Quality Controlled Government with Spherical Logic

By Pamela and Xenogene Gray

Pamela Gray *is an adjunct senior lecturer at Charles Sturt University and a former Visiting Fellow in Law at Cambridge University. She practised law for 15 years prior to becoming a lecturer. Dr Gray's research has been widely published, including the book 'Artificial Legal Intelligence' (1997) which underpinned much of her subsequent doctoral design of the eGanges system.*

Xenogene Gray *is a computational physicist and a PHD candidate at Macquarie University. He is the proprietor of the online business Grays Knowledge Engineering which offers licenses in eGanges.*

Abstract

In the management of large enterprises, quality control has been implemented since it was successfully introduced to Japanese manufacturing following the Second World War. It began with the Ishikawa fishbone graphic (c.1985) which was a practical advance on the Porphyry tree (c.300) that captured the logic of Aristotelian ontology. The fishbone suited a strategic focus on a final objective, with a tributary hierarchy demarcated by goals and targets; it was like a logic River system that could be contrasted with contradictories, uncertainties and consistencies. Graphical representation of the totality of these contrasts took the structure of a sphere (c.1990).

Spherical logic was used to determine processing heuristics in the doctoral design of a legal expert system shell, eGanges, which is also an enhanced quality control tool that can be used to assist education. The obvious use of eGanges is as a quality control tool for government. Its capacity accommodates information as large and as complex as required, and processes the inherent combinatorial options of *pro tem* possibilities as well as data retrieval of information about potential and expectations for change or adaptation, at its precise point of relevance. In an age of globalisation, science and technology, lawmakers and administrators must upgrade their precision and effectiveness to manage an increasingly complex and dynamic real world. Now, civilisation must be designed for sustainability with collective intelligence aids; it cannot tolerate the uncertainties of a *laissez-faire* market that seems to be hurtling toward its own destruction with imploding greed.

If the Australian Environment Minister, former rock star Peter Garrett, had used eGanges to develop a sound legal ontology of insulation and its government-funded installation, his scheme may have been effective to reduce the use of coal-produced domestic electricity, instead of resulting in deaths, fires, unnecessary costs of exploitative entrepreneurs and a change of Prime Minister.

Quality control

Quality control has been implemented effectively in the management of large enterprises, since it was successfully introduced to Japanese manufacturing following the Second World War. It is respected in the administration of British government departments, particularly with the influence of the Department of Trade and Industry, and this is a sound basis for quality controlled government. The skills of quality control in government turn upon the management of large scale, detailed information that can give rise to massive combinatorics in the application of rules of law to the real world; the same skills may be required for business rules and other rules of knowledge or expertise. The paradigm of quality control shifts the nature of government from policy generics which are malleable, to scientific precision in designing and implementing sustainable and optimal civilisation through law and administrative decision-making.

The fishbone

After WW2, with American assistance in the 1950s, quality control was initiated in Japan with the fishbone
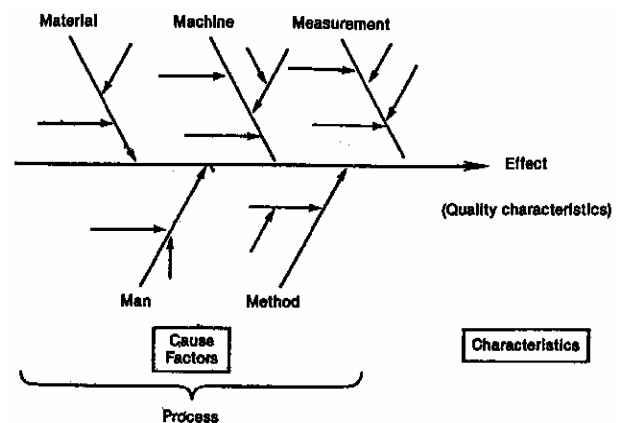
graphic of Ishikawa, shown in Figure 1.

Figure 1: Ishikawa Fishbone[1], Cause and effect diagram

Figure 3: Horrock's Porphyry tree[2]

Ishikawa was concerned to produce a quality standard in manufacturing and his fishbone set out the matters (causes) that had to be managed to achieve this objective (effect). Five matters are identified in generic terms, and the fishbone graphic showed how there might be further particularisation of each: (1) materials, (2) man, (3) machine, (4) method and (5) measurement.

