

Discuss the advantages and disadvantages of adopting a multi-paradigm or multi-rationality approach to management and decision making

This paper shall examine the consequences of a *conscious* adoption of a multi-paradigm or multi-rationality approach. Firstly the limits of formal logic are examined, and thus those of rationality, and what logic itself suggests should be done about it. Management is supposed to direct organisations through high-level decision making, but this paper suggests its true purpose is actually to manage *uncertainty*¹ i.e.; organisations exist to manage uncertainty, usually through conversion into risk. The paper then concludes with case examples of how pathological the fear of uncertainty can become, but also how paradoxically the exact same mechanism can save us from the same morass.

The Limits of Rationality

More than anything else, the age of reason defines the modern age², and nothing is of more importance to rational thought than the systematic application of logic and mathematics. However, with the publication of *Principia Mathematica* in 1911-1913, the terrible reality that logic has limits reared its head³. With Kurt Gödel's 1931 paper on *Principia Mathematica*, the incompleteness of formal logical systems became incontrovertible truth.

Put simply, Gödel's Incompleteness Theorem means that for any consistent formal theory that proves basic arithmetical truths, one can construct an arithmetical statement that is true but not

¹ Uncertainty throughout this paper is used as a technical term for the future.

² Precisely why Gottlieb named his seminal encyclopaedia on the history of western philosophy 'The Dream of Reason'.

³ To be specific, the books set out to derive all the truths of logic and mathematics from a minimal set of axioms. The entirely unexpected problem it encountered was that you cannot eliminate self-reference from a complete formal logical system, which means that logic is fundamentally paradoxical!

provable in the theory. That is, any theory capable of expressing elementary arithmetic cannot be both consistent and complete⁴.

This might seem damning, and indeed was seen as damning at the time⁵. It implies that all logic, all mathematics and thus all rationality are arbitrary, subjective and incapable of describing something completely. However, as Hofstadter (1979) shows, it became realised that rather than being a bad thing, this property is very much a good thing – a “strength” as Hofstadter calls it – because it generates *meaning* through formal systems necessarily generating not just truths about the thing they describe, but inadvertently also about themselves. This meta-functionality ultimately leads to self-awareness.

This all may seem far removed from Management and decision making. However, I wished to make clear that the use of and justification through quantitative rationality by appealing to the existence of an objective truth was disproved by the logic movement itself nearly a century ago. There **are** *truths*, because our knowledge of any objective truth is necessarily subjective. Furthermore, one truth is not necessarily deducible from another truth – they stand alone, as “islands of truth” (Chaitin, 1990).

More usefully, this also suggests consequences. Rational decision making is good for incremental, linear causality but a rational approach continued too long will always fail eventually⁶. Ormerod (2005) gives a great deal of empirical evidence to support this, proposing his “Iron Law of Failure” which says that everything, absolutely everything fails eventually. His most obvious example is that 99.9999% of species which have lived on planet Earth failed⁷, but also so do massive corporations and indeed, whole countries – it’s just that the timespans are different⁸.

⁴ Consistent in logic means ‘without contradiction’. Complete in logic means that all truths are stated. Gödel’s Theorem has an interesting parallel with Heisenburg’s Uncertainty Principle where you cannot know both the location and momentum of a subatomic particle – you can know either, but not both at the same time. One finds this duality of unknowability repeatedly in many formal systems which led to the development of paradox logic. See Priest (1979).

⁵ This entire paragraph summarises Hofstadter (1979).

⁶ One might react to this by suggesting that laws of Nature are infallible. In fact, *our* laws of Nature are good only for certain ranges of distance, time, mass, temperature or density. See Penrose (2004).

⁷ He does not state if this includes those species which evolved into something else – however given mass extinctions, it’s probably still true irrespective.

This implies that every once in a while, successful decision making requires rationality must let irrationality “jump” it into a new level, to a new “island of truth” from which new rationalities can be derived. This is often called a “paradigm shift” (Kuhn 1962). The big problem with these logical realities is that they do little to tell us *when* to perform a “jump” – and as Ormerod (2005) shows, the main source of failure is not that one gets a strategy wrong, but rather that one does not realise the strategy is wrong *quickly enough*. This introduces the need for timeliness, and thus how to evaluate uncertainty.

