Angell, Ian O., and Dionysios S. Demetis. "Tidy Minds, Technology and the Myth of Control." *Science's First Mistake: Delusions in Pursuit of Theory*. : Bloomsbury Academic, 2010. 85–104. *Bloomsbury Collections*. Web. 26 Apr. 2023. <<http://dx.doi.org/10.5040/9781472544957.ch-006>>.

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CHAPTER SIX

Tidy Minds, Technology and the Myth of Control

With this present chapter the authors reach a catharsis. By contrasting their ideas with the popular and prevalent attitudes towards science and technology, they will be in a position to deconstruct fully the notion of delusion that underpins much of their thinking, and justify their assertion concerning *Science's First Mistake*. In previous chapters they outlined the complexity and paradox behind so-called rationality, and showed how this has given rise to the myth of control, which permeates much of contemporary thinking and practice. They contend that much of the appliance of science to society and business is quite absurd, only most people don't see it that way. Just like the young boy in Hans Christian Andersen's fairy tale, the authors know the emperor has no clothes. Here they justify that claim.

Humanity has always tried to exercise control over its surroundings. However, until the rise of science we always assumed our fate was in the lap of the gods; and our role was merely to placate them. Modernity removed the gods from the equation, and imperially we clothed ourselves in rational methods and the scientific approach, strutting our control for all to see. That this control is grounded in 'instrumental fictions' was rarely considered. Now that our scientific and social systems have acquired a high degree of complexity, the cracks are appearing, and we are beginning to see through the delusions to the paradoxical consequences beneath.

In this chapter we will discuss the shared-delusions of the present day, many involving the perfecting of technological systems, particularly computers. Computer applications certainly have a utility, but one that often deceives its users into believing that they are in control of a benevolent technology. The fallacy of personal validation takes over; we see only the limited successes, and overlook the failures. Our inability to see the absurdity in our attitudes towards technology has created a society in denial.

Only after the authors have highlighted the many problems with computerization, and the reader is convinced of the validity of their position on delusions, can they entice her to dig deeper into the relationship between cognition and observation. To do that she must step outside the self-referential certainties of a society in thrall of technology and join in the deconstruction of *Science's First Mistake*.

An Obsessive Compulsive Neurosis?

The unquestioned acceptance of computerization by our societies and the sheer scale of modern applications are having a huge impact on social, political, scientific as well as economic life. Consequently, a great deal of social endeavour has come to rely totally on the functioning of the technology. Increasingly societal structures develop primarily on the basis of this reliance. This precondition of what has become a dependence on technology has reached such a degree that it has lost touch with reality.

For far too long technology was seen as an automated replacement for manual processes. That distinction between manual and automated processes has become almost universally accepted, although it is as artificial and paradoxical as any other distinction. With computerization penetrating so deeply into contemporary life, the structure of all modern institutions has changed to such a degree that the distinction between manual/automated processes is no longer even considered. Computerization has so deeply penetrated contemporary life that it now constitutes a justification in itself for the development of further computerized processes, and the distinction between manual/automated processes quite often becomes utterly meaningless.

These processes are a symptom of mass automation, and already presuppose a belief in technological instrumentalism; a belief that remains strongly held despite so much contradiction. This belief, relatively benign in individuals, possibly even useful, becomes hugely problematic when it is organized and promoted within larger social groupings. Witness the ever-expanding multi-billion pound spending of the UK government on databases for everything from health records, to children at risk, to criminal records, to identity data; all set against a history of failure, and budgets spiralling out of control. 'Madness is something rare in individuals – but in groups, parties, peoples, ages it is the rule' (Nietzsche, 1990). The madness of our particular age is an absurdity we rarely question: that our world can be controlled using the excessively tidy methods of science and technology. It is a madness that believes, particularly nowadays through computerization, that the world will become the way it ought to be. French President Pompidou¹ may have been right: 'There are three roads to ruin: gambling, women and technology. Gambling is the quickest, women the most pleasurable, but technology is the most certain.' Computer technology fails, not necessarily because of human error, but inevitably because of the paradoxes implicit in the notion of data.

This book calls for a rejection of any belief that ‘truth’ (and subsequent ‘understanding’ leading to control) may somehow be pursued scientifically. The construction and evolution of such a pursuit have always involved some form of technology or another. In the particular case of modern society, the computer has been promoted to the means of achieving anything from improving organizational efficiency to even constructing science itself. The results of a computer’s operations are then elevated to a supposed simulation of socio-economic reality, but this is precisely the problem: the fallacious belief that the simulation of reality by computerized methods can provide an accurate enough picture for the manipulation of that reality. This tendency of constantly tidying up the world through the help of automation is reminiscent of obsessive compulsive neurosis, in that people are compelled to act according to rigidly applied rules in order to achieve tidiness and control over what they designate to be problematic. Some go out of their way looking for it. A place for everything, and everything in its place. Increasingly this madness is appearing as a corporate disposition, particularly in the lunacy of trying to *manage change* or *engineer knowledge* with the tidy methods of science, or rather a pseudo-science.

