Part I

Integral Relational Logic

Liberating Intelligence from Its Mechanistic Conditioning

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In general there is an enthusiasm for the idea of having new ideas, but not for the new ideas themselves

Edward de Bono

Even though Integral Relational Logic (IRL) is the commonsensical science of thought and consciousness that we all use everyday to form concepts and organize our ideas, it originally emerged in consciousness in the early 1980s to solve a business management and modelling problem that no one on Earth seems to know exists. So before we look at the solution to this unknown problem, we need to spend a moment looking at the problem itself and why it is unknown.

The central issue here is that in the middle of the twentieth century groups of mathematicians, scientists, and engineers on both sides of the Atlantic invented a machine quite unlike any other tool we human beings had ever previously invented: the stored-program computer. For many thousands of years, our forebears had been inventing tools to extend our rather limited *physical* abilities, not unlike the other animals, who had been using and making tools with other tools for thousands of millennia, as Table 6.11 in Chapter 6 'A Holistic Theory of Evolution' on page 560 shows.

Some of the first tools that human beings made were stone choppers, axes, and knives, such as those illustrated in Figure 10.6 in Chapter 10 'Entering Paradise' on page 774. Our ancestors then went on to invent such things as the wheel, printing press, steam engine, internal combustion engine, typewriter, and telephone, which allowed us to travel farther and faster than our fragile bodies would allow and to communicate extensively through space and time. The computer has further communications abilities, as we see in the Internet. But this is not what makes it different from all the other tools we have invented over the years.

The stored-program computer is essentially a tool of thought, capable of extending our *mental* abilities, even sometimes replacing them. So while physics is the science behind the technological revolution of the past two or three centuries, a science based on physics can tell us nothing about what we have invented and about the psychological and economic implications of our growing dependency on information technology.

Rather, if we are to manage our business affairs with full consciousness of what we are doing, we need a science of mind and reason to guide us. As Erich Fromm said in the mid 1970s, if we are to avoid a major psychological and economic catastrophe, we urgently need to develop a new science of Man.[1] And such a humanistic science can only be developed by turning inwards through self-inquiry, by answering the question, "Who am I?", the ultimate goal of both scientific and spiritual research.

But developing self-knowledge is discouraged, if not forbidden, by the religious, scientific, and business authorities who have set themselves up to govern our society. So as we do not know what it means to be a human being, in contrast to the other animals and machines, like computers, we have very little understanding of what we have invented, leading to all sorts of nonsense being written by the 'cognoscenti'. Today, scientists and technologists are driving the pace of technological development at exponential rates of accelerating change and we have almost no idea why this is happening. So we are managing our business affairs with little understanding of the evolutionary energies that cause us to behave as we do, which is rather like driving along the highway faster and faster with our eyes closed, not very sensible.

The data processing watershed

For myself, I began to awaken from my slumbers in the late 1970s, when both the data processing industry and myself were going through a major crisis. So to see how Life resolved my personal crisis by healing my fragmented, deluded mind in Wholeness, we need to look at the watershed that the DP industry was passing through at that time. For this led me to wonder about the essential difference between human beings and the stored-program computer, invented thirty years earlier. This was a question that I had wondered about since writing my first program on punched cards to calculate the roots of a quadratic equation on an IBM 7094 after joining the data processing industry in 1964 as a mathematician/programmer after graduating in mathematics. But I did not get very far with my investigations. All I knew was that human beings are good at pattern recognition but comparatively poor at arithmetic, while with the computer it is the other way round. Why is this? Why is it so easy for most of us to instantly recognize a human face as a whole but so difficult for a computer program to do so?

By 1980, these questions was not just of background interest. The data processing industry was in a major crisis, as articles published in the *Harvard Business Review* and other journals indicated quite clearly.[2] For the old ways of managing the information systems function in business were no longer working. To understand why this was so, we need to remember that both capitalism and communism operate within a materialistic and mechanistic worldview, established during the first scientific revolution in the seventeenth century, especially through the works of René Descartes and Isaac Newton. And as the prevailing worldview since then has been that the Universe is a machine, it must follow that we human beings are machines, and nothing but machines, leading to the belief that the global economy is also a machine and needs to be managed as such.

Now, in designing machines, engineers are particularly concerned with the efficiency and effectiveness of their designs, producing the desired effects with the optimum amount of energy. In the workplace, the success of the business machine is primarily measured, not in terms of joules, but in terms of the bottom line: in the profitability of the company and the dividends paid to shareholders. In other words, the primary goal of business corporations is to generate the maximum amount of money at a minimum cost, in financial terms. We live in a society where ecological, psychological, and spiritual matters are of secondary concern, if they are a concern at all.

During the first three decades of the DP industry, IBM, whose initials aptly stand for International Business Machines,[3] emerged as the dominant force in the industry. As a company set up to help other companies improve the efficiency of their operations and effectiveness of their decision making, IBM was to play a central role in the global economy. As Simon Nora and Alain Minc were to write in 1978 in a report to the President of France, then Valéry Giscard d'Estaing, "IBM, … as a controller of networks, … would participate, whether it wanted to or not, in the government of the planet."[4] In terms of improving the productivity of businesses, those of us working for IBM and other companies in the industry needed to find ways of replacing as many jobs being performed by human beings by machines, as possible. For as computers could do some jobs done by human beings more cheaply, it was the economic imperative of our times to replace these jobs by machines, as it still is today.

For myself, I had joined IBM as a systems engineer in a sales office in London in 1968, moving into management in 1974, after spending some four years in the electricity industry developing both scientific and business applications. But what was a systems engineer? It is one thing for engineers to design washing machines, televisions, and aeroplanes. But how do you design an entire economy, viewed as a machine? Of course, I did not see my job in such grandiose terms initially. From a social perspective, I was interested in helping to automate repetitive jobs in business, for these can dull the mind, freeing up energy to be more creative. But answering this broader economic question was to become an inevitable consequence of my responsibilities to IBM and society in general.

Working for IBM as a systems engineer was, for me, the most interesting job in the industry. For we were more generalists than specialists, having the fascinating opportunity to look at every aspect of the way organizations function. Today, such generalists are often called information systems architects, from the Greek *arkhi* 'chief', from *arkhein* 'to begin, rule', and *tektōn* 'builder, craftsman', from Proto-Indo-European (PIE) base **teks* 'to weave, to fabricate with an ax, to make wicker or wattle fabric for (mud-covered) house walls'. So like an architect who designs buildings, the IS architect is the master builder, able to see the big picture, beginning designs at their causal origin, another meaning of the root *arkhē* . So when we view the Universe as a vibrant, meaningful information system, rather than as a moribund, meaningless machine, we can discover its innermost secrets: what it is, how it is designed, and our origin and destiny as a species.

But such thoughts were very far from my mind when I joined IBM in 1968. At the time, I still did not have a clear idea what a computer is, despite having had four years experience in the industry. In a tutorial with a branch manager as part of IBM's extensive training programme, I was asked for a definition of a computer. Not having a ready answer, I was given this definition: "A computer is a machine for processing a sequence of instructions." This includes the jump or branch instruction, the crucial ability to change the sequence of the computer's instructions by making comparisons, the key both to decision making and to repetitive processes, as we see in Figures 7.2 and 7.3 in Chapter 7, 'The Growth of Structure' on pages 583 and 583, respectively.

So our first responsibility as IBM systems engineers was to design and sell computer systems that could, with suitable programming, automate, at the very least, the many repetitive tasks being performed by human beings, such as billing, accounting, and payroll, although in this last case there were often so many variations in the rules that this application was far from being the simplest. But in the 1960s and 70s, we were still groping in the dark, not having much understanding of what we were doing. As the computer is an extension of our mental capabilities rather than our physical ones, there was no tradition in our culture to deal with this quite new situation. For to increase the profits of business enterprises, not the least IBM's, we needed to know how the mind works, an understanding that both scientists and Christians discouraged. We were thus very much pioneers, exploring a territory where few had gone before.

Not surprisingly, we systems designers made many mistakes, spending many years on the flat part at the beginning of the S-shape of the learning curve, illustrated in Figure 6.6 on page 539. As a symptom of the problem, many systems that DP departments designed for their user departments were never implemented, as Figure I.1 well illustrates.[5]

For us working in an IBM sales office in the mid 1970s, this DP crisis was highlighted with two diagrams. First, Figure I.2 shows the widening gap between computer capacity, growing at exponential rates of development, and the availablity of programmers to fill what was called the 'application wedge'.

Secondly, with the application portfolio growing, programmers were spending an increasing amount of time maintaining and enhancing existing applications, rather than developing new ones, as Figure I.3 illustrates.

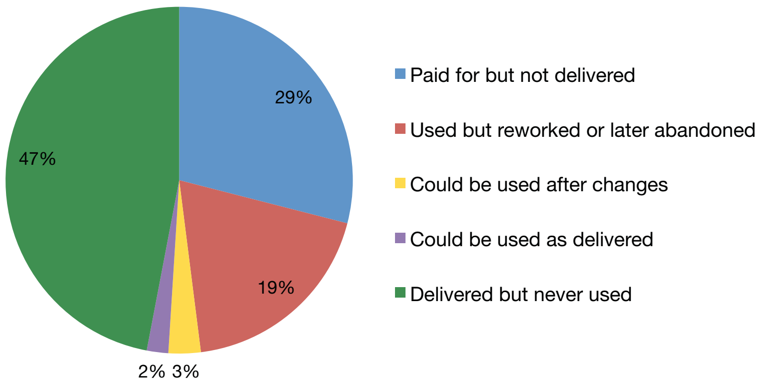


Figure I.1: *Wastage of software development*

Part of this problem was that IBM products were still rather primitive, compared to what they were to become. This was not so much a problem with the hardware, but of the software that is needed to run computers. Since the beginning of the twentieth century, IBM and its predecessor companies had been in the business of selling business machines, such as tabulators, typewriters, scales, and clocks, and it continued in this way for the first two decades of selling computers. IBM's success in this endeavour, first with its 1401 and 7094 commercial and scientific second-generation computers, then with its System/360 family of computers introduced in 1964, led it to become the dominant company in the industry.