⁸ Fascinatingly, he shows that the failure rate profile for firms in the last century is identical to the profile for that of species over the last few hundred millions years – there are rare mass extinctions with more frequent smaller extinctions, and furthermore that both follow the same allometric rule (also known as a geometric power law). He postulates that failure in a population is a natural constant.

The True Nature of Organisations

From the 27th to the 21st century BC, in the Supe Valley of Peru, there existed the Caral civilisation⁹, probably the first civilisation of the Americas. Unlike contemporary or earlier civilisations like the Sumerian in Iraq, the huge advantage of Caral is that it was abandoned and never built over by subsequent civilisations. This discovery has quite literally revolutionised archaeology¹⁰ since its rediscovery in the 1990's¹¹.



Figure 1: The Ruins of Caral from Google Earth

⁹ Shady (2001) is the seminal paper detailing the discovery & excavation of Caral. Unless otherwise noted, facts about Caral are copied from this paper.

¹⁰ As a beginning, it demolished the warfare theory that warfare prompted civilisations to form for mutual protection as Caral never knew war. It also rewrote many theories on writing, numeracy and astronomical systems.

¹¹ One may find a copy of a May 2002 article in Frontier magazine at <http://www.philipcoppens.com/caral.html> of interest.

It also has revolutionised how we understand organisations. One principle question of all archaeology is why did civilisation begin in the first place? Archaeology not unreasonably holds that the primary characteristic of civilisation is *organisation*¹² – directing large amounts of labour to act as a cohesive whole e.g.; to build large buildings such as temples. Unlike most later civilisations, Caral was hedonistic and had no knowledge of violence – they *voluntarily* built the pyramids with the largest (pictured above) containing some two million cubic metres of material which is as much as the largest pyramid in Egypt built with slave labour¹³. The region was occupied since around 4000BC, yet pyramid building did not begin until around 2600BC and furthermore, at some 20km from the sea where there was no source of animal protein¹⁴. Even more strangely, most of the crop grown there was cotton which you cannot eat.

It turns out that the only plausible explanation is that of trade. Caral became a cotton manufacturing economic “super power” which made various cotton products for export such as fishing nets. In exchange, Caral received in trade all its animal protein (mostly fish), coca from the rainforests (some 200km away) and various other products from far away whose presence can only be explained by a vast trading network. This network ran smoothly, with no war, for at least 600 years, and went on to spawn the less peaceful Incan and Mayan civilisations who inherited their systems of numeracy and writing. Even more impressively, there is ample evidence to show that Caral was fully populated during this entire period – severe famine or disease were also unknown.

The entire meaning of a successful organisation is that it **lasts** despite the vicissitudes of uncertainty. If harvests fail several years in a row, has a civilisation stored enough food to last the course? In the case of Caral, the most remarkable thing is that people became *specialised* – and that doesn’t just happen without incentive. Why would a person risk becoming dependent on others for the **entirety** of their food by specialising in growing cotton unless they trusted that the organisation they were in had absorbed much of the uncertainty into risk?

¹² From the transcript of the BBC Horizon documentary on Caral at <http://www.bbc.co.uk/science/horizon/2001/caraltrans.shtml>.

¹³ Ibid.

¹⁴ There weren’t even any axes or spears discovered at Caral which makes sense as there were no trees and no animals to hunt (the Supe Valley is primarily desert).

The classic example of an organisation absorbing uncertainty into risk is insurance. Many people pool together a regular payment. Should a catastrophe occur, those affected have **some** of the damage compensated – enough at least that one can begin again. In the case of Caral, the complex irrigation systems required to maintain the economy of the entire civilisation were fragile and subject to flooding from excessive rain. One man, or even one family could not hope to repair damaged irrigation systems in time to save the harvest. Only an organisation, one capable of redirecting the efforts of thousands of people to repair the systems all at once can create such security. By dedicating oneself to such an organisation, the quality, security & stability of life was much improved.

Caral provides an ancient and impressive example of when man first subjugated his individual interest for that of an organisation's. It is one of the first known examples when multi-rationality decision making in the modern sense became commonplace, and is a definite example of the advantages of a multi-rationality approach to management and decision making.

The Pathology of Fear of Uncertainty

The modern world is very much a massive extension of the principles of those which created Caral. However, fear of uncertainty has caused us to construct such massive systems that we have become far removed from reality – for us, the reality we construct has become a smokescreen over incredible inefficiency.