The literature is full of cure-alls that sell tidiness to the gullible in the form of ritual application of computerized methods. Consultants then charge onto the scene, promising a world neatly described in networks of boxes, triangles, hexagons, circles and arrows; a world controlled by bubbleware. With their methodologies, with their computerized information systems, with their organizational charts and mission statements, with their battle cries of synergy, management of change, competitive advantage, business process re-engineering, total quality management, data warehousing and data mining, knowledge management, customer resource management, with their tidy minds, they sally forth turning organizations into neurotics. It is well to remember that ‘when a lot of different remedies are proposed for a disease, that means the disease can’t be cured’ (Chekhov, 1991). Most so-called methods have a half-life of about five years, and probably less.

The Folly of Forecasting

Despite the obvious and persistent failure of these methods when applying supposedly scientific solutions to complex problems, the belief in their utility remains undiminished. Even worse, it is believed that the accumulation of past information about whatever is being modelled, somehow with the

help of technology, will assist in a direct manipulation of that information. Predictions about future behaviour then assume the mantle of scientific validity. Indeed, the first reaction of decision takers is to run to modern pseudo-scientific methods. When faced with profound uncertainty the standard approach is to impose tidiness on the complexity of this world, and to automate the tidiness with the support of information technology. However, a good technology platform, although useful in organizing and structuring part of the complexity and assisting in information exchange and communication, is not sufficient for success. In the search for success, what makes the real strategic difference is the quality and integrity of the people involved and their network of contacts. Both success and failure will be determined by unique social, political, organizational, and particularly personal factors.

An unquestioned belief in automation only demonstrates another misguided belief in managing uncertainty. For uncertainty is a foreboding, where the surprise of imminent change is outside of our control, and it certainly does not conform to a neat computational logic. Deep down, surely we must all know that profound uncertainty contradicts the smug certainty of formal methods? Yet still neurotics want their world to be well behaved, and they believe it is virtuous to collect numerical data: representations of so-called absolute facts. This situation is reflected in the large number of methods through which computerized tidiness is being forced on society, all underpinned by the arbitrary use of measurement: with systems analysis, opinion polls, market research, socio-economic classifications, performance measures, efficiency audits, cost–benefit analyses. Everywhere, in the folly of forecasting, which the authors insist is merely the arbitrary assignment of numbers to the future, the neurotics believe that such numbers are meaningful in their urge to control. Neurotics insist that control comes by labelling uncertainty with numbers, rather than by continually re-evaluating each uncertain situation.

The approach of searching for the right numerical label to represent the future, whatever its scientific credentials, points to a lust for numerical solutions and other theoretical abstractions that is spreading. But numbers can only show an average of what is not a homogeneous sample. Numbers always hide some act of choice, some hidden agenda, a prejudged priority, some preconceived notion of category and of what the number means. ‘Not men but measures: a sort of charm by which many people get loose from every honourable engagement’ (Burke, 1975).

Computerizing the Neurosis

The perversity of number-driven decisions is obvious to those who view categorization as an including/excluding act of distinction. In this act of distinction, categorization constructs an abstraction that represents all that a category is, but only that. And yet this approach is being used indiscriminately in both public and private sectors to computerize each and every decision process. With the minimalist insight of true genius, Pablo Picasso identified our particular predicament: 'computers are useless, they can only give you answers'. More often than not, the answers they give are irrelevant, or just plain wrong, or they solve the wrong problem, and in the process they create new problems.

And yet (pseudo-)scientists project the world as a deterministic black box; as if linking pre-ordained input parameters with real-world variables leads to an output that predicts behaviour in that world. Neurotic governments and companies attract these tidy minds, which only goes to reinforce the institutional neuroses. But they will eventually find that ambiguity cannot be resolved into some tidy pattern, and that jumping onto a bandwagon of methodologies is merely impulsive stress-relief. The result is an insecure world where everyone feels that the remedies are successful for everybody else, but not for them.

Computerizing the tidiness only goes to amplify the error/absurdity. Computers can deal with well-structured problems with amazing speed, they handle detail, but they cannot cope with the subtlety, ambiguity and complexity that permeate much of contemporary problems. Part of the reason can be found in the fundamental problem of integrating computerized information systems with human activity systems: two radically different modes of operation. Computers do not work in physical space or within a biological existence, but in a mathematical dimension; a subtlety too easily forgotten until it is too late.