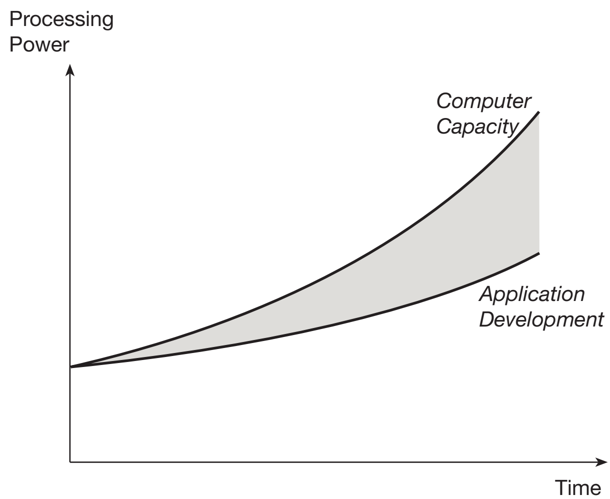


Figure I.2: *The application wedge*

But as the computer is essentially a tool of thought, it could not continue in this way indefinitely. In 1969, IBM 'unbundled' and began to charge separately for software and services, the most significant change in its history, opening up the way for the software and information-systems consultancy industries to emerge. So IBM was no longer in the business of manufacturing and selling material objects; it was now in a business that was and is far more intangible. You cannot kick software, a situation that took IBM's executive management a long time to recognize. This myopia was to lead IBM to make a loss of 8.1 billion dollars for the 1992 financial year, the largest single-year corporate loss in U.S. history at that time.[6]

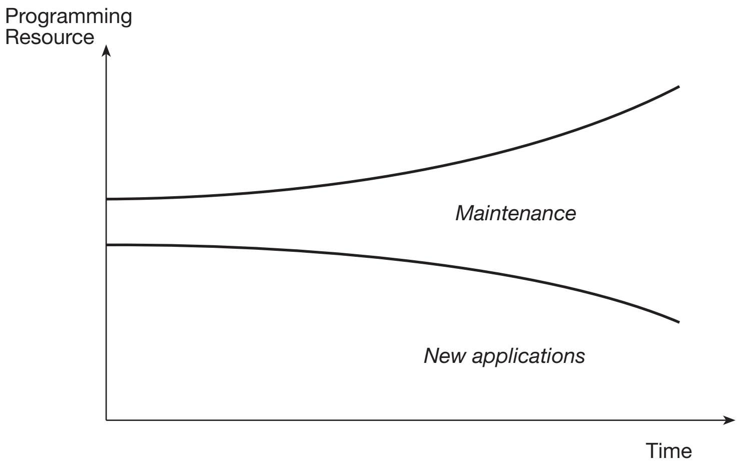


Figure I.3: *The programming maintenance problem*

IBM did not unbundle for any altruistic reason. First, it needed to do so because competitors, such as Amdahl, were beginning to sell IBM clones more cheaply than IBM. Part of the reason for this was that not only were systems engineers in branch offices responsible for helping to sell computers in the first place, they were also heavily involved in helping customers make the best use of their IBM products. For as Moore's Law began to take effect, described on page 579 in Chapter 7, 'The Growth of Structure', IBM's customers would only replace their machines by filling them with applications and databases. So such customer service was effectively marketing, paving the way for the next generation of more powerful computers. Secondly, if IBM did not charge for its software and services then independent software and services companies could not compete, giving IBM problems with the anti-trust laws in the USA.

To resolve this great crisis in the DP industry, IBM and its customers, together with theoreticians in academia, found two major approaches, one technological and the other organizational. Technologically, the key word was *structure*. People began to realise that systems and programs needed to be developed in a natural evolutionary manner. As we explore further in Sections 'Growth of program structure' and 'Growth of systems modelling structures' from pages 580 to 590, the architecture of computer hardware was an inhibitor here, with its jump or branch instruction. We needed to learn to develop information systems closer to the way that the mind works than the computer does. Of course, as the neo-Darwinian theory of evolution does not include human learning as an evolutionary process, we were not really aware of the evolutionary nature of our activities. Nevertheless, significant progress was made in the 1970s in structured systems analysis, design, and programming, which was to be further extended during the following three decades. These developments, later supported by advanced computer applications, were to greatly increase programmer productivity, leading to the dot-com bubble in the late 1990s, as the Internet expanded at exponential rates of development that could not be maintaind.

The other major technological development centred on the words *integration* and *synergy*. Database designers began to realize that information could be derived not only from data elements, but also from the *relationships* between data elements. In other words, an integrated whole is greater than the sum of its fragmented elements; an integrated database has the property of synergy, where 2+2 can be greater than 4!

The key technological breakthrough here was an 11-page paper written by Ted Codd in 1970 when he was working at the IBM Research Laboratory in San Jose, California called 'A Relational Model of Data for Large Shared Data Banks'. It is not generally known, but this seminal paper, which even the experts say is difficult to understand, has proved to be one of the most significant ever to be published in a scientific or technological journal, as we explore further in Section 'Growth of data structures' from pages 593 to 603.

For myself, I first read this paper in 1972, when designing and marketing database systems in an IBM branch office. I knew at once that this was an incredibly important development, although I was not aware of its full potential at the time. What led to this initial insight was that the relational model of data provided, for the first time, a mathematical representation of the basic resource in the data processing industry: data itself. Nothing could be more significant within a culture where the language of science is mathematics.

However, once again IBM executive management were slow to see the significance of this breakthrough, even though it had been developed in one of IBM's own laboratories. For as we see on page 600, IBM felt that the relational model of data threatened its flagship database management system: Information Management System (IMS). One who was not slow to see the significance of the relational model of data was Larry Ellison, who founded Oracle Corporation on this short paper. He then became one of the richest people in the world, enabling him to win the America's Cup—the oldest trophy in international sport—as captain of the BMW Oracle Racing team's boat *USA* in February 2010.

So the relational model of data can generate great wealth, not only in financial or material terms. The word *wealth* derives from Old English *wel* 'well' or *wela* 'well-being', formed on the pattern of *health*, from a PIE-base **wel-* 'to wish, will'. To be well thus originally meant 'according to one's wish'. We can distinguish *being well* and *well-being* by noting that the former means lack of illness, while the latter indicates something more positive, a deep feeling of contentment. Swedish makes a similar distinction between *fred* 'lack of war' and *frid* 'inner peace', which I denote by *Peace* to make a similar distinction in English. One of the meanings of *wealth* in the fifteenth and sixteenth centuries was 'spiritual well-being', reflecting this second meaning. We can resurrect this meaning today, for the relational model of data enables the fragmented mind to be healed in Wholeness, as the first part of this book describes.

Returning to the way that businesses responded to the crisis in the DP industry in the 1970s, as specialists in DP departments were unable to satisfy the needs of their user departments, these began to take the matter into their own hands. One way was to use the time-sharing facilities provided by service bureaux outside particular companies. Another was to buy and install a minicomputer within user departments, such as the popular PDP-11 developed by DEC. As a lecturer from the Harvard Business School said on a course I went on in 1976 in Belgium, "a minicomputer is a machine that can be hidden in a middle manager's budget."

Such developments were another key feature of the watershed in the DP industry at that time. For the first two or three decades, computers had been driven by professional 'chauffeurs', not unlike the way the first cars were driven. But now non-experts were doing their own personal computing, some years before the personal computer, itself, was to appear, 'driving their own cars'.

However, during the second half of the 1970s, this solution began to get out of hand, with each department finding its own solution to its problems. Furthermore, while this solution could be useful in computationally intensive applications, such as financial planning and simulation modelling, it did not help with data-intensive applications. With companies accumulating larger and larger databases, a way needed to be found of providing both middle managers and customer service personnel access to all this information. Not the least because when householders rang a customer service line enquiring about an invoice they had been sent, for instance, they would not infrequently be told, "Sorry, I don't have that information, it's on the computer."

This critical situation led companies to see that data and information are resources of a company, and need to be managed like any other resource like the traditional four 'm's': machines, material, money, and men (and women, of course). When the computer was first used in business in the 1950s, many companies created a data-processing (DP) department led by a DP manager reporting to the finance director because the first applications to be automated were such things as accounts payable and receivable. But given the growing importance of data and information, companies needed to make radical changes in the structure of their organizations.

As a consequence, the DP manager evolved into the Chief Information Officer (CIO), often called the Information Services Director, coming into being alongside the Chief Financial Officer (CFO) or Finance Director, both reporting to the Chief Executive Officer (CEO), as Figure I.4 illustrates. Today, many companies have extended information management to knowledge management,[7] within what Peter M. Senge calls 'the Learning Organization'.[8]

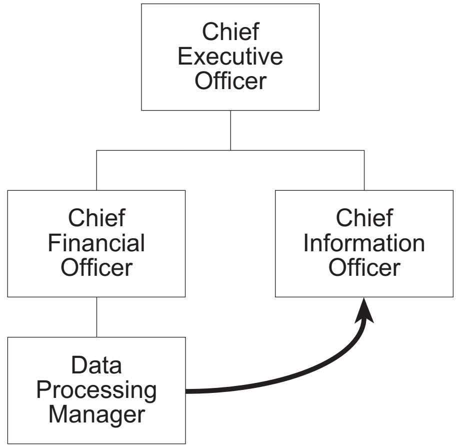


Figure I.4: *DP Manager becomes CIO*

Another organizational change that happened as a result of this major change in perception was the establishment of a user support department, generically called the Information Centre, helping 'end-users' do their own personal computing. Other new roles were those of data adminstrator and database administrator, responsible for the business and technical aspects of data management, respectively.