Hawken & Lovins (1999) detail an appalling record¹⁵. In the largest and supposedly shining example of economy on the planet, the United States is also the most wasteful. In 1990, each person in the US consumed on average **per day**:

- 56kg of solids (dry-weight)
 - 21kg of fuel
 - 21kg of construction materials
 - 7kg of farm materials
 - 3kg of forest products
 - 2kg of industrial minerals
 - 1.4kg of metals
- 59kg of gaseous materials
 - 20kg of material (e.g. soot)
 - 6kg of concentrated wastes
- 907kg of water so contaminated it cannot be safely returned to the environment
- And some 168kg of material displaced by mining, oil extraction etc.

This totals to some 454,600kg of waste **per person per year** and that was back in 1990 – the US economy has grown by over 50% since then¹⁶. To put this in even clearer perspective, in one year the US produces 113,398,092,500,000kg of waste. That's 113 *trillion* kilograms!

Despite this colossal use of resources, the average worker is working between one hundred to two hundred more hours per year than twenty years ago, yet for less real income¹⁷. In fact, *true* income

¹⁵ In chapter 3. The values have been converted into kilograms.

¹⁶ Source: The Economic History Website at <http://eh.net/hmit/gdp/>

(real income less income expended on social or environmental ills¹⁸) has dropped very significantly as the costs of social malaise have risen. Figure 2 shows how GPI (Genuine Progress Indicator), which is a simple removal from GDP of non-productive costs, has remained mostly static during the last thirty years. This situation is no different in any of the old Western economies.