The fishbone was a practical advance on *Porphyry's* tree (c.300AD) that captured the logic of Aristotelian static ontology. Figure 2 shows the Porphyry Tree and Figure 3 shows Horrock's annotations of it to assist in developing the semantic web. The generalisations and inductive instances of Aristotles' ontology in Porphyry's Tree illustrate the logical validity of his arguments such as:

> All men are mortal;
>
> Socrates is a man;
>
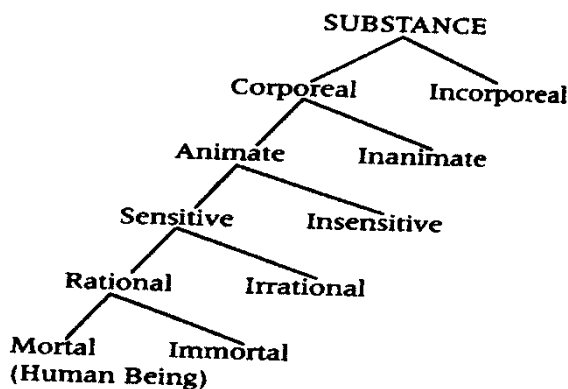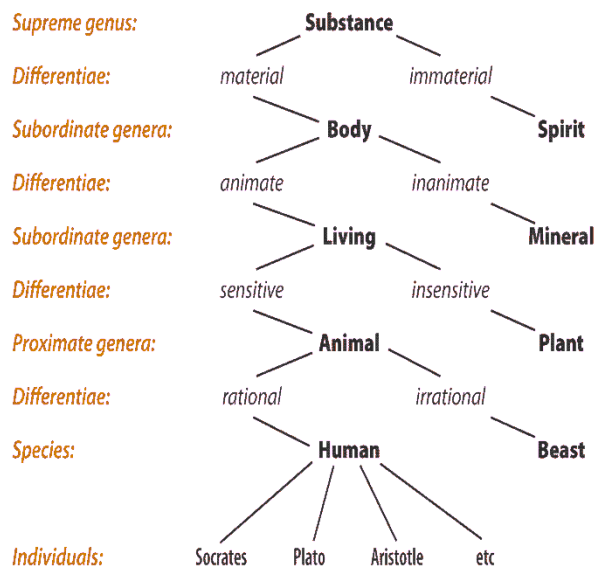> Therefore Socrates is mortal.

Figure 2: Porphyry's tree

Unlike the Porphyry tree, the fishbone suited a strategic focus on a final objective, with a tributary hierarchy demarcated by goals and targets to achieve this objective. It was a practical logic based on a cause and effect ontology of manufacturing. More and more, computer science has hijacked the philosophical notion of ontology to expand its use of semantic nets, according to language use, rather than logic structures. However, the use of ontology, in the philosophical sense of the scheme of being(s), is still required for knowledge engineering rather than semantic engineering. The validity of an ontology may be presupposed, as experts are relied upon to instruct on it. The epistemology of experts in their use of their ontology may better determine the nature of their logical validity and verification.

The British Department of Trade and Industry keep articles on quality control, including on the fishbone method, and other quality control techniques, on their website[3].

Although the fishbone runs left to right, it can be turned in the same direction of top down as the Porphyry tree. Figure 4 (see overleaf) shows the Ishikawa fishbone turned top down, so that it can be read more like the page of a book written in English, from left to right and from top down. In the top down form, the fishbone structure is more readily understood as a tributary River system.

The eGanges river

As a tributary hierarchy, Figure 4 can be understood as a River representation of manufacturing expertise. The River representation was used to develop the eGanges software[4], a quality control tool for use in various stages of quality control. eGanges is especially suited to the legal domain as it was originally designed as a legal expert system shell[5]. An eGanges application can capture the detail required for attainment of an objective, and communicate massive complexity in a user-friendly way, such that no more than the rural understanding of the tributaries of a river system or the urban understanding of street maps is required.

Quality control management, in whatever field, is concerned with detail. It is the Seurat painting or the microtechnology of a domain. Increasingly, legislation particularises complex systems and, in doing so, expands the required bureaucracy to carry out its administrative tasks. The information to convey the detail, and its relevance to legal choice and consequences of informed or ill-informed selection, is not readily available or manageable without common quality control aids.

Stages of quality control could be used by government administration: firstly, brainstorming of new legislation could determine the final result or objective of the legislation, not just to assist statutory interpretation, but also as an achievable objective. Secondly, how to

achieve that objective could be devised as pathways of conditions, details, options in disjunctions, neutral