So really significant changes were happening in the DP industry at that time, as a flurry of learned articles[9] and books[10] being published well indicated. IBM, promoting the radically new way in which businesses were being run, had a marketing slogan 'manage data as a corporate resource' at the time. We were entering what was to become known as the Information Age. But this watershed was raising a host of psychological and economic issues that no one seemed able to answer satisfactorily.

From a financial perspective, what is the relationship between money managed by the CFO and information managed by the CIO? Well, money is a type of information, as James Martin, widely known as a leading computer guru, pointed out in *The Wired Society*,[11] nominated for the Pulitzer prize in 1978. So money can be represented in semantic business models developed by information systems architects. However, it is not possible to satisfactorily represent the meaning of information, and hence its value, in econometric, financial, or accounting models. As the social scientist Daniel Bell pointed out, "we have no economic theory of information, and the character of information, as distinct from the character of goods, poses some novel problems for economic theorists."[12]

For me, another major social issue concerned the management and access of integrated databases. Francis Bacon famously said, "Knowledge is power." But how was this power to be distributed in the Information Age? As we saw on page 9, integrated databases have the property of synergy; the more integrated they are, the more information that is available from them through the relationships between the component databases. This might not be of concern if we really lived in the free society that politicians talk about so often. However, I saw a trend towards authoritarianism in dominant hierarchical structures, both within IBM and in society in general, an issue of much concern to civil-liberties groups. Despite the liberating potential of computer technology, we seemed to be moving towards a rigid society governed by Big Brother, as in George Orwell's *Nineteen Eighty-Four*, and we were then just a few years away from 1984.

Thirty years later, I discovered that Ralph Metzner has a similar concern. As he says, "capitalism … is an institutionalized system of slavery and predation,"[13] closely related to the war system, for as report from 1967 indicated, if we ever lived in love and peace with each other, the global economy would collapse![14] And as Ralph points out, the root of this problem lies in the concept of the joint-stock company, whose original purpose was "the production of shoes, bread and other 'goods' and the provision of services, such as transportation or construction".[15]

I had a similar insight back in 1980, albeit rather fuzzy at first. When joint-stock companies were first established in the seventeenth and eighteenth centuries, they were incorporated with Articles of Association, which stated the relationship of the company to its shareholders and directors, and a Memorandum of Association, which governed the relationship of the company to the outside world. The Memorandum contained, among other things, the objects of the company: baking bread, building houses, making coats, or whatever. However, over the years, these meaningful purposes have increasingly been disregarded in favour of a single purpose: making money. So as far as company law is concerned, selling guns to kill people or drugs to poison them are legitimate objects of business, making a positive contribution to a country's Gross Domestic Product (GDP). Car crashes are even considered a positive contribution to a nation's GDP! To reflect this reduction of purpose to a lowest common denominator, it is no longer necessary in the UK to state a company's objects; money is the only thing that matters, by law.

When I joined IBM in 1968, I naively thought that IBM was above such absurdities. It called itself a 'special company'[16] and that was how I also felt. As well as being known for its vigorous marketing practices, it also had some advanced personnel policies, introduced by Thomas J. Watson in the 1930s. So I felt that IBM was a company that looked after its staff, even at difficult times. But a number of events in the late 1970s made me realize that IBM is just like any other company: putting profits before people.

Nevertheless, back in 1980, IBM was not an ordinary company. Because the stored-program computer is a tool of thought, it was in the business, not so much of selling business machines but of selling business information systems, which were introducing significant changes into the workplace. As well as those we have already looked at, the computer was leading to radical changes in the skills profiles required by organizations. To give just one example, the introduction of point-of-sales terminals in department stores and supermarkets was leading to major changes in the skills required by buyers in the retail industry.

This was not a new situation. Ever since the beginning of the industrial revolution in the middle of the eighteenth century, more and more machines had been introduced into the workplace, radically changing the way most human beings had been working for thousands of years. We were no longer spending most of the day tilling the fields and shepherding animals in order to feed and clothe ourselves, as most of our ancestors had had to do. This is well illustrated by an estimate of the population and wealth of England and Wales that Gregory King, who was employed at the College of Heralds, made in 1688, the year after the publication of Newton's *Principia*. In this survey, King estimated that nearly 80% of the population of around five and half million were engaged in agricultural work, either as employers or labourers.[17]

Then during the years of the industrial age, the number of agricultural workers fell dramatically, so that by 1976 just 3.3% of the working population in the UK was engaged in the extractive industries, which include forestry, fishing, and mining, as well as agriculture.[18] At that time, 39.5% of the employed population was working in the industrial sector, consisting of the manufacturing, utilities, and construction industries, with the remainder in a wide variety of services industries. So even then the number of industrial workers was declining rapidly as the industrial age was giving way to the Information Society.

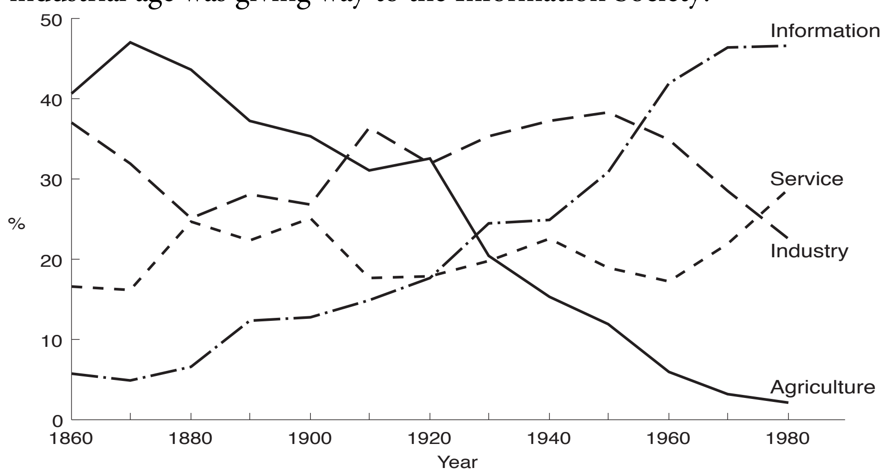


Figure I.5: *Four-sector classification of US work force, 1860-1980*

There has been a similar trend in the USA during the last two centuries of the second millennium. This is clearly shown in Figure I.5, using a four-sector classification of Agriculture, Industry, Service, and Information.[19] During just these 120 years, the agricultural sector dropped from 40.6 to 2.1% of the workforce, while the information sector increased from 5.8 to 46.6% of people in work. But how would these trends develop in the future, until 2010, let us say? Most particularly, would computer scientists have been able to build computers with artificial intelligence by this time, and if so what would be the sociological consequences? IBM's motto was THINK.[20] So what would happen if the machines that IBM was manufacturing and selling would be able to think for themselves one day? We answer this question in Chapter 8, 'Limits of Technology' on page 619.

In the meantime, there were just two answers to the first of these questions, assuming that Aristotle's Law of Contradiction holds in this domain of discourse. First, would information systems designers and computer programmers be able to develop the skills and tools they need to replace all the cognitive tasks being performed by human beings, including both their own and those of the accountants running businesses today? If so, the knowledge processing facilities of the stored-program computer would exceed human intelligence, with unsustainable consequences. For computers today cost a tiny fraction of the cost of human labour. And it is the economic imperative of our time that if there is a cheaper way of doing a job, then businesses should follow this path regardless of the ecological and psychological damage that might be caused by this policy. So as more and more jobs were replaced by machines, unemployment would rise to 20%, 30%, 40%, or whatever. Who knows where the theoretical limit might be? The fact that unemployment in the world has not yet generally reached these figures is circumstantial evidence that this possibility is not the true one.

On the other hand, if human beings are not machines and nothing but machines, contrary to what scientists from physicists through developmental biologists to neurophysiologists seem to believe, then there must be something about human behaviour that is not mechanical. In this case, computer technology would be limited in some way, and technological development would not drive economic growth indefinitely. One day, technological growth would reach the top of the S-shape of the growth curve, looked at in Section 'The growth curve' on page 538, and hardware and software companies would no longer be able to sell enhancements to their products, which would have reached the peak of their capability. This scenario would thus have a similar effect to its alternative. The economy would go into permanent recession, requiring a radically new work ethic, one that regarded the awakening of human intelligence to be far more important than technological invention. It is this scenario that is beginning to become manifest in the business world today, as we look at in Chapter 13, 'The Prospects for Humanity' on page 1027.

So, it is quite irrelevant whether artificial intelligence is possible or not. In either case, the basic assumptions of the global economy are clearly unsustainable. Following the invention of the programmable computer, it will shortly no longer be true that human beings are both workers and consumers in the economy, as articulated by Adam Smith in the opening words of *The Wealth of Nations*, the book that laid down the foundations of capitalism:

> The annual labour of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it annually consumes, and which consists always either in the immediate produce of that labour, or in what is purchased with that produce from other nations.[21]

In 1980, this simple reasoning led me to see that the materialistic, mechanistic, and monetary economies of capitalism and communism are incompatible with the stored-program computer invented thirty years earlier and with the Information Society that we were then just entering.

I came to this realization due to a personal crisis that I went through between 1977 and 1979. During my first fifteen years in the data-processing industry, I had worked in many different specialities, never working in the same job for more than two or three years at a time. So my knowledge of the industry was quite fragmented, rather like the red spots in Figure I.6, which represent what I knew about each speciality in order to do my job.