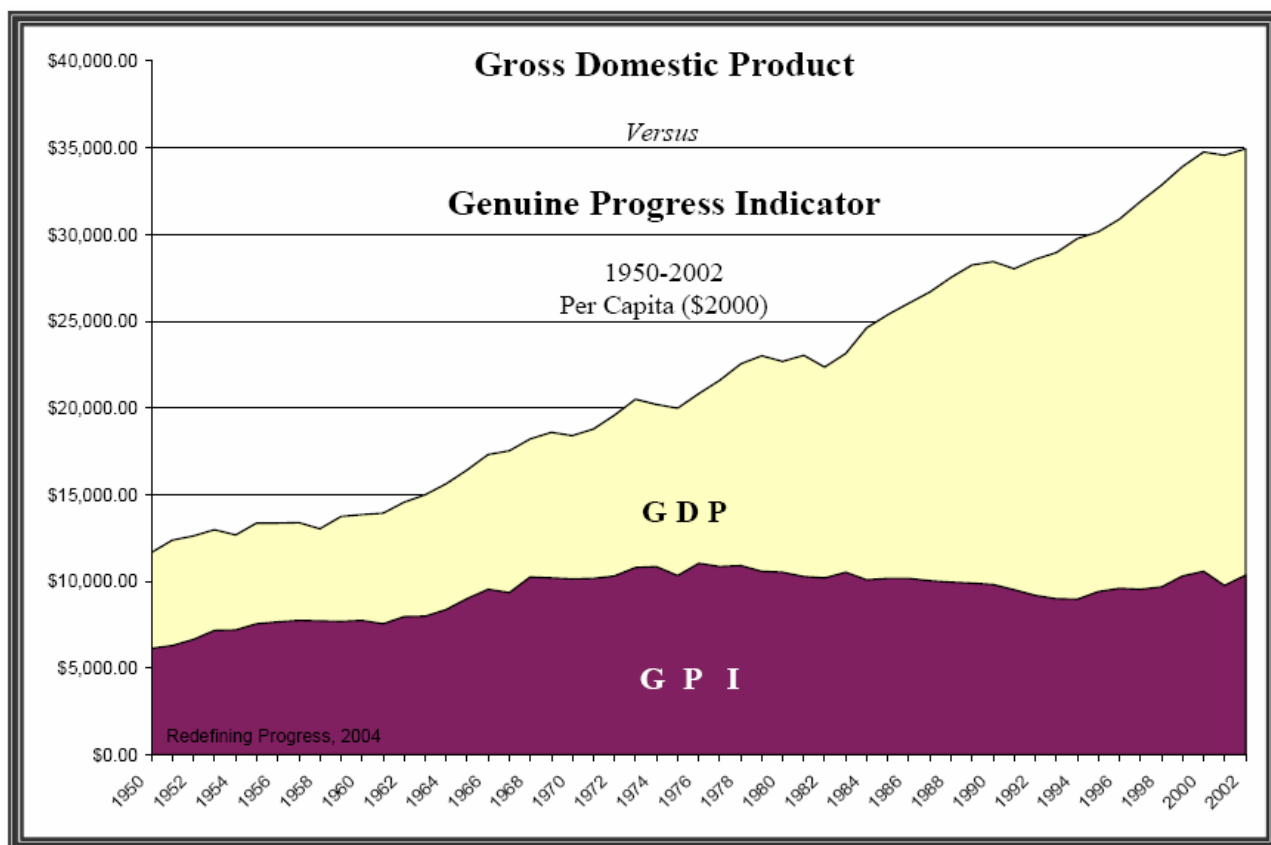


Figure 2: GDP vs. GPI for the USA, 1950-2002¹⁹

Coming at the situation from a less economic perspective, the Happy Planet Index²⁰ is a simple measure of how happy and long-lasting lives are for a given input of resources. On this scale, the

¹⁷ Mishel (1997). The bottom 80% of the US population have seen real income decline almost continuously since the 1970's.

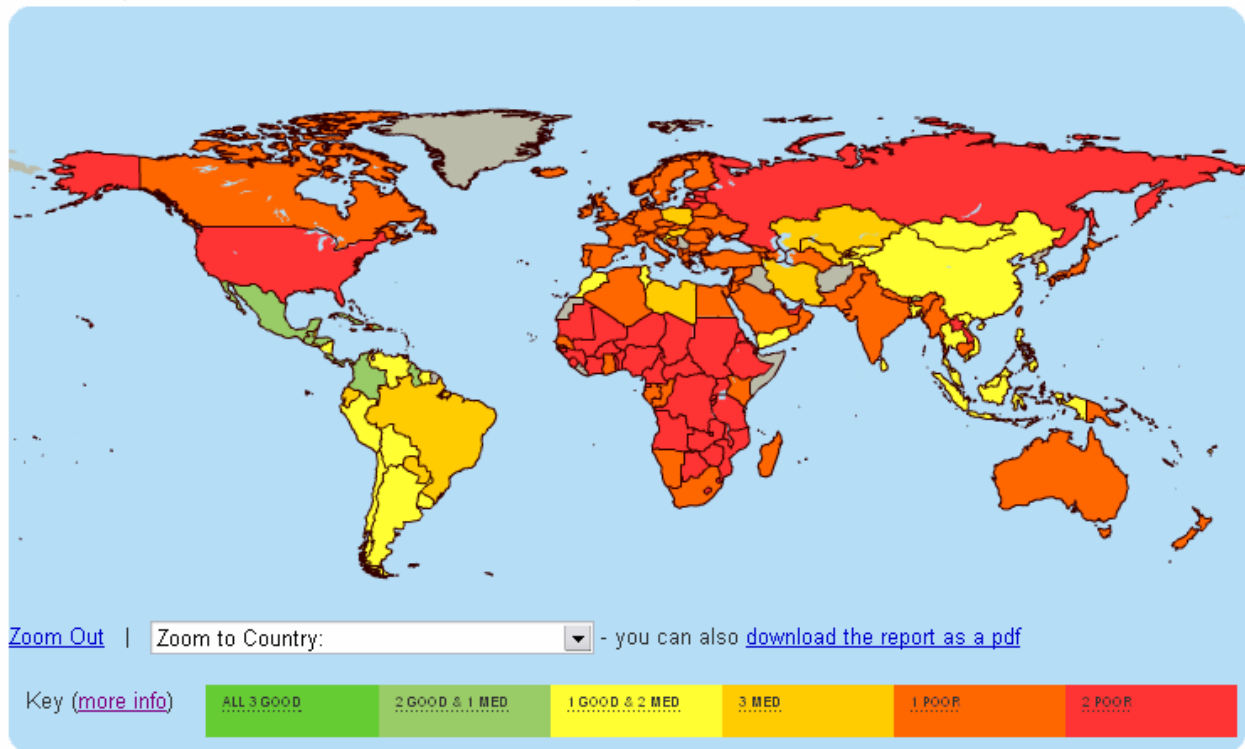
¹⁸ It is a peculiarity of GDP calculations that the costs of commuting, poisoned air or food, crime, unemployment etc. are *added* to net income rather than subtracted. Prominent economists have clamoured for change since Keynes onward.

