evolution/Revolution

Thus, these barriers all impede the imminent emergence of an Information Age. At some point in time, the resistance to the advantages of an Information Age will be overcome and the advantages will start to become apparent. The place where that will occur will be the place of lowest resistance to these changes.

The Industrial Revolution began in Britain because of its inherent lower resistance to change, compared to other more advanced and wealthier places, such as France. A preparedness to welcome the nouveaux riches who derived their status from the new sources of wealth, a lack of significant resistance from an establishment attempting to preserve the old ways, and social mobility for people in the new order all created an environment in Britain conducive to revolutionary social change.

The Industrial Revolution demanded new skills from both the leaders and workers in the new society. The old skills were devalued as there was no requirement for Agricultural knowledge in the new Industrial centres of wealth creation. Further, as it is more difficult for older people to adapt to change, the new Industrial centres of wealth creation provided benefits primarily for the generations following the generation who had created the revolutionary change. The new ways of organising people came naturally only to those brought up in the new society and trained for those tasks.

Similarly, the Information Revolution will also demand new skills from both leaders and followers in the new society. Again, the old skills will be devalued as there will be no requirement for Industrial knowledge in the new Information centres of wealth creation. Again, the older people will find it harder to adapt to change, and thus the new Information centres of wealth creation will provide benefits primarily for the generations following the generation who created the revolutionary change.

This complete displacement of education requirements, methods of organising and the basic knowledge one needs for success in society is a revolution by any definition. There is no way any society can evolve to that point, as evolution is based upon enhancing existing knowledge rather than replacing it - and an Information Age needs different knowledge than the Industrial Age.

The Information Age

So, what are the characteristics of this upcoming Information Age? And how are they so different from the late Industrial Age with which we are all familiar?

The first point is that this is a great underlying change of the way we think. It changes our assumptions about everything, and thus becomes a difficult subject to describe, as one has to reconsider one's frame of reference to fully understand it. Perversely, the more expertise one has in a field, the harder it is to recognise the future. The basic problem is that we all tend to extrapolate the past to predict the future, but a revolution does not follow this pattern. In fact, the real answer is only obvious after the event.

Thus, some aspects of the Information Age will be described using contrasts from an Industrial Age perspective and describing the differences and the reasons for those differences.

Globalisation/Localisation

The Industrial Age has seen an increasing level of concentration of industrial production throughout its span. Initially the centralisation was to large cities dominating production in specific fields in each country, later for trading blocs and most recently to globalised centres fulfilling all requirements for a specific market. This trend is based upon the five assumptions of: (1) the benefits of the economies of scale (i.e. larger scale manufacturing is cheaper than smaller scale manufacturing); (2) the need to maximise returns from expensive capital investments for manufacturing capacity; (3) the benefits from clustering like organisations together to gain increasing returns from proximity; (4) the standardisation of products to minimise set-up costs; and (5) the inexpensive distribution of products.

However, in an Information Age none of these assumptions are valid. Computerised flexible manufacturing capacity reduces set-up costs to insignificant levels, thus largely eliminating the benefits of economies of scale and the consequential benefits of large size in manufacturing. The replacement of capital by information as the primary source of wealth creation enables more capital intensive manufacturing to be effective in the market, as capital is no longer scarce – thus allowing more 'expensive' small manufacturing facilities to be competitive. Further, the Information Age emphasises design over production as the information component dominates the physical capital component in the costs of any product, thus encouraging ever-smaller niches for products and customisation to individual requirements. The use of large numbers of smaller scale facilities drawing design capabilities from networked sources enables dispersal of manufacturing, thus minimising the amount of transport required to deliver products to market at the same time that transport costs can be expected to rise rapidly as a consequence of increasing energy costs. Finally, the emergence of information infrastructure and services changes the focus of clusters from leveraging off common physical locations to leveraging off common information networks.

However, the Information Age also represents a globalisation/localisation paradox in that there is the need to maximise the size of information and communications networks in order to achieve the full benefits from sharing information multiple times and to multiple customers. This ability to derive ever-increasing revenues from each item of information as a network increases in size is the main factor that will drive the expected substantial increase in wealth per person and transform the relativity between information and physical capital.

Thus, the shift from Industrial Age to Information Age represents a shift from a globalisation trend to a combination of globalised information services and localised industrial capacity.