This difference between computerized information systems and human activity systems is clearly visible in complex socio-economic environments where the integration of technologies is rendered problematic, but it can also appear in traditionally scientific applications, such as aircraft navigation. In August 1987 there was a collision between two RAF Tornado fighters on separate low-flying night exercises over Cumbria. Based in different airfields, the planes were using the same program on their onboard computers. A cassette, given to each navigator before take-off, flies the plane automatically to avoid obstacles like hills and electricity pylons. Although

coming from different directions, the planes arrived at exactly the same spot simultaneously, hence the crash. What no one had realized was that the computer program (the delusional frame) had reduced the flying space of three dimensions into a single linear path, where the planes could not avoid one another. Even though this is not a systemic error of integrated technologies, and it can be corrected (as indeed it was in the next version of the computer program), it does demonstrate how the mundane so often escapes the attention of architects of automation. Such examples abound.

The checks and balances fundamental to error tolerance and correction in any human activity system can become invalid in the rule-based world of computerized information systems. We simply cannot act fast enough to keep up with machines, and so instead we often surrender responsibility. But because it is only in hindsight that we can analyse the subtle differences between the dimensions of man and computer, there is an enormous potential for misunderstanding. The sheer speed of feedback from computers means they are just not in tune with the human mode of error correction. By our failure to deal with this different time scale, errors are amplified, and this feeds back into chaotic situations. A trader once typed 1,150 instead of 1,250, followed by 'At Best', when trading in Vodafone AirTouch stock, triggering a drop of two pounds a share and wiping £13 billion off share prices.

The Butterfly Effect

Of course, such errors are to a certain extent avoidable; but the issue here is different. Tidy minds fail to grasp that all facts are context sensitive and do not recognize a 'capricious division and fragmentation' (Nietzsche, 2006) in the flux of events. Nuances of detail, as well as deliberate, accidental and arbitrary actions feed back and continuously modify and amplify the elements, processes and sub-systems. In most cases this feedback has minimal effect on the processes that stabilize the system (so-called negative feedback); it simply reinforces them. But every so often positive feedback,² with its seeds in *Chaos*, explodes the stability. The devil is in the detail, or rather the complexity.

An initially marginal event can, through positive feedback, trigger the long-term dramatic events of the Lorenz Butterfly Effect.³ Apparently, a butterfly flapping its wings in the Amazon can 'cause' a typhoon in Hong Kong. There are innumerable marginal events (butterflies) out there, but very few precipitate the butterfly effect; and those can only be identified in hindsight, and then only hypothetically. They cannot be identified in

advance. However, just because the typhoon may not have happened without this mythological butterfly, that doesn't make that butterfly the 'cause'. It was merely one of a series of influences, all of which culminated in the effect; not forgetting everything that could have previously stopped the butterfly, but didn't. Much of the insights claimed for this effect derive from the mathematics of the Theory of Chaos, and its demonstration of a causal path between the butterfly and the typhoon: whence a single butterfly takes the blame for the chaos. However, *Chaos* as we mean it cannot be caused. It is always and already there; it is pre-order, the natural non-linear backdrop out of which all artificial and unnatural linear 'order' is constructed by human cognition.

The importance of this insight of the butterfly effect is not that a single butterfly can in popular parlance cause chaos, rather that minor events can interact, and through feedback build up into a significant force. As noted above, by the same reasoning, the constraining of our untidy world into a straitjacket of categories is forcing square pegs into round holes. This sheds a debris of detail that conspires with the context to form a critical mass, and a subsequent explosion of confusion of inexplicable observations.

The prevalent form of linear thinking disregards most processes that are responsible for the creation of positive feedback, thus creating systemic instability. Such thinking reckons that any instability can be rectified by the discovery of cause-and-effect processes that counteract any form of positive feedback. Also, it totally rejects the idea that the act of imposing tidiness onto a world that cannot be accurately simulated because of its complexity can itself lead to a chain reaction of chaotic positive feedback, which generates hazards that refute any prior analysis. We may know the general form of a hazard, but we may not recognize a particular occurrence until we are wise after the event.

Today's technology is awash with such hazards, and these often go unnoticed. Our touching faith in a benign technology has uncanny parallels with the preposterous claims made in the early days of every technology. X-rays were once considered harmless novelty, used unguarded to check on foot size in shoe shops; and to make a photographic souvenir for newlyweds, bride and groom clasping skeletal hands showing brand new wedding rings. In its pioneering days, electricity was promoted as a cure for everything: consumption, dysentery, cancer, blindness, worms and impotence. Of course, one hazard of technology that has at last been recognized as a direct consequence of industrialization is global warming.

Nowadays, automation through computerized information systems is also promoted as a cure for everything; as the metaphorical silver bullet. There is no denying that the dominant ideology of our times actually promotes computerization as a virility symbol. No expert can appear on television without the ubiquitous microcomputer peeping over his shoulder. Every business programme on CNN and BBC displays wall-to-wall knowledge-giving computerized charts; meanwhile the categories that have been constructed to make use of these particular applications remain hidden. The pleasant visual aesthetics of something that is computationally supported is apparently enough to hold unwelcome thoughts at bay. We really *do* believe that computers increase business potency.