scientific, technological and engineering infrastructure bring new legal duties of care in social management,
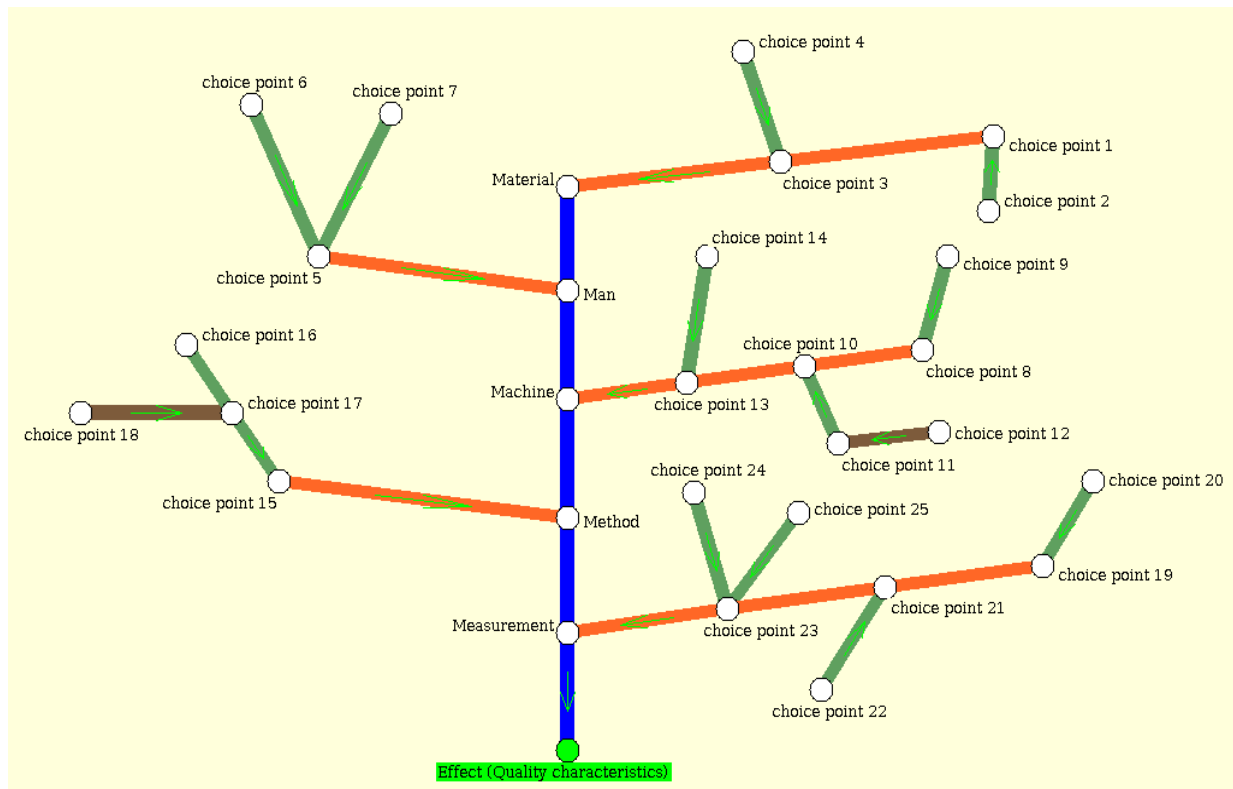

Figure 4: Ishikawa's fishbone turned upside down

work, and everyday life. For instance, the Christian

(tolerable) consistencies, or contradictories (intolerable) to be avoided. The software, eGanges, could be used to assist the brainstorming through an application that maps the pathways to the final objective, as a hierarchy of conditional propositions or rules for the draft legislation. An eGanges application allows for the determination of questions to be asked in order to establish the conditions required, and thereby give public accessibility to the new law. Further brainstorming may produce changes and improvements, as well as maintenance of applications as knowledge expands.

With quality control, comes the need for increased on-the-job training for administrative tasks and the scope for such is inevitably restricted without common quality control aids. Perhaps the complexity exposed by quality control acts as a veil that results in power and protection, by giving rise to informed managers who understand the system and are in a position to impose consequences that were never well understood by those to whom they apply; and because those managers with power are protected by the ignorance of others who do not understand the system of finer choices and consequences which might allow them to call these managers to account. Communicable quality control is necessary for justice. The complex systems of micro-law can be managed and communicated in detail with quality control communication technology.

Perhaps the world that is now governed has become more complex as urban populations have grown and

principle of 'love thy neighbour', which was used to found the law of negligence, now has micro meaning which includes roping off the wet area of a cleaned floor in a supermarket, so that customers are not harmed if they slip and fall on the wet surface. It also includes, for a financial adviser, advising customers on financial risks of investing in foreign currency trading, if that investment is recommended.

A real example: quality control home insulation

In Australia, in 2009, federal legislation provided funding of home insulation as a measure to reduce the use of electricity for heating and cooling. Possible negative and uncertain matters were not managed in the scheme. The insulation industry expanded rapidly with inexperienced insulators. Some stapled insulation to electric wiring, causing some deaths; some covered downlights in the ceiling with insulation, causing some fires; many provided the maximum amount of insulation that could be funded when a lesser amount only was required, and so wasted available funds.

This failure of quality control was thought to have contributed to the change of Prime Minister from Kevin Rudd to Julia Gillard and, possibly, the Australian Labor Party's subsequent failure to obtain sufficient votes to form a majority government after the 2010 federal election. If the Australian Minister for the Environment, former rock star Peter Garrett, had employed eGanges to

develop a sound quality control system of insulation and its government-funded installation, his scheme may have been effective in achieving a scientific reduction of the use of coal-produced domestic electricity, instead of

Where a node has the appearance of a soccer ball, that indicates it has a submap. Any node can be glossed with retrievable data relevant to that node. Glosses might indicate the range of instances of a condition, or simple