Role of the Information Network

The information networks of the late Industrial Age are merely links between separate computer systems, enabling access to information that organisations and people decide they wish to release to the public. There is no responsibility for the correctness, availability or timeliness of information on these systems. The most well-known of these networks is the Internet.

However, the Information Age is based upon the dominance of information as the prime source of wealth creation, rather than the physical capital of the Industrial Age. In this new age, the collection, storage and distribution of information play the central role in creating the wealth of society. The correctness, availability and timeliness of the data are essential to a society relying upon this data to create wealth and to operate the very systems required for every-day life.

Economic Unit Size

The Industrial Age relies upon the city as its economic unit size. Resources are brought into a city for transformation into products, which are then exported to other cities or distributed to people within the city and its surrounding region. The primary infrastructure of the city are the transportation links required to move these resources and products around (e.g. railways, roads, ports), the warehouses and depots to store products and resources and the retail facilities for product distribution.

The Information Age instead relies upon the information network as its economic unit size. The information network is the method by which information services are enabled. Large numbers of sensors and systems collect the primary resource of an information economy (data) on every aspect of people's lives, from metering the use of resources to tracking movement of people, vehicles and goods. This data is stored in information warehouses and depots (repositories), where people and automated systems can access the products (information derived from data using relationships between data elements).

This information network capacity depends upon maximising its scale to maximise its benefit. The more data collected, the more information can be produced. The more people connected, the more the demand for information. This virtuous cycle creates the incentive for the largest possible network connecting the largest number of people, and would maximise its benefit by serving every person on the planet.

Role of the Individual

The role of a person in an Industrial Age is defined by their rights provided by government, the property they control and their occupation. These relationships have become established based upon the practicalities of a pre-Information Age society, with limited and time-delayed communications, the limited surveillance capabilities of organisations and governments, the physical nature of most wealth and the security of skills for lifelong personal wealth generating capability.

However, the practicalities of an Information Age are quite different. There are practically no physical limitations or time delays in communications, governments and organisations can monitor everyone all the time, most wealth is not physical but instead intangible, and the person skills have short periods of usefulness as innovation rapidly finds better ways of achieving the same results.

Thus, the individual has the opportunity and incentives to assume a much more active role in the governance of their society. The all-pervasive nature of technology creates an incentive for people to actively protect their position and limit delegation to representatives, while also providing the mechanism for active participation. In particular, the management of personal property rights becomes an essential element of any individual's position in society, and the ownership rights to data unique to an individual will be central to the type of society that evolves.

The information network has a pivotal role in helping to define the role of people within society, by enabling the enforcement of personal property rights and safeguards against misuse of personal information. A new balance is available where an individual can be protected while enabling the benefits from society's access to wider amounts of information for the benefit of all, without sacrificing the needs of the individual or society.

The Job Redefined

A key aspect of the Industrial Age has been the dominance of the machine and the requirements for people to fit in with the requirements of machines. People's employment was based upon standards required to fit pre-defined tasks and education was structured to enable people to fulfil these roles. This standardisation enabled any person to be replaced by another person with equivalent skills – essentially people became part of the great machine of society. The growth of ever-larger and more centralised industrial centres to gain economies of scale emphasised standardisation of products produced, and thus the skills required by people to operate the machinery to produce the products.

The Information Age has different limitations. The elimination of the advantages of economies of scale and the ability to economically produce niche products tailored to small market or individual requirements transforms the requirements for people skills. Further, the information network enables people to apply their skills over any location served by the network, thus eliminating the link between a person's location and their place of wealth creation.

The consequence of these two changes is a shift to vast numbers of micro-manufacturers located near the markets served, accessing knowledge from people located across the planet and providing small production runs of products optimised to customer needs and able to rapidly incorporate innovations. This situation will stimulate innovation, lead to a massive market for intellectual property and completely transform the manufacturing and distribution industries.

For the individual, access to large markets can enable greater niching of skills, the development of greater expertise in response to market stimulation and an active market for skill to support individual projects, rather than merely filling a position within an organisation.

Self Responsibility

A further consequence will be the growth of self-responsibility. In the Industrial Age, the organisation and government assumed a degree of responsibility for people's lives. The average person tended to assume that somebody was looking after every problem, whether or not there was any reason for such confidence. Within large organisations and governments, the same reliance upon others promoted confidence in 'leaders' and 'experts' to make decisions, allowing the employee to at least partially avoid taking responsibility for risky decisions, and thus avoid being held to account for failures – with the consulting industry being one outcome of this reliance.