Climbing the Nearest Tree

The history of human problem solving is littered with examples of this *first step fallacy*: 'they think they are reaching for the moon, but all they've done is climb the nearest tree' (Dreyfus and Dreyfus, 1986). It is only after the nonsense stops that a technology can be used propitiously to its optimum potential. But the nonsense goes on.

The market's response to this onslaught is to 'follow any lead one can get' (a television advertisement for computer manufacturer Compaq). By following these leads, the belief in a potent technology is insinuated as part of the deal. Governments and businesses worldwide have rushed headlong into what can only be called a technology binge, in the confident belief that lavish spending on Information and Communication Technology (ICT) will ensure success and progress. Developing countries in particular have been urged to fall into this trap and are induced into spending big on technology, even when their basic infrastructures are underdeveloped or non-existent. In light of our dominant scientific mind-set, it was inevitable that computerized information systems would be thrust upon organizations, all with the highest motives. But ICT is just the latest technological adventure whereby man feels he can subjugate nature by mere will. How easily we forget Alan M. Eddison's warning, that 'modern technology, owes ecology, an apology'.

A history of technological achievements, including the development of the computer itself, sustains a scientific optimism that is apparent in the huge sums being thrown into the bottomless money-pit of computing. Despite the waste, the sheer power of optimistic rationality dominates. A belief in progress; being in control of a better world, achievable through rational thinking: rational thinking expressed as science and technology.

Tidy thoughts implemented by tidy minds on that icon of tidiness, the computer.

Far too often, ICT is considered culturally neutral, when in reality it is value-ridden, and hides a powerful intellectual imperialism. This predicament is nothing new; it is the culmination of the trend, the unquestioned application of scientific method, which was recognized over 200 years ago by Edmund Burke. He stated: 'But the Age of Chivalry is gone. That of economists, sophisters and calculators has succeeded; and the glory of Europe is extinguished for ever' (Burke, 1999). For behind much application of information technology is the malignant belief that human thought is mere calculation; we are no more than biological analogue computers. There is a sinister hidden agenda stemming from the dominance of two degenerate attitudes: that a number can be a meaningful representation of human experience; and that arithmetic operations on such representations, implemented on a computer, can produce so-called rational decisions about the human condition.

Information Audits

Computer simulations maintain the pretence that they represent reality within their limited models. Unquestioning acceptance of simulations of open-ended human experience is sheer folly. Models can only ever be a pale shadow of what actually happens, and can never emulate the subtle, and not so subtle, checks and balances and the feedback of unknown and unknowable interactions. They really cannot hope to emulate the infinity of parameters implicit in 'being there'. The application of ICT obscures the difference between correlation and causation, confuses superficial process with substance, and principles fly out the window. One horrific example is presented by the neurosis for targets in the British National Health Service. Over a fifteen-month period thousands of seriously ill patients had to wait for hours aboard ambulances parked in 'holding patterns' outside overstretched hospital Accident and Emergency units in order to meet a UK government pledge that all patients would be treated within four hours of admission.⁴ Apart from the danger posed to the health of patients by this 'patient stacking', detaining the ambulances meant they and their trained crews were not available to answer new emergency calls.

The reader should think about Goodhart's Law. Charles Goodhart, a distinguished Professor of Economics at the authors' university, made this celebrated reflection: 'any observed statistical regularity will tend to

collapse once pressure is placed on it for control purposes' (Goodhart, 1983). What Goodhart is saying is that cause and effect must not be mixed. Any observed regularity in society is an effect, but the moment it is measured, and that measure is used as the basis of control, then a false assumption is being made that the regularity is the cause of the observation. The problem is made worse because of the highly subjective nature of observation itself, which as we shall see from Chapters 8 onwards opens up a can of worms.

Everywhere people are using the term *system*, when all they actually mean is *installation*. For a system is what that installation becomes, what it will become, and not what it was intended to be, as we shall see in Chapter 7. The belief that any system can be designed to optimize and organize the context within which it is placed is, however, a fallacy. The system can only temporarily optimize itself, but all the while it creates completely unexpected phenomena that influence/change both the system and its context.

Systems Misbehave

Systems misbehave! And technological systems are no different. Technology is a prisoner of societal consequences, which cannot be controlled, no matter what the management regime. Theoretically valid ideas can result in failure, while blatantly incorrect facts can induce success. When using the tools of technology to solve a particular problem, we may or may not succeed, but what is certain is that completely unexpected phenomena will happen. This is John Gall's First Law of Systemantics: 'All Systems have Antics' (Gall, 1988). Sometimes the antics lead to a system's inversion, where the exact opposite occurs to what was intended. Grand schemes may solve the problem as intended, only to create worse or different problems. Worried that adverse weather conditions at Cape Canaveral would delay the Apollo project, NASA constructed a giant awning over the launching pad. It was so large that a micro-climate formed beneath it: even though the sun was shining on Florida, it was raining on the rocket.