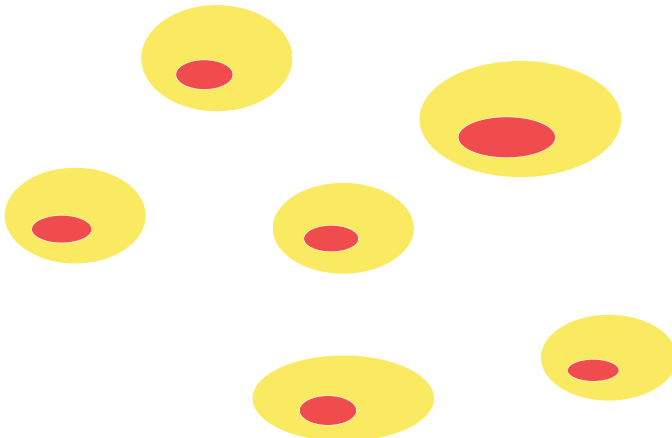


Figure I.6: *Pools of consciousness*

However, whenever I worked in a speciality, I would always attempt to put my work into a broader context, going much deeper into subjects than required by the immediate task in hand. So surrounding all these fragments of knowledge there were pools of consciousness, as indicated by the yellow shapes in the diagram.

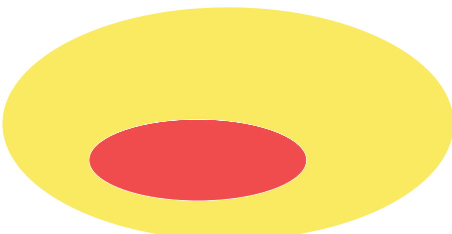


Figure I.7: *Sea of consciousness*

But as I began to explore the relationship between humans and computers more deeply in the late 1970s, all these pools of consciousness, which had characterized my business career, merged together to become a lake of consciousness, a whole that was very much greater than the sum of the individual parts because of the relationships that were forming between the thitherto fragmented parts. This lake of consciousness then became a sea of consciousness, as I extrapolated what I could visualize into the future. This led me to see that the global economy holds the seeds of its own destruction within it and that because of the accelerating pace of technological development, it could well collapse like a house of cards within thirty years, when my two children would presumably be bringing up children of their own.

Wishing to understand how we might all deal with this critical situation, I was led to try to solve the business modelling problem that I outline in the next section. As this problem is now solved, as described in this book, this sea of consciousness has expanded into the Ocean of Consciousness, as Figure I.8 illustrates. By liberating Intelligence from its mechanistic conditioning, individual consciousness has expanded and deepened to such an extent that it is coterminous with Consciousness itself.

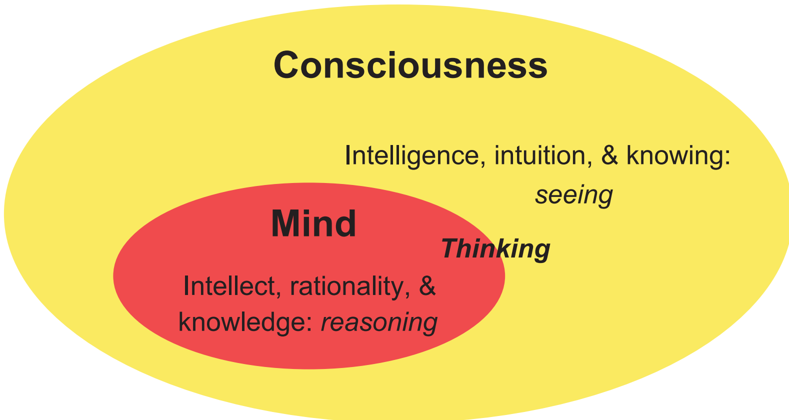


Figure I.8: *Ocean of Consciousness*

The central information systems modelling problem

However, back in 1980, I was in something of a dilemma. I did not know anyone either in IBM or outside the company who was interested in studying the psychological and economic consequences of society's growing dependency on information technology, a situation that still prevails today. For the introduction of the stored-program computer into the workplace requires us to question the fundamental principles on which our business affairs have been based for thousands of years, and who has the courage to conduct such profound inquiries? So we were, and still are, managing our business affairs having little understanding of the creative evolutionary energies that cause us to behave as we do, a perilous predicament.

So not having a research grant for this critically important project, the only option I had was to study these crucial social issues from within IBM. To this end, in January 1980, I joined IBM (UK)'s Information Systems Support Centre (ISSC), a marketing department that had an unusual brief to take a five-year view of developments in the information technology industry, unlike the three-month view of finance directors. My brief was to develop an innovative national marketing programme for decision support systems (DSS), the first country in Europe to develop such a programme. I felt that this was the best way that I could determine whether captialism would collapse within thirty years because artificial intelligence is possible or because it is not.

IBM Canada, which I had visited the previous year, had made a distinction between Operational Automation Systems (OAS) and Decision Support Systems (DSS), which roughly correspond to what Robert N. Anthony called Operational Control, Management Control, and Strategic Management,[22] illustrated in Figure I.9.

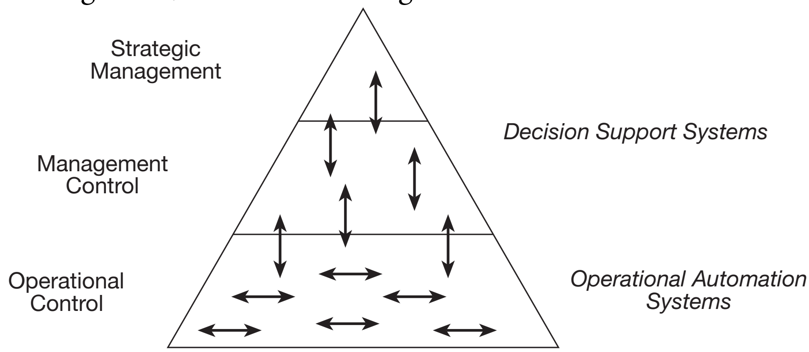


Figure I.9: *Information flow in organizations*

OAS are principally concerned with the *efficiency* of business enterprises, viewed as machines. In other words, they are focused on productivity, with producing products, as goods and services, at minimum cost. This means that as computers become cheaper and cheaper compared to human labour it is the economic imperative of our time for as many jobs as possible to be automated. DSS, on the other hand, are more concerned with the *effectiveness* of decision making, about whether decisions that are made can lead to desired goals, most essentially, increased profit and dividends for shareholders

So could DSS be automated as well as OAS? Well, Peter G. W. Keen and Michael S. Scott Morton, in their seminal book *Decision Support Systems*, classified all business tasks into three major groups in this way:

Structured tasks

These tasks are repetitive and routine; a formal procedure can be developed for handling them. They can thus be fully automated.

Semi-structured tasks

These tasks involve interaction between the human being and the computer. The machine handles the computational complexity, while the human provides judgement and subjective analysis.

Unstructured tasks

These tasks require intelligence and intuition. They cannot be automated.[23]

It might seem that the three levels of task structure map to Anthony's three levels of managerial activities. However, Keen and Scott Morton developed a matrix showing examples of different tasks or decision making at all three levels, illustrated in Table I.1.[24]

	Management Activity			
Type of Decision/Task	**Operational Control**	**Management Control**	**Strategic Planning**	**Support Needed**
Structured	Inventory Management	Linear programming for manufacturing	Plant location	Clerical, EDP or MS models
Semistructured	Bond trading	Setting market budget for consumer products	Capital acquisition analysis	DSS
Unstructured	Selecting a cover for *Time* magazine	Hiring managers	R & D portfolio development	Human intuition

Table I.1: *A framework for information systems*

An example of a structured task in the operational area of control is that of reordering a product when supplies run low. To this end, one of the earliest algorithms to be developed in the computer age was that for economic order quantity (EOQ) in inventory management. The basic formula is:

$$EOQ = \sqrt{\frac{2C_O D}{C_H}}$$

where C_O is the fixed cost of an order, C_H is the holding cost per item per unit of time, and D is the demand rate in terms of units per year. Creating such algorithms is obviously a key element in automating the workplace, or even in writing programs that can play chess better than any human being, generally regarded as a sign of computer intelligence. But we should remember that it is only possible to formulate such equations after concepts such as order cost, holding cost, and demand rate are formed. Otherwise, the formula is just a collection of meaningless signs. So how were these concepts formed in the first place, a central issue that we address on page 181 in Chapter 2, 'Building Relationships'?

The spectrum of types of tasks identified by Keen and Scott Morton followed on from Herbert A. Simon's distinction between programmed and nonprogrammed decisions. Simon said, "Decisions are programmed to the extent that they are repetitive and routine, to the extent that a definite procedure has been worked out for handling them so that they don't have to be treated *de novo* each time they occur." On the other hand, "Decisions are nonprogrammed to the extent that they are novel, unstructured, and unusually consequential."[25] But would computers one day be able to replace the jobs of business managers and directors, including those of management accountants? Simon believed that they could for he said in 1960, "I believe that in our time computers will be able to perform any cognitive task that a person can perform."[26]

I didn't believe him, for it were true, computers would be able to write poetry, novels, and symphonies, be able to create scientific theories and prove mathematical theorems, and who knows, what else? For instance, if human beings are machines and nothing but machines, it would be possible for a computer to write Mozart's forty-second symphony or Beethoven's tenth in a style recognizable from their other symphonies. It would even be possible for a computer to solve the ultimate problem in science, which Einstein called the unified field theory, to whose solution he devoted the last thirty years of his life. In effect, we would have created a new species, one that exceeded human capabilities, just as *Homo sapiens sapiens* has an intelligence greater than all the other animals. But such a vision was too horrific to even contemplate, although I have since discovered that some of my contemporaries, such as Ray Kurzweil and Hans Moravec, seem to be relishing this prospect.