¹⁹ Source: <http://www.rprogress.org/>

²⁰ Source: The New Economics Foundation (<http://www.happyplanetindex.org/>)

US (as with most western countries) does poorly, coming in at position 108th of 178. Figure 3 shows a colour-coded map of the world depicting HPI levels.

A map of the world colour-coded by HPI



Map powered by [DIY map](#) © The new economics foundation 2006.

Figure 3: World HPI map

How can we have so lost our way? The problem is one of perception – we simply do not account for externalised costs when calculating net benefit. Put more simply, when we calculate benefit to ourselves, we leave out the damage we have pushed onto others – leading us to believe that our benefits sum to a total benefit much higher than is truthfully the case. The continuing use of GDP to measure wealth of nations when GPI is being published in some form by most Western governments shows just how deeply this conceptual problem is buried.

Yet it is only **very** recently that anyone has realised the scale of this – literally the last twenty years²¹. Indeed, even ten years ago we didn't even have reliable estimates of the quantities involved

²¹ Hawkin & Lovins (1999) makes an excellent anthology of the empirical evidence. Capra (1983, 1996, 2003) goes considerably into the historical & ideological causes.

in the movement of the carbon, water and nitrogen cycles on which all life on Earth depends²² – and we *still* don't know the nature of these figures.

This is an outstanding example of the disadvantages of multi-rationality and multi-paradigm management. Unlike the citizens of Caral, or indeed almost any civilisation which came before us²³, we have become so far removed from the holistic feedback effects of our actions that we cannot easily see ourselves walking straight at the cliff precipice. The reason we have become so far removed is because of nesting organisations within more organisations to so insulate ourselves from uncertainty that *we can no longer perceive true uncertainty at all!* This is a fundamental problem of centralising & specialising production – we obscure the noticeable effects of resource extraction by moving them to the third world many thousands of miles away²⁴. Interestingly, this is precisely as the limits of logic predicted – incrementally extending a good rationale, but not realising when to “jump” and thus inviting failure.

²² As I found out last summer when trying to research these figures. I haven't quoted any sources because literally among three publications which made a reasonable attempt, there is such wide variation as to make the exercise useless. We simply don't actually know.

²³ Easter Island being a notable exception.

²⁴ Henderson (1995)

The Problem is the Solution

An Alabama hairdresser called Philip McCrory was watching the television during the *Exxon Valdez* oil spill in 1989²⁵. He noted, as did anyone watching at the time, that otter fur seemed remarkably good at soaking up the oil. However unlike everyone else, McCrory wondered to himself if human hair might do the same.

He took some hair from his salon floor and stuffed it into a pair of tights. He then threw this “dummy otter” into his child’s paddling pool after adding a gallon of used motor oil. Within two minutes the pool was clear.

McCrory is now rich after selling the technology to oil companies. Had it been available in 1989, they could have contained almost the entire spill within a week using hair salon refuse instead of spending \$2bn over months to capture only 12% of the spill.

Like many problems which seem intractable, the solution can be incredibly simple. How many millions of people have watched oil spills on the television over countless decades, noted how easily the otters soaked up the oil and didn’t think anything more of it? All it requires is for someone to *ask the right questions* and bingo! One has just improved efficiency ten fold using what used to be waste.

This is an example of just how advantageous a multi-paradigm or multi-rationality approach to management and decision-making can be. The only difference between us and the people who lived in Caral is that we have realised how to do some things more efficiently – it is the sum of embodied realisations made by people like McCrory. Paradoxically, as predicted by the nature of logic, the same thing which is damming us is also our salvation.

Like logic or a knife, organisations can be used for both good and evil. Making good decisions and engaging in good husbandry has yielded a better quality of life in every civilisation. To do so involves balancing multiple factors, taking enough time to reflect whilst not too long to lose timeliness. It is certainly hard to do, but far easier than getting it wrong and losing everything as Europe saw during the Dark Ages.

²⁵ Source: *The New York Times* June 9th, 1998. <http://www.zetatalk.com/info/tinfo06e.htm>

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