The Information Age is rather different, with more active participation in governance and self-employment creating the conditions where people assume more responsibility for their own conditions. The shift to small organisations aligns the rewards for risk taking and the costs of failure, thus providing greater balance and encouraging more innovation in the market. The access to intellectual property enables expertise to be incorporated in any product, thus encouraging experts to focus upon innovation rather than risk reduction.

This shift to self-responsibility will have a major effect upon the culture of people in society. The most likely outcome is that future generations may rediscover the type of self-responsibility present in the Agricultural Age before the Industrial Age redefined the concept of work, and become less reliant on external guidance.

Efficiency/Effectiveness

The Industrial Age is based upon the use of capital, in the form of machines and materials such as steel and coal. The economics of this age meant that capital was expensive, so it made sense to focus on producing the maximum output from the available machines and materials. This has led to a focus on efficiency and its close cousin productivity as the primary objectives of good management.

The Information Age is different. The primary source of wealth is information, not capital, and so it really does not make any significant difference if machines are idle or resources waiting so long as they are available when needed to make maximum use of information. This is actually quite a major change, where effectiveness becomes the primary goal and efficiency becomes an issue that no longer really matters.

The change from efficiency to effectiveness redefines how we operate organisations. Current expert theory for management, accounting, economics and other organisational disciplines are all based upon the old efficiency paradigm. Concepts like 'just-in-time' and 'best-practice' become not only worthless, but potentially damage an organisation's ability to compete.

Thus, new skills are required to successfully operate businesses and other organisations, to foster innovations, ongoing change and maximising the returns from information.

Consequences for the Average Person

The aspects described above demonstrate that an Information Age has stark differences from the current late Industrial Age. In fact, the appearance of an Information Age has consequences for all sections of society. There are few parts of human endeavour than are not transformed or redefined by an Information Age revolution.

However, big picture concepts have little meaning for the average person. So, how does that affect the people living today? The answer is dramatically.

In fact, the average person will need to adjust to these changed circumstances to prosper in the new reality. In mid-19th century Britain there was a lost generation of people who were ousted from the Agricultural Age existence they had been born into and forced to migrate to the new cities, where they failed to adjust to the new lifestyle. There is a threat of another lost generation in the early 21st century if we fail to understand the changes happening around us and do not try to adjust to the new reality.

A series of views of the consequences for the average person have been described to provide a perspective on what this new reality may look like for the average person.

New work patterns

The vast majority of the population will shift to working for small organisations, which are essentially a single work team comprising all the skills required for their task, or will work for themselves. These small organisations will coordinate their tasks, employ each other and provide products and services through information networks, interconnecting millions if not billions of people. They can manage the timing and size of their commitments based upon the interests of the people in the organisations, enabling lifestyles that can evolve as people circumstances change.

The average person today is probably currently employed in a large organisation based upon an Industrial Age work model, employing hundreds to millions of people. This organisation will be unable to compete against the more innovative, more effective and more focussed Information Age micro-organisations described above. In fact, this process has already started, with the shedding of large numbers of people from large organisations as they struggle to become more competitive.

For the average person, this means that their current job is going to disappear. There will no longer be any relevance in a title defining a place on a promotion ladder within an organisation, thus shattering many people's perspective of themselves. The security of retirement and medical benefits will simply disappear.

However, there is an opportunity for people to move on and embrace a future based upon their performance rather than historical social structures.

New place to work and live

The place the average person lives in today is located in, or clustered around, a city - the economic unit of the Industrial Age. However, the Information Age breaks the tie of location and work. Instead, the average person will need to be able to access the economic unit of the Information Age – the information network. The network enables local production of products and services for local consumption, the creation and supply of information products to anywhere served by the information network and interconnection between people and communities.

Thus, access to communications is going to define the new place to work, and as a consequence, the place to live. High performance communications technology is currently dominated by fibre-optic cables, with microwave, satellite and wireless providing useful links into fibre-optic capacity or as alternatives in adverse geography. These communications links already span the world, and link all significant centres in developed countries. In fact, people could theoretically live anywhere.