However, at the time, I did not have a sound scientific explanation for this disbelief, for I did not yet know what it truly means to be a human being in contrast to the other animals and computers. To try to find an answer to what was clearly the most important question of our time, I turned to a business-modelling tool called Business Systems Planning (BSP), which some of my colleagues in the ISSC were basing their strategic marketing activities on. One of these told me that BSP had evolved from *Industrial Dynamics* by Jay W. Forrester (1961), *Planning and Control Systems: A Framework for Analysis* by Robert N. Anthony (1965), and *Management Information Systems: A Framework for Planning and Development* by Sherman C. Blumenthal (1969), so it had an impeccable pedigree.

BSP was one of IBM's first attempts to develop a comprehensive modelling tool to support the information systems function in businesses. While it was very primitive compared with the complexity of today's tools, it nevertheless enabled me to eventually find the key that would explain the essential difference between human beings and machines and thereby heal the split between science and spirituality. The central point about business modelling methods, such as BSP, is that the models that are developed are at a high level of conceptual abstraction, independent of organizational and technological considerations. The relational model of data, mentioned on page 9, showed the way in this respect. As Codd said, the relational model "provides a means of describing data with its natural structure only—that is, without superimposing any additional structure for machine representation purposes,"[27] the key to data independence, as we look at on page 593 in Chapter 7, 'The Growth of Structure'.

In BSP there were two principal types of model: an entity model showing the relationships between the basic entity types in an enterprise, such as customers, products, and deliveries, and a process model, depicting the processes that deal with these entities, such as manufacturing, ordering, and invoicing, and their relationships to each other. Most importantly, such models are not concerned about whether human beings or computers perform tasks in an enterprise. Such issues are considered later when at the implementation stage of information systems development. To show the relationship between the entity and process models, BSP provided the means of developing a process-entity matrix, like Figure I.10, illustrating in which processes data about entities is originated (0 or >), changed (+), and referred to (-).[28]

ENTITY / PROCESS	PLACE	PLACE-PLACE RELATIONSHIP	BUSINESS	REGISTERED ADDRESS	PRODUCT	DELIVERY POINT	ORDER RECEIVING POINT	CUSTOMER ORDER	PRODUCT ON ORDER	REQUESTED DELIVERY POINT	DESPATCH POINT	DELIVERY POINT	DELIVERY BATCH	DELIVERED ORDERED BATCH
Recognize PLACE	0	0												
Accept BUSINESS for Trade	>	>	0	0										
Change REGISTERED ADDRESS	>	>	-	0										
Acknowledge DELIVERY POINT	>	>	-		0									
Change BUSINESS Credit Rating			+											
Discontinue Trade with BUSINESS			+											
Introduce PRODUCT						0		+	+			+	+	
Launch PRODUCT						+		+	+			+	+	
Withdraw PRODUCT						+								
Establish ORDER RECEIVING POINT	-	-	-				0							
Close ORDER RECEIVING POINT							+							
Take CUSTOMER ORDER	>	>	-		>	-	-	0	0	0				
Add to CUSTOMER ORDER						-		+	0					
Change REQUESTED DELIVERY POINT	>	>			>		-	-		0				
Accept CUSTOMER ORDER			-					+						
Cancel CUSTOMER ORDER								+	+			+	+	
Change PRODUCT ON ORDER Quantity								+	+			+	+	
Establish DESPATCH POINT	-	-	-								0			
Close DESPATCH POINT											+			
Schedule DELIVERY					-			-	-		-	0		
Cancel DELIVERY												+		
Add to DELIVERY						-			-			-	0	0
Make DELIVERY												+	+	+
Change DELIVERY BATCH Quantity													+	+
Take Back DELIVERY BATCH													+	+

Figure I.10: *Process-entity matrix*

Back in 1980, there were two features of these BSP models that interested me in particular. The first was an idea that I got from my visit to IBM Canada in Toronto the previous year to discuss the development and marketing of decision support systems. While looking at another business modelling method being proposed in the company, it was suggested that companies within a particular industry have some patterns in common, even though their business models are unique. Similarly, even though we are all unique individuals, there are some patterns in our DNA that enable biochemists to determine a child's maternity or paternity. Extending this analogy, there are also patterns in the DNA molecules of all human beings that are similar, but different from our nearest relative, the chimpanzees. So the natural question to ask is whether there are any patterns that all business enterprises share.

This question led me to consider the second BSP feature that interested me. All businesses have an information systems function. So would it be possible to model the data processing function in the process-entity matrices at the heart of such BSP models? These matrices show the relationship between the process and entity models, which we can consider active and passive data, which we look at in depth in Chapter 8, 'Limits of Technology' starting on page 625. So I set out to model program development, personal computing, decision support systems, and query languages in such matrices.

To this end, I turned to IBM's own principal tool for extracting and analysing data from its corporate database called APL Data Interface (ADI). ADI provided some basic functions for querying the database and for presenting it in a manner useful for the vast majority of analysts and planners. But, as the program was written in APL—an open-ended, interpreted language—it was also possible for those with the necessary skills to add their own functions to the language. So I first attempted to model such personal computing skills in a BSP process-entity matrix, which proved pretty meaningless for this process was happening much faster than it could be modelled.

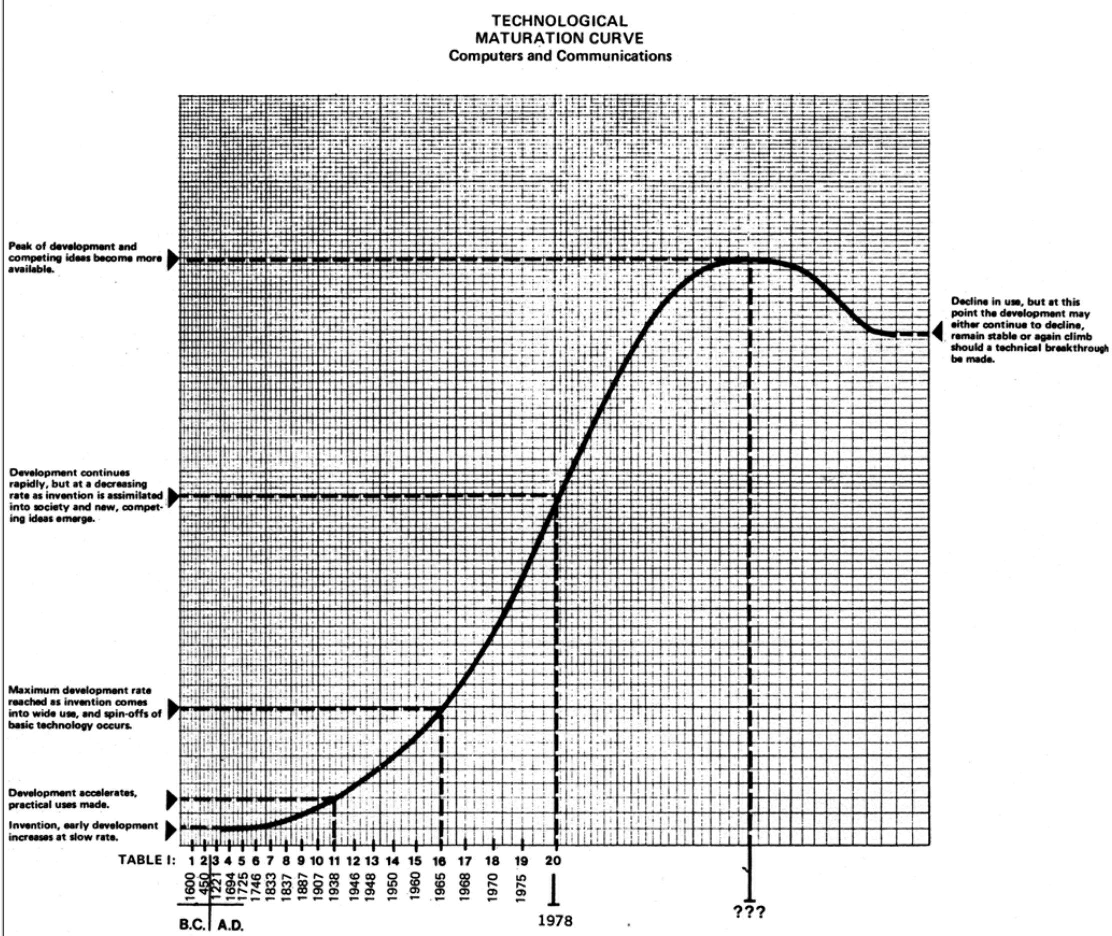
Nevertheless, I used this process to investigate one other curious feature of ADI. Not only could human beings add functions to the language, using some unusual constructs in the language described on page 635 in Chapter 8, 'Limits of Technology', so could ADI functions. When a user formulated a query, this was not answered by a prewritten function. Rather, a new function would be dynamically created, executed, and destroyed, making it very difficult to understand the workings of the program when I peered under the covers. And such a programming process proved even more difficult to model in a BSP process-entity matrix, for entities could be strings of characters at one moment as passive data and executable processes or functions as active data nanoseconds later. In 1979, I bumped into ADI's author at IBM's European education centre in Belgium one morning at breakfast and asked him why he had written the program in this strange way. Sadly, I did not get a satisfactory answer. But the fact that such a program existed was a major motivating factor in my drive to discover the essential difference between human beings and machines.

For here was an example of a computer programming itself, a capability that is possible because programs are contained within the computer along with the data that they process. But could such a stored-program computer do this without human intervention? The function that had dynamically created other functions in ADI had been written by a human being, as had the APL interpreter. Indeed, all programs, whether compiled or interpreted, including the compilers and interpreters themselves, had been generated with the assistance of other programs. Looking at the entire history of the data processing industry, there was thus a long mechanical chain of causes and effects going back to the beginning of the industry. So how did the first program come into existence? Where did the first program come from? Using Aristotle's notion of an unmoved mover, Thomas Aquinas had answered a similar question by proving the existence of God, not just once, but five times over, as we see on page 640 in Chapter 8, 'Limits of Technology'.