Most software supports, administers and/or refers to other software. How many applications of technology solve the wrong problem? Problems are solved because we know how to solve them, rather than because we want or need them solved. And more often than not, even more technology is needed to shore up that non-solution.

No technological solution is applied in a vacuum: we have to perceive the problem; there has to be proper management and housekeeping in order for technology to achieve its intended functional aims. At the same

time we must deal with any implications of its use, avoiding any emergent hazards, all the while profiting from any unexpected opportunities that may arise. These new risks, both hazards and opportunities, must be sensed as problems and subsequently solved. Lo and behold, we are back at the beginning. The feedback loop, which holds the potential of opportunity and risk, is closed. Some feedback will oscillate and amplify the loop processes, eventually totally destabilizing the system. Problems increase exponentially, as do the technological solutions. We are one step away from chaos. Anyone who runs a computer system will recognize this scenario.

Some loops will imply risk, and these must be intercepted and curtailed. Even the feedback loops that enable commercial opportunities must be monitored, so that they don't oscillate out of control. We must control the feedback loop, not just tinker with the tools. We must all face up to the problem of keeping the commercial and social feedback from information technology under some semblance of control.

The Law of Diminishing Returns

Prevailing over both the functionality of the technology and the phenomena of complex systems that spontaneously emerge around it is the dominant requirement of intelligent human response: to sense a problem and to identify what is appropriate and inappropriate action.

The role of technology in the construction of a *problem* and its subsequent *solution* therefore becomes central. Only on the basis of personal criteria can an individual balance the advice from those around him, and decide which method is most appropriate. But more often than not, that doesn't happen. The authority of our scientific society forces the individual to formulate every new solution in terms of technology. We even sense the situation as being a problem, specifically because of the potential offered by technology. Give a boy a hammer, and he will look for nails.

The self-serving logic of methodically applying technology takes on a significance far greater than the original problem. The use of technology has become *compulsive*. Because of an initial success, managers *obsessive-ly* introduce yet more and more layers of technology. To justify the extra effort and expense, they will look around for partners in search of synergy, that mystical pot of gold they learned about in MBA courses. The implications of each new layer of technology always feed back in the form of new questions about the appropriateness of solutions, and of new problems: *neurosis*. Any tidy demarcation will always collapse in a confusion of multiple overlapping

systems. For example, the vast majority of software simply deals with other software, and not the management problems at hand. Eventually complexity increases to a point where utility turns into reliance, reliance becomes dependence, and the law of diminishing returns precipitates a galloping descent into nightmare.

It is common for managers to think that by creating a database, it will somehow throw out facts to help them in their crusade for tidiness. But classification is notoriously difficult. A Canadian electricity company decided to produce an Executive Information System that would tell the management about the state of the organization, and would help them deal with the competition and with local political factors (Marche, 1991). They started by cataloguing their 'buildings', but then the whole process fell apart.

One structure was built in two separate stages. To the company it was two buildings, but the local authority claimed there was just one. Then there were portable cabins. In winter these have sleds fitted; for most of the year they run on wheels, and if unused they are stacked as containers. Were they to be taxed as buildings, vehicles or containers? There was the problem of manholes. It took a very expensive Royal Commission to decide that a manhole containing a seat was a building, otherwise it was just a hole in the road. Feedback had reduced the whole situation to farce. Would the company have been any worse off if it had left well alone? It would have saved a great deal of money. The management finally learned an important if somewhat expensive lesson: the tidy collection of data is not necessarily virtuous or beneficial.

An Information Ideology

Ultimately, because of a growing tsunami of technological complexity, both the sensing of problems and the managing of solutions become impossible, and the whole edifice falls apart. The basic problem is that the pseudo-scientific ideology of sameness has mixed up cause and effect. The dominant belief is that with proper control procedures we can impose order. This is a complete misunderstanding of the human condition. Control doesn't create order, quite the contrary. Order is systemic and may have come about in the complexity of human actions (rather in the feedback of interactions with the environments), but not necessarily from human intent. Order must emerge there first, and this order tolerates control. Only by the concession of that order, does the consequent control impose structure and stability. Don't confuse order with structure and stability; don't confuse cause with effect.

All order is transitory regularity; order allows controls to work, and then order fails; consequently the certainty of control and structure collapses. Uncertainty precedes the birth of a new order, followed by new controls. Innovators act as midwives at this birth. They stand out against the tidy minds that spread the deadness of stability, and instead create the turmoil of yet more transitory but temporarily useful orders.