However, people also like to have contact with other people with similar cultural backgrounds. Thus, we can expect to see a shift towards village based life styles reminiscent of the Agricultural Age, where the village is the terminal of the high capacity network hub and acts as a focus for social activities. The existing suburbs are likely to evolve into villages, with different cultural types separating into different communities. The existing cities are likely to become redefined as centres for large-scale social interaction, rather than as places of economic activity.

Thus, the average person is going to find that their home will become the centre of their new cottage industry, based within a local community. Their existing lifestyles will change to meet the needs of the new ways of creating personal wealth.

Information unleashed

Like the late Industrial Age, the Information Age uses computer technology to deliver information as required to people. However, what is perceived as a computer and how it is used are going to change dramatically. The current computer model assumes people use separate computer hardware to operate locally installed software, enabling computing tasks, such as writing this document, and accessing an information exchange (e.g. the Internet).

However, while the average person understands personal computing from their experience, the largest effect of the Information Age revolution is upon the large-scale computing used to operate the core logistical systems that support the late Industrial Age economy. The expense, long leadtimes and complexity of large-scale computer systems severely restrict the strategic options for organisations and shifts substantial power within an organisation into a 'high priesthood' of computer specialists, with an inevitable loss of focus on customer outcomes and organisational performance.

Instead, computers in the Information Age are going to become more ordinary, commonplace and simplistic. They will be used primarily as information access devices, to enable people to access and store information stored on repositories attached to an information network, performing all tasks currently performed by both large-scale computing and personal computing. These systems will be totally dependent upon the information network to perform their functions as a gateway to information. This network-centric computing model will enable services at an economic cost that will transform society, while enabling rapid change in response to changing circumstances.

The average person will be able to use this service with no technical training. The computers will surround them, in many formats such as picture frames, buttons and tablets. Information services will be accessible from practically anywhere, without worrying about data management, backups or other such archaic concepts.

Breaking the mould

Our culture depends largely upon what works to succeed in the current environment. Knowledge that is no longer relevant to the 'modern' world tends to become lost between generations. Other elements of culture become redefined in 'modern' terms, to carry worthwhile lessons forward in a relevant context.

For the average person, this may seem a little bewildering, in that the beliefs of their youth will no longer be as respected as before. However, the next generation will see the new mould as natural and consider the old beliefs quaint at best.

The Great Irony

One of the driving factors behind the Industrial Age is an emphasis upon efficiency in order to achieve superior profits. New inventions allow more to be done with less.

However, the great irony is that the Information Age through an emphasis on effectiveness will, as a byproduct, become more efficient than the Industrial Age equivalent. The shift towards local production capability dramatically reduces energy used in transport and consequential pollution. Innovation allows new ways to achieve the same tasks to be engineered. Flexibility allows these ideas to be put into practice rapidly. Local production can take advantage of local resources to provide effective solutions to local demand.

In fact, the reduction of waste can avoid the negative impacts of resource shortages over the next couple of decades. The unleashed innovation process can use this period to create substitutes for finite resources, while renewable resources can be more effectively managed for the benefit of society. The shift to a more effective (and efficient) society may well save the lives of millions or possibly billions who otherwise be lost in the wreckage of the Industrial Age as it implodes from resource constraints and conflict over monuments to the past.

Further, the replacement of the old-style computer industry with user orientated information devices will release millions of the most talented and creative people in the world from the necessity of supporting archaic information systems and enable them to focus on enhancing society in new ways. This redirection of talent will have unpredictable positive consequences for the world, while at the same time eliminating a constraint upon the flexibility and performance of other industry segments through the removal of the dead hand of the 'high priesthood' of computing.

Where we can all make a difference

Thus, the Information Age represents a new paradigm, a new way in which human activity can organise. The current generation is blessed, or cursed, with an opportunity that last occurred two hundred years ago – the ability to transform the world for the betterment of all. The world that can be created will be one that is uncomfortable for many of the existing generation, but it is a world that will make sense and seem natural for the generations to come.

Further, an Information Age is coming in any case. A major question is simply how much pain and suffering will be caused by reactionary forces of the old order trying to extend an unsustainable position at the expense of the next generation. Sooner or later, the reactionary forces will fail in any case, as pressures for change mount. However, the later the transition, the higher the overall cost to society and the more devastating the losses for the people concerned.

We can all help to reduce the barriers to change and help minimise the negative impacts of the transition. The Revolution is coming in any case. Let us all help each other to make the revolution as painless as possible, for the sake of the generations that follow us.