But before I could establish the concept of the Absolute scientifically, as is done in Section 'The Absolute Whole' in Chapter 4, 'Transcending the Categories' on page 244, there was one even trickier problem to solve. While it is theoretically possible for software developers to write programs without a plan, such an approach may not be very efficient and be prone to error. It would be like trying to build a domestic dwelling, office block, or opera house without a blueprint to do so. So today, there is widespread support for Model-Driven Architecture (MDA) using the Unified Modeling Language (UML), the de facto business modelling method developed by James R. Rumbaugh, Grady Booch, and Ivar Jacobson of Rational Software in the 1990s, now a subsidiary of IBM, and for the relational model of data, already mentioned on page 9.

So if information systems architects were to develop a comprehensive model of the psychodynamics of an entire organization, they would need to include their own thought processes in the enterprise-wide process-entity matrix being developed. Nothing less would do if we were to intelligently and consciously manage our business affairs. Even if we could model 99% of business processes, leaving out the process of creating the model would mean that we were living with a psychological blind spot, not fully understanding the evolutionary energies that cause us to behave as we do. And for this to happen, evolution would need to become fully conscious of itself.

Back in the winter of 1980, there was thus just one more question to answer: what is causing scientists and information systems designers, like myself, to accelerate the pace of technological development at exponential rates of change? What initially triggered this question was the graph in Figure I.11, contained in an article called 'DP's role is changing' by C. W. Getz, published in *Datamation*, February 1978. What was particularly interesting about this growth curve is that it put the computer revolution of the third quarter of the twentieth century into the perspective of human learning since the Babylonians. Furthermore, this diagram clearly shows that information technology is limited in some way, a fundamental fact that few scientists, technologists, and business executives are yet willing to face. Computers are not the leading edge of evolution; human beings are.



1. 1600 B.C. Babylonian math tablet
2. 450 B.C. Abacus
3. 1221 A.D. Abi Bakr Astrolabe
4. 1694 A.D. Leibniz calculating machine
5. 1725 A.D. Bouchon's punched card weaving machine
6. 1746 A.D. Ben Franklin's kite and electricity
7. 1833 A.D. Babbage's Differential Engine
8. 1837 A.D. Morse's telegraphy
9. 1887 A.D. Herman Hollerith's tabulating equipment
10. 1907 A.D. Vacuum tube
11. 1938 A.D. Mark I electromechanical "computer"
12. 1946 A.D. First electronic computer
13. 1948 A.D. Solid state circuitry
14. 1950 A.D. Internally programmable computer
15. 1960 A.D. Multiprogramming, multiprocessing, large networks
16. 1965 A.D. Chip technology, wide use of electronic switching
17. 1968 A.D. Carterfone decision
18. 1970 A.D. Minicomputers, word processors
19. 1975 A.D. LSI MOS circuitry, microcomputers, distributed processing, merging of computers with communications and word processing
20. 1978 A.D. The end of the beginning

Figure I.11: *Growth curve of computing technologies*

The following year, 1979, the BBC broadcast a fascinating series of programmes that put these technological developments into the context of evolution as a whole, at least from the formation of the first self-reproducing forms of life some three and a half billion years ago. In the first programme of the series *Life on Earth*, David Attenborough showed how evolutionary development is accelerating exponentially, as we look at in more detail on page 534 in Chapter 6, 'A Holistic Theory of Evolution'.

But what is causing the pace of evolutionary growth to accelerate in this way? In 1687, Isaac Newton showed with his famous equation $F = ma$, published in the *Mathematical Principles of Natural Philosophy*, that for a body in motion to accelerate, a force must be applied to it. Similarly, even though society is not a body in motion, change in society is not accelerating all by itself. Surely there must be a scientific explanation for the unprecedented rate of change that we are all experiencing today.

So, as the pace of change in society is accelerating exponentially, what actually is accelerating and what force is driving this acceleration? To answer these questions, I reviewed all the major developments that had been leading the DP industry to reach a significant watershed in its development as a coherent whole. First, the increasing synergy of integrated databases and the introduction of structured programming, analysis, and design indicated that what is accelerating in society is the complexity of structure.

We can obtain an initial understanding of why this is so from the root of the word *synergy*, which derives from *sunergos* 'working together', from *sunergein* 'to cooperate', from *sun-* 'together' and *ergon* 'work'. In ancient Greece, a fellow-worker was called *sunerithos*. The first recorded use of *synergy* in English was in 1660, when it meant 'cooperation', specifically between human beings, in contrast to "sensless stock or liveless statua".[29] However, *synergy* did not reach the *Concise Oxford Dictionary of Current English* until its sixth edition in 1976, when it specifically meant something like 'the combined action of two or more substances in the body whose joint effect is greater than the sum of their individual effects'.[30] The eleventh edition, published in 2004, now titled *Concise Oxford English Dictionary*, has this more general definition: "interaction or cooperation of two or more organizations, substances, or other agents to produce a combined effect greater than the sum of their separate parts".

Now as we miraculously get something for nothing through synergistic effects, this would explain why society is becoming more and more complex, a process that has been going on for hundreds, thousands, millions, and billions of years at an ever-increasing rate of development, as we see in Chapter 6, 'A Holistic Theory of Evolution' on page 521. As miraculous phenomena are outside the province of science and because mathematics cannot handle situations where 2+2 is greater than 4, in terms of the evolution of the species, most biologists seemed to believe that this happened because of mutations in the DNA molecule, those that survived being determined by natural selection. But such biological randomness could not possibly explain the exponential rate of development of the DP industry. Rather, this was clearly happening because of the cognitive skills of scientists and technologists, aided and abetted by the corresponding data structures in computers, illustrated in Figures 8.9 and 8.5 on pages 640 and 630, respectively.

Furthermore, for sixteen years, I had been participating as an active player in these developments. So in my endeavours to develop a comprehensive model of the psychodynamics of society, including my own thought processes, I needed to look inwards to discover the root cause of my creativity and how my knowledge and skills might be represented in a BSP process-entity matrix as passive and active data. Specifically, I wanted to answer the question, "Can machines think?" in order to determine whether the global economy would self-destruct within 30 years because artificial intelligence is posssible or not.

Now the key to this problem obviously lay in IBM's marketing slogan 'manage data as a corporate resource'. So all I needed to do was discover just what this mysterious being called *data* that we were managing was and all would be revealed. It was with these thoughts in mind that at 11:30 a.m. on Sunday 27th April 1980, as I was strolling across Wimbledon Common in London to the pub for lunch,[31] I suddenly realized in an explosive eureka moment that if data is getting its synergistic effects by integrating wholes into ever-greater wholes, then data, in the broadest sense of the word, must be energy. For in similar way to *synergy*, *energy* derives from *energeia* 'activity, efficacy, effect' from *energes* 'active, busy, working' from *en-* 'at' and *ergon* 'work'.

As data is ubiquitous, I knew at once that I been given the key that would eventually reveal the innermost secrets of the Universe, which had puzzled me since I was a small boy, the most fantastic experience that anyone can possibly enjoy; utterly exhilarating and mind shattering. Specifically, I could see that the active and passive data in humans, aided and abetted by the corresponding structures in computers, could be likened to kinetic and potential energy in mechanics. It was thus clear that change is accelerating because of the existence of nonphysical, mental energies, which the physicists apparently did not recognize. The rate of change is exponential because learning, as a form of evolution, is accumulative, synergistically creating wholes that are greater than the preceding wholes through the new relationships that are formed, apparently out of nothing.

An outline solution

Three weeks later, on 16th May, I resigned from my job marketing decision support systems for IBM and set out to develop a coherent body of knowledge that would unify the psychospiritual energies I had 'discovered' with the physical energies recognized by materialistic, mechanistic science through the concept of data energy. From the perspective of the history of ideas, I realized that such an accomplishment would be as epoch-making as the publication of the *Mathematical Principles of Natural Philosophy* in 1687, quite a challenge. But I could also see that nothing less than such an earth-shattering scientific revolution would be sufficient to avoid the psychological and economic catastrophe that we were, and still are, blindly accelerating towards. I was in such a great state of excitement that I did not stop to think that even my colleagues in IBM did not know of the existence of the business modelling problem that I had been wrestling with during the previous winter and so would not understand the solution.

But how revolutionary could this synthesis of all the forces at work in the Universe be and still be credible as a work of science? At the very least, I thought that I would need to use some very advanced mathematics. After all, Newton had used Cartesian coordinates and the infinitesimal calculus in developing the laws of motion of physical bodies. In refining these laws, Einstein had been able to continue with analytical Euclidean geometry in developing the special theory of relativity. But in the general theory, to show that four-dimensional space-time is curved, he had had to use non-Euclidean geometry and tensor analysis to provide the metrics.

For myself, I thought that I would need to use René Thom's aptly-named catastrophe theory, further developed by Christopher Zeeman, to provide the mathematical tool that I needed to model the catastrophe that I saw humanity blindly accelerating towards.[32] After all, Thom's introductory book on catastrophe theory was called *Structural Stability and Morphogenesis*, the word *morphogenesis* meaning 'growth of structure', deriving from *morphē*, 'shape, form' and *genesis* 'origin'. So even though Thom was concerned with biological forms not with noological ones in the form of in*form*ation and other structures, it seemed that catastrophe theory could well be the mathematical tool that I needed. Furthermore, the subtitle of his seminal book was *An Outline of a General Theory of Models*, and I too was endeavouring to develop a general theory of models. However, thankfully I did not need any such arcane mathematical theories. In the event, the only mathematical constructs that I needed to integrate all knowledge into a coherent whole were those of set, relation, and graph, based on mathematical mapmaking techniques described in Subsection 'Mathematical mapmaking' in Chapter 1, 'Starting Afresh at the Very Beginning' on page 75, very much simpler.