It is typical of countries with an excess of government control, such as the former Soviet Union, North Korea or Castro's Cuba, to misunderstand totally this property of order and control. These governments had socialized their economies through rigid controls and by the setting of arcane planning targets. It was only a short step from these unrealistic targets, to false accounting, and ultimately to economic collapse. Mao Zedong's Great Leap Forward in China claimed that revolutionary zeal would deliver national self-sufficiency. The result was the Cultural Revolution, and 28 million deaths from starvation. All the while the Chinese government was keeping up the pretence of targets. Things there have changed substantially for the better since the death of Mao.

The very act of naming the target figure guarantees a phoney success. The government controls the data collection, and so it can re-label any old data to fit the categories being measured, and then bluffs its way through, ignoring that quantity is not a measure of quality. Announcing that it is about to spend large sums of money is another good trick. The message: the more money it spends, the more successful it will be. Such are the shared-delusions designed to deflect criticism, because no one sees the big lie. Even when its figures are transparently false, what does the government do? Fire a few scapegoats, before creating a fanfare around yet more targets. 'Lies, damn lies, and statistics'⁵? The sleight of hand can become very sophisticated, like the agricultural targets and claims of full employment that continued well beyond the point that the former Soviet Union was bankrupt and Mao's China was starving. Ultimately, however, the accumulation of inevitable failure becomes undeniable.

These governments were rain-dancing with pseudo-science. It is ludicrous to think that they can control uncertainty. Forget the promises of science and logic. Ultimately, the sorcery of a new rhetoric will always emerge to sweep away the old, although that too will eventually degenerate. 'Every revolution evaporates and leaves behind only the slime of a new bureaucracy' (Kafka, 1995). We must live with that uncertainty and love it. Enjoy the sheer wonder of it. So when anyone tells us that information is good, more information

is better and computerized information is best, reach for the straitjacket. When a man has a watch he knows the time. When he has two watches, digital or otherwise, he isn't so sure.

This then is the human condition, and the place of technological systems within it. The only property all systems have in common is that they *all* fail. The only question is when. Control is a myth. Confidence in control systems is a precursor to hubris. With a restatement of Nietzsche's observation that theory is 'refined ignorance', this book has completed its first circuit. The authors have returned to their starting point with a description of the problems that beset their own topic of Information Systems, only for them to suffer from an even bigger headache with the notion of *theory* in general. Their sceptical message is that all theoretical descriptions are based on frames that are both underpinned by delusions and from which delusions emerge, which in turn trigger paradoxes. This is all tied up with the structural coupling of observation and cognition, all made possible with acts of choice by the singular observer.

The authors could have ended the book here, but that would have been disingenuous. For readers must look at these issues at a deeper level. Granted the authors have confronted their initial concerns with their self-referential analysis, although they deem it necessary to set off on yet another self-reference. In the remainder of the book they will peel away the various theoretical layers underpinning what they meant by the structural coupling of observation/cognition.

However, before they expand on any esoteric theory, the authors believe it is important for the reader to place these notions among her commonplace everyday experiences. The discussion of observation that follows is not meant solely for the rarefied world of theory. It has relevance even to the world of the mundane, to the world of technological folly we have described in the present chapter. It has particular relevance for pragmatists who want to cut through the self-referential absurdities of the modern word. To do this we need to consider where these absurdities come from, and how they are ignored. This requires that we consider further the notion of higher orders of observation, which is at the core of the upcoming analysis. Before the reader writes off such concepts as mere pseudo-intellectual indulgence on the part of the authors, we take a short detour with a more down-to-earth example of how objectivity, by failing to take orders of observation into account, can lead to misplaced confidence in logical/scientific reasoning, particularly when other people are involved. However, those readers who

are comfortable with these notions can skip the next section, and jump directly to Chapter 7.

Considering Orders of Observation with a Brainteaser

Some years ago the Sunday Times, a leading British Sunday newspaper, ran a recruitment advertisement for a major IT Management Consultancy Company. It contained the following variant of a well-known brainteaser; the wording of the original advert has been adjusted for illustrative purposes:

A prison warden decides to release the *cleverest* of his three prisoners (let's call them A_1 , A_2 and A_3). In the prison yard he shows the prisoners three black disks and two white ones, and tells them that he will pin a single disk on the back of each prisoner, and then pocket the remaining two disks. The warden announces that he will release the *first* prisoner who can *name* the colour of the disk on his own back, and give valid *reasons* for the choice. In fact he intends to pin a black disk on each prisoner, and pocket the two white ones without allowing anyone to see which disks are unused. Each prisoner will see the black disk on each of his two companions' backs, but not the one on his own. The warden then planned to walk to the far side of the yard and await the first prisoner to come forward with the *correct* answer plus valid reasons.

The advertisement went on to imply that anyone who could put themselves in the role of one of the prisoners, and solve this problem, would be well-suited to a career in consultancy and should apply for the advertised post.

This brainteaser is typical of a simplistic logical/rational view of the world that this book is questioning, and it is well worth considering this rigid type of thinking from the relativity perspective of first-, second-, third- and even higher-order observations. This involves recognizing that each observation carries with it the assumptions/delusions made at its own level, and also different assumptions at all the lower orders.