Catastrophe theory also gave me some hope for our children's future. As Figure I.12 shows, change in Nature can be both continuous and discontinuous.[33] So if we were ever to develop a life-enhancing, cooperative global economy that put people before profits, rather than the other way round, such a radical change in the way we run our business affairs would not necessarily need to be catastrophic. It is theoretically possible for such a change to come about smoothly. However, I did not stop to think that what was happening to me at that time was an apocalyptic catastrophe. It was so liberating, healing, and awakening that it did not feel like anything out of the ordinary; it was completely natural.

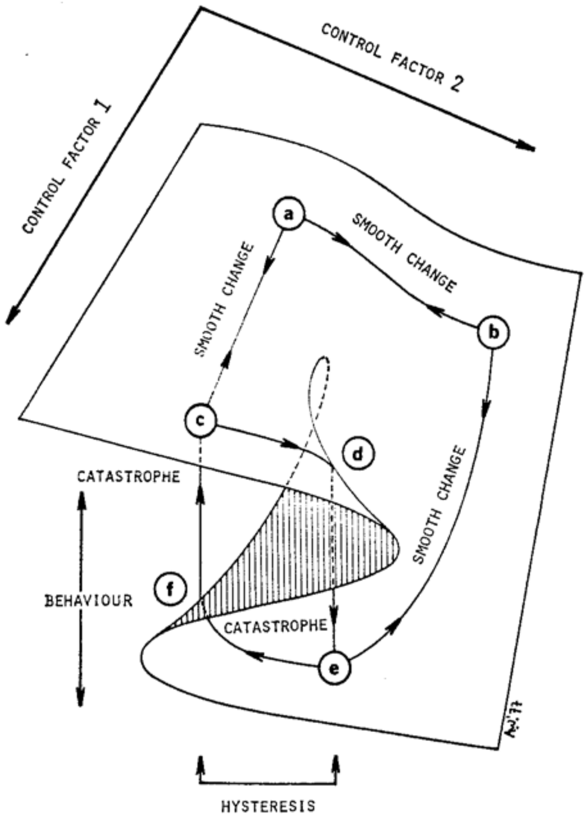


Figure I.12: *Continuous and discontinuous changes shown as paths on the cusp catastrophe graph*

Of course, catastrophe theory was pretty revolutionary in mathematical and scientific terms, not the least because it is essentially qualitative, not quantitative. As Lord Kelvin (William Thomson) famously said, "To measure is to know," and "When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind," notions we have inherited from Pythagoras and Plato. Such limiting beliefs have been carried into the business world with such slogans as "If you cannot measure, you cannot manage." Sadly, however, as no one in the world knows that the business modelling and management problem that I have outlined in this preface even exists, nobody understands its solution, described in this book.

But as an information systems architect, I was on a search for meaning, which could include both qualitative and quantitative measures. And information systems modelling methods provide a far more meaningful picture of what is happening both in the business world and in the Universe—as an ordered structure of forms and relationships—than financial modelling methods. This denial of meaning in science and business has arisen because mathematics regards quantitative measure to be more important that qualitative semantics. However, this doesn't make sense, for we can only define the concept of number after we have defined the concept of set, the basis of semantics, a situation that led to a major crisis in the foundations of mathematics, as we look at further on page 236 in Chapter 3, 'Unifying Opposites'. For me, mathematics is more the science of patterns and relationships than the science of number and space, expressed in arithmetic and geometry.

While I am not the first to say this, building science on such a mathematical foundation would introduce the most fundamental change in the history of Western thought, no small understaking. Indeed, Einstein was well aware of the difficulties of introducing even some minor refinements to Newton's laws of motion, as he indicated in the first paragraph of his introductory book *Relativity*:

> In your schooldays most of you who read this book made acquaintance with the noble building of Euclid's geometry, and you remember—perhaps with more respect than love—the magnificent structure, on the lofty staircase of which you were chased about for uncounted hours by conscientious teachers. By reason of your past experience, you would certainly regard everyone with disdain who should pronounce even the most out-of-the-way proposition of this science to be untrue.[34]

Today, we face an even greater challenge. If we are ever to live in love, peace, and harmony with each other and our environment, we need to pronounce even more scientific propositions to be untrue. There are so many of them it is difficult to know where to begin. However, I have identified seven key misconceptions, which arise from the fragmented, split mind, from the false belief that we are separate from the Divine, Nature, and each other. These misconceptions about God, Universe, Life, humanity, money, justice, and reason are called the seven pillars of unwisdom, outlined in the preface to Part II, 'The Unified Relationships Theory' in Section 'Seven pillars of unwisdom and wisdom' on page 477 and explored in more depth in Chapter 12, 'The Crisis of the Mind', starting on page 989.

But we cannot begin with the seven pillars of wisdom, for we need a methodical approach to the revelation of the seven pillars of unwisdom on which Western civilization is based. Figures I.13 to I.17 outline just such a systemic approach, further expanded in the chapters of this part.

We begin with the simple circle in Figure I.13, which represents the entire business world, the complete workplace. This is the territory that we need to map or model. This circle includes not only joint-stock companies and banks, but also all partnerships, government agencies, hospitals, schools, universities, churches, nongovernmental organizations (NGOs), and any other organization where work takes place. As we also work in our homes, we need to include these in the business world, even though such work is not normally part of the formal economy.

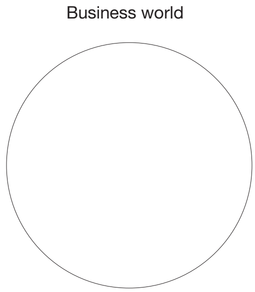


Figure I.13: *Business world*

Now, in order to manage our business affairs, we need knowledge and information. This includes the locations of all premises, such as offices, factories, distribution centres, and shops, details of all products, suppliers, customers, and employees, and all financial information, such as capitalization and stockholders. These are some of the basic entity types in organizations. But we also have knowledge on the business processes that take place in organizations, which have often been systematized, documented, and accredited through the ISO quality management system of the International Organization for Standardization.[35] All this knowledge of the business world acts as the first level of mapping of the territory being studied, and as Figure I.14 shows, the map is included in the territory; there is no separation between them.

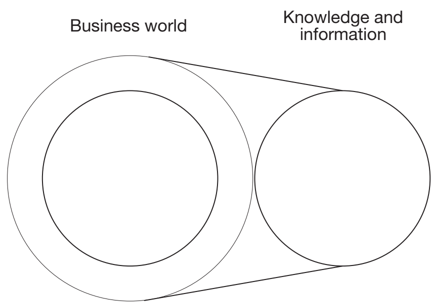


Figure I.14: *Knowledge and information about business world*

The next step in modelling the entire business world is to develop semantic models of the relationships between all processes and entity types. For these provide the framework for the computerization of society, necessary if business enterprises are to become ever more efficient and effective. And of course, such models are part of the knowledge and information that businesses develop about themselves, so must be included in both the larger circles, illustrated in Figure I.15.

Now information systems architects do not develop such semantic models without some guiding principles to do so. Over the years, a number of techniques have emerged to assist this process. As mentioned on page 9, the relational model of data provided the seminal

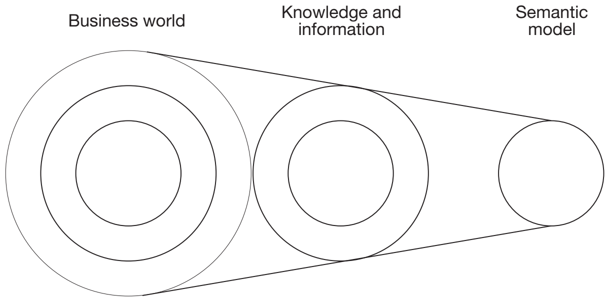


Figure I.15: *Semantic model of business world*

mathematical foundations for such modelling processes, which have been further expanded and refined over the years, as described in 'Growth of conceptual modelling structures' on page 604. These data modelling techniques are universal; they apply prior to any particular interpretation of the territory being mapped. And again, they are contained within the various levels of territory being mapped, as Figure I.16 illustrates.

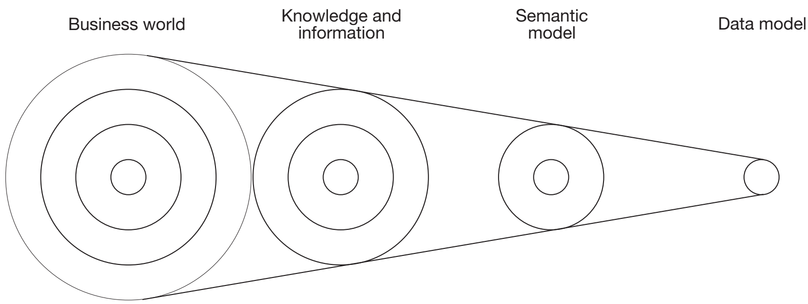


Figure I.16: *Underlying data model of business world*

So far, we have been looking at how we can develop a comprehensive model of the entire business world, of the psychodynamics of the whole of society. But now we need to show that the nonphysical energies that are causing the pace of evolutionary change to accelerate exponentially follow the same patterns as all other energies in the Universe. To do this, requires two steps, both illustrated in Figure I.17. First we relabel the largest circle the Totality of Existence to represent the Universe, whatever we might mean by this word. Secondly, we need an observer of this entire process, a knowing being, who, of course, is a participant in the Universe, in general, and in society, in particular. This witness is self-reflective Intelligence, as we discover as we look deeper and deeper into ourselves.

This, in brief, is how Life began to heal my fragmented, deluded mind in 1980 when I wondered what was, and still is, causing scientists and technologists, like myself, to drive the pace of technological development at exponential rates of change.

To simplify and clarify, the Totality of Existence is the Universe, which we can view as the union of the physical and nonphysical or outer and inner space, the latter being the Cosmic

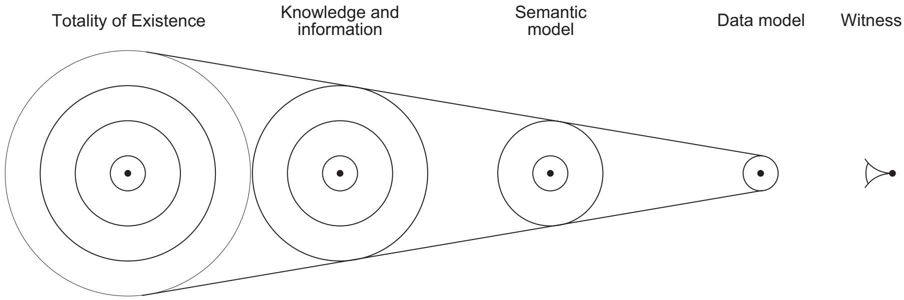


Figure I.17: *Witnessing modelling of Totality of Existence with self-reflective Intelligence*

Psyche, from the mind to the soul. Geometrically, we can view the Universe as a sphere, with the physical universe on the surface and the Cosmic Psyche stretching from just beneath the superficial crust to the centre of the sphere, the Origin of the Universe. Historically, we in the West have focused our primary attention on the superficial, that which can be accessed through the five physical senses, knowing almost nothing about the Cosmic Psyche, which we can regard as 99% of the Universe, as this spherical model illustrates. So if we are to discover what it truly means to be a human being, in contrast to computers, it is essential that we look inwards, learning to map the Cosmic Psyche, information systems architects in business

An evolutionary perspective

Looking at this business management and modelling problem thirty years or more on, it looks so simple that it is easy to forget that the technological structures that triggered my spiritual awakening were only clearly manifest for a few short years. They are so well hidden today that even information technologists do not know of their existence.

First, while IBM later sold ADI as a data analysis tool for managers, it eventually withdrew this program product from the marketplace in 1997.[36] Furthermore, the structures in APL, which led me to replace the question, "Can machines think?" with "Could computers program themselves without human intervention?" are not so obvious in any other language, even when they exist, as we see on page 635 in Chapter 8, 'Limits of Technology'.

Secondly, the process-entity matrix of BSP is not a construct within the Unified Modeling Language (UML), the de facto business modelling tool developed by Rational Software in the 1990s, a company that IBM bought in 2003 after many years attempting to develop such a tool in-house. However, a product aptly named System Architect does provide facilities for such matrices to be developed. System Architect was originally developed by Popkin Software, which was bought by Telelogic in Sweden in 2005. In its turn, IBM bought Telelogic in 2008 as part of its Rational division. Today, Rational System Architect is IBM's tool of choice for enterprise architecture.[37] So what began with BSP as a strategic tool has come full circle.

However, humanity is in a bit of a dilemma today. On the one hand, we have all the tools we need to build a life-enhancing global economy in harmony with the fundamental laws of the Universe, recognizing that human beings are the leading edge of evolution, not computers, and thereby putting people before profits. However, the innermost secrets of the Universe are so well hidden from decades, centuries, and millennia of personal, cultural, and collective conditioning that no one Earth, except perhaps a few mystics, knows what they are.

It is therefore not surprising that there is a widespread belief that the business modelling problem outlined in this preface has no solution. Most seem to believe that the synthesis of everything that has thus emerged is impossible, that it is impossible for us human beings ever to live in love and peace with each other. For if we are ever to end the long-running war between science and religion by unifying Western reason and Eastern mysticism, then we need to solve a business management problem that no one knows exists.

This communications challenge is quite natural in the evolutionary scheme of things. For how could an amoeba possibly imagine a trout, or a trout a horse, or a horse a human being? In terms of human learning, the ancient Greeks had no notion of evolution and could not have foreseen the invention of the stored-program computer some two and half thousand years later. Neither could they have foreseen evolution reaching its Omega point at the end of time, as Pierre Teilhard de Chardin prophesied in a book that he wrote between 1938 and 1940, extending essays he had written ten years earlier,[38] but which was only published posthumously in 1955.

The central issue here is that each of us is brought up within a particular culture and taught to think and learn in particular ways. None of us can escape this cultural conditioning, which happens no matter whether we are born in a materialistic Western family, a deeply spiritual Eastern one, or something in between. As no child has ever been born within a family where these opposites have been unified, those who write books or give talks at 'big-name' conferences on the relationships between science and mysticism must do so within the context of one or more of the cultures that prevail in the world today. Otherwise, they would not sell any books or get a hearing. People will only listen to what they want to hear, to what makes sense to them within their existing frames of reference.

Yes, sometimes, as children have grown older, they have questioned what they had been taught by their parents and teachers. If this had not happened, then we would simply have built a body of knowledge on the foundations that our less than fully conscious ancestors laid down. It has been necessary to dismantle what they discovered from time to time so that evolution could move forward. But as learning is as much a social endeavour as an individual one, it has been necessary for these evolutionary changes of direction to be accepted by a consensus of like-minded individuals. Otherwise they would have just withered and died away.

In my case, it was my destiny to question everything, being carried back to the very start of evolution, to its Alpha point, which is necessary if we are to reach evolution's glorious culmination at its Omega point, in conformity with the Principle of Unity. In terms of human learning, this was like going back some 25,000 years to the time that our ancestors first acquired the great gift of self-reflective Intelligence, which distinguishes human beings from the other animals and machines, like computers.

As IRL leads the practitioner Home to Wholeness, before I describe it in detail, here is a description in just five sentences:

> The origin of the Universe is the Ineffable Nondual Datum, that which is given, which is without form, and void.
>
> It is from this Emptiness that Life creates all structures, forms, and relationships in the manifest universe, called data patterns prior to interpretation by a gnostic being.
>
> Through the action of the Logos, called *Dharma*, *Tao*, or *Rita* in the East, and by carefully observing the similarities and differences in these data patterns, they can be interpreted and organized by self-reflective Intelligence showing that the Universe, viewed as Consciousness, has a deep underlying structure described as an infinitely dimensional network of hierarchical relationships.
>
> All the concepts that are formed by this process of interpretation are in pairs of opposites, for whenever any concept is formed, its opposite is always also formed, a notion encapsulated in the Principle of Duality: A complete conceptual model of the Universe consists entirely of dual sets.
>
> The Principle of Duality can unify the Nondual, Formless Absolute and the relativistic world of dual forms, revealing the fundamental design principle of the Universe: *Wholeness is the union of all opposites*, called the Principle of Unity, leading to Fullness, and thereby back to the Datum of the Universe at the end of time, when Alpha and Omega are one.

These five sentences provide a complete description of evolution from its beginning to its end, as must be possible if the Unified Relationships Theory is to provide a true representation of the dynamics of the entire Universe in general, and of the psychodynamics of society, in particular. In other words, for conscious, intelligent individuals to understand how the Universe is designed, their ontogeny must be a recapitulation not only of human phylogeny from conception to death, but also of the complete life cycle of the Universe as a whole.

It is interesting to note that the first sentence corresponds to the first verses in the Bible: "In the beginning God created the heaven and the earth. And the earth was without form, and void."[39] The void is also the central notion in Buddhism: *Shunyata*, generally translated as 'Emptiness'. The last sentence in this brief exposition of Integral Relational Logic corresponds to the last chapter in the last book in the Bible. In *Revelations*, John the Divine describes an apocalyptic vision he had on the island of Patmos, ending with these words: "I am Alpha and Omega, the beginning and the end, the first and the last."[40] In Eastern terms, this sentence is closest to Advaita, founded by Shankaracharya, who lived from 788 to 820 CE.[41]

For *Advaita* means 'not-two or nonduality', and by the Principle of Unity, Nonduality is the union of Nonduality and duality, illustrated in Figure 4.2 on page 250.

The structure of the first volume of this book expands on these five sentences. First, Chapter 1, 'Starting Afresh at the Very Beginning', beginning on page 35, is perhaps the most difficult both to write and read in the entire book, but it is absolutely essential to begin here. However, people do not generally demolish the entire world of learning as an act of personal will, for doing so is so mind-shattering that it can easily cause much mental derangement. Yet, it was necessary for me to pass through such an apocalyptic catastrophe in the spring of 1980 in order to determine whether the global economy will self-destruct because artificial intelligence is possible or because it is not.

Chapter 2, 'Building Relationships' beginning on page 177 then describes the first part of the solution to the business modelling problem outlined in this preface, describing the commonsensical science of reason that we all use to organize our ideas. And because IRL is universal—something that we all share—its adoption globally would help to end all the divisive wars that take place between academics, nations, religions, and so on, creating conceptual clarity out of confusion and delusion.

The Principle of Duality described in Chapter 3, 'Unifying Opposites', beginning on page 223, was revealed to me around midsummer 1980, providing the skeleton of IRL with its backbone, on which all other structures can be built. This is the first step in adopting a both-and approach to life, able to see both sides of every situation, a clear sign of innate intelligence, which tends to be stultified at an early age by the either-or cultures we live in.

The Principle of Unity then emerged in consciousness from the Principle of Duality around October 1983, when I was once again strolling across Wimbledon Common, but this time from the south to the north. Chapter 4, 'Transcending the Categories', beginning on page 243, then shows how I was able to solve a problem that had deeply disturbed me since I was eight years of age: how can we unify the concepts of God and Universe, the incompatible contextual concepts for religion and science, respectively?

I have been living in solitude in Wholeness ever since, telling me that it is the ultimate destiny of all us human beings to return Home to Wholeness, from which we have never actually left. We are all Wholeness at every instant in our lives. It is when we all realize this that we can truly live in love, peace, and harmony with each other and our environment.