Five words are italicized in the statement of the problem. This is to help illustrate that the expected so-called mathematical logic needed to solve the problem requires a very restricted interpretation of those five words, and depends totally on other very important and yet unstated underlying assumptions/delusions. Of course, there is yet another layer of observation, namely the reader of the advert, who has the extra information about A_1 ,

A_2 and A_3 , and who uses it while watching/imagining the warden watching A_1 , who is watching A_2 , who is watching A_3 ; not forgetting all the many other permutations of higher-order observations. By introducing various interpretation/assumptions among the various levels, the authors, who are also observers of the scene, intend to lead the reader towards some very different inferences.

According to assumptions made in the authors' higher-order observations of events, the 'solution' that the consultancy expected, and by implication by the imagined warden, is something similar to the following *reductio ad absurdum* falsification argument. The authors, for their own particular purposes, have packed it with bracketed comments about orders of observation.

Consider prisoner A_1 . {From his first-order observation,} he sees two black disks on the backs of his two companions (A_2 and A_3), and concludes that there can be at most one white in play; and if so, that would be on his back. Prisoner A_1 starts by assuming that there is a white disk there. He would then conclude {from his own second-order observation of A_2 (who is watching both himself A_1 and A_3 , in what to A_2 is a first-order observation)} that A_2 (seeing the white on A_1 's back) would deduce that there is only one white in play (on A_1 's back) for otherwise A_3 would see two whites {in his first-order observation (second-order by A_2 watching A_3 , and third-order by A_1 watching A_2 watching A_3)}. However A_3 doesn't move, and so A_2 would conclude his disk is black. However, A_2 doesn't move, so A_1 's initial assumption has been falsified, and therefore A_1 decides that he must have a black disk on his back, not white.

The same logic should also hold for both A_2 and A_3 (and their respective higher-order observations of the other two prisoners). Hence the first prisoner to move is the cleverest, being the first to work it out. Of course, fundamental to this pure logic is the assumption that all three prisoners share a common objective logic, and that the various orders of their observations don't matter. This is the warden's interpretation (the brainteaser's assumption), but not necessarily any of the prisoners'. For suppose A_1 , A_2 and A_3 do not share the warden's ability in logic. Then the warden's assumption (the assumption is actually being made by the person who is solving the problem according to this logic), about the rational objective behaviour of the prisoners in his analysis, is invalid. In this situation, A_2 's first-order observation of A_3 would be different from A_1 's second-order watching A_2 watching A_3 , and the same is true for all the other possible permutations of who is watching whom.

Of course, if A_2 did actually share the same mathematical logic as A_1 , but was cleverer, he would come to the same conclusion as A_1 , but sooner, and so would approach the warden. However, because A_2 had moved, A_1 would gain the instantaneous impression that his initial assumption was correct, and that he does have a white disk on his back. A_1 would react immediately to A_2 's move, and if a faster runner, he would reach the warden first, but with the wrong answer. So the various orders of observation, and the sequence in which they are processed by the logic, do make a very real difference. What sort of logic needs each solution to be universally free of contradiction for it to be valid? Answer: a logic steeped in, but in denial of, paradox.

Note also how the problem, as stated by the warden, implicitly equates *cleverness* with thinking in this rigid, paradoxical and formal mathematical (and the only *correct*?) way of thinking. This presumption is far from being universally valid, and as we have seen can place mathematical thinkers at a real disadvantage when they are cast adrift in the real-world turmoil of human observation and assumptions.

The very existence of alternative logics, such as those given below, will further deny the predictability of the behaviour of the three prisoners needed in the above argument, and in doing so will invalidate the mathematical logic, showing that the various orders of the observation cannot be dismissed with impunity. These substitute logics have the extra advantage of not requiring any assumptions about the abilities of the other prisoners; they are pure intellectual abstractions, and so can be said to be order-less observations for all A_1 , A_2 and A_3 . Delusions in the making, maybe?

Suppose, for the sake of argument, that the three prisoners are a gambler (A_1), a disbarred lawyer (A_2) and a psychologist (A_3), with behaviours imposed in the first-order observation of the authors. The consequent radically different world views of each individual prisoner mean that a mathematical solution to the problem (as perceived/observed by the warden: the only objective thinker present) cannot be isolated from the contrariness of human context and experience, or from a recognition of 'who is watching whom, watching whom'.

Note that the warden too is an observer. While he is pinning the disks to their backs, and watching proceedings with fixed expectations of the prisoners, he may have ignored A_1 tossing a coin, and A_2 sneering at him, or that A_3 is already moving towards him. That's the problem with observation; it involves choice and focus, it uses distinctions, and hence it entails not seeing, as well as seeing.

A_1 , the gambler, takes a probabilistic perspective, and could reason in the following perfectly rational way. 'Only one prisoner will be released, so unless I am *first* with the answer, even though I am *correct*, I will not get my freedom. The *a-priori* probability of my being correct and being first with the solution is one in three. I *reason* that if I toss a coin, my chance of correctly *naming* the colour of my disk is one in two (evens): much better odds. So I will toss the coin and be first! Of course with three black disks and two white disks, the odds are not evens: the *a-priori* probabilities are black (three in five) and white (two in five).

Will I act on this, or will I take a little time to look (a first-order observation by gambler A_1) at my companions' disks (both of which happen to be black), and calculate the *a-posteriori* probabilities: black is now one in three, and white two in three. Any one of these approaches is as good as, if not better than, the odds of straight competition between my fellow prisoners and me: one in three.' So the sensible choice for A_1 is not to waste precious time observing his fellow prisoners, but to toss his coin and act. However, then the assumptions made by the warden that all the prisoners (including A_1) are watching and logically analysing their companions' behaviours will be invalid. And it gets worse for the logic required by the advertisement.

Even this simple logic takes far too much time. Consider A_2 , the lawyer, who will have taken the warden's words literally, and who has a totally different, but again a rational and consistent logic. 'The warden did not say that only one solution could be given by any prisoner. So I will say "My disk is black; my disk is white". Since I have exhausted all possible solutions, then one of my statements must be *correct*, and within the letter of the law I will have both *identified* the colour of my disk and given my *reasons*. Therefore I must be released!'

When we come to A_3 , we meet the shrewdest of all the prisoners (according to the authors), a student of human nature. His logic is the most cynical, and the most profound. He rejects the mathematical logic out of hand. He is turning the tables, and is observing the warden: 'I know these brainteaser people, like the warden. They think they are so *clever*! In fact, so clever that they are totally predictable. So as not to give any one of us an (unfair) advantage, any problem they set will disclose exactly the same symmetrical information to all three of us. Since it is impossible for each one of us to see a total of two whites (implying three white disks in all), or a black and a white (which is combinatorially impossible with three people), I *reason*

that the warden will put a black disk on each of our backs.' So A_3 has the answer before the warden has even started to pin on the disks.

The individual experience of these three prisoners has created, for each, his own unique view of reality and his own coherent and consistent, but totally subjective, logic. So none of the prisoners are making the assumptions required for the logical analysis to work, and it has been shown that the mathematical approach is itself subjective in assuming a world of mathematically astute individuals. The prisoners' first- and second-order observations are in fact the warden's first-, second- and third-order (that he misinterprets), and the reader's first-, second-, third- and fourth-order observing the scene through both the warden's and the prisoners' eyes. This all has to be condensed down into a single first-order objective mathematically rational (and incorrect) view. An objective world, constrained by a linear logic, where the various orders of observation play no part in any analysis, is not the world inhabited by us humans.

Even in this most trivial and contrived of examples, the rigid mind-set of mathematical logic is seen to be not only inappropriate but also actually invalid. What is more, the assumption that the warden knows what he is doing is questionable. He could be mathematically unsound, and is merely copying a game that he has seen elsewhere. Since he may not have the slightest idea of what is going on, who knows what colour disks he has placed on the prisoners' backs? The prisoners, even if they are all mathematically adept, will then be unable to operate the requisite analysis in what is now an arbitrary situation.

But why stop there? It would be interesting to consider the attitudes of other prisoners to the problem. Some old lags don't want freedom; that would confuse the issue even more. Therefore, the belief that mathematicians (or other groups that share a similar logic, such as chess players) make the best strategists, solely because of their reductive and mathematical deductive skills, is self-evident folly. Even the above imaginary gambler knows that in a two-person game of perfect information there is no optimum strategy, because moves in such a game become predictable.

Then there is the harsh reality that this game is a contrivance, designed (that is, based on a set of assumptions/distinctions) to identify people who share a particular set of assumptions: so-called scientific truths. However, the world of hard knocks is not a board game with well-defined rules, but a subjective jungle of uncertainty; at least this is what the authors observe. People cheat! We humans must face up to the reality of asymmetric communication, incomplete information and of risk.

What we have here is yet another example of *Science's First Mistake*: namely a belief in an objective world, independent of observers. Thus the Sunday Times advertisement was proselytizing a flawed mathematical perfection. Holding up logic as a virtue is promoting a formula for an incestuous reinforcement of a narrow, restricted, restrictive and un-human approach. Sceptics, such as the authors, insist that consistency and predictability must lead to false assumptions, although they do admit that in certain circumstances, such assumptions may lead nevertheless to a utility. However, we must never forget that people are irrational. As an *aide memoire* we would do well to remember John Maynard Keynes warning about solvency and markets.⁶

It is now time to leave this brainteaser far behind, and with *Science's First Mistake* in mind set off on a deeper analysis of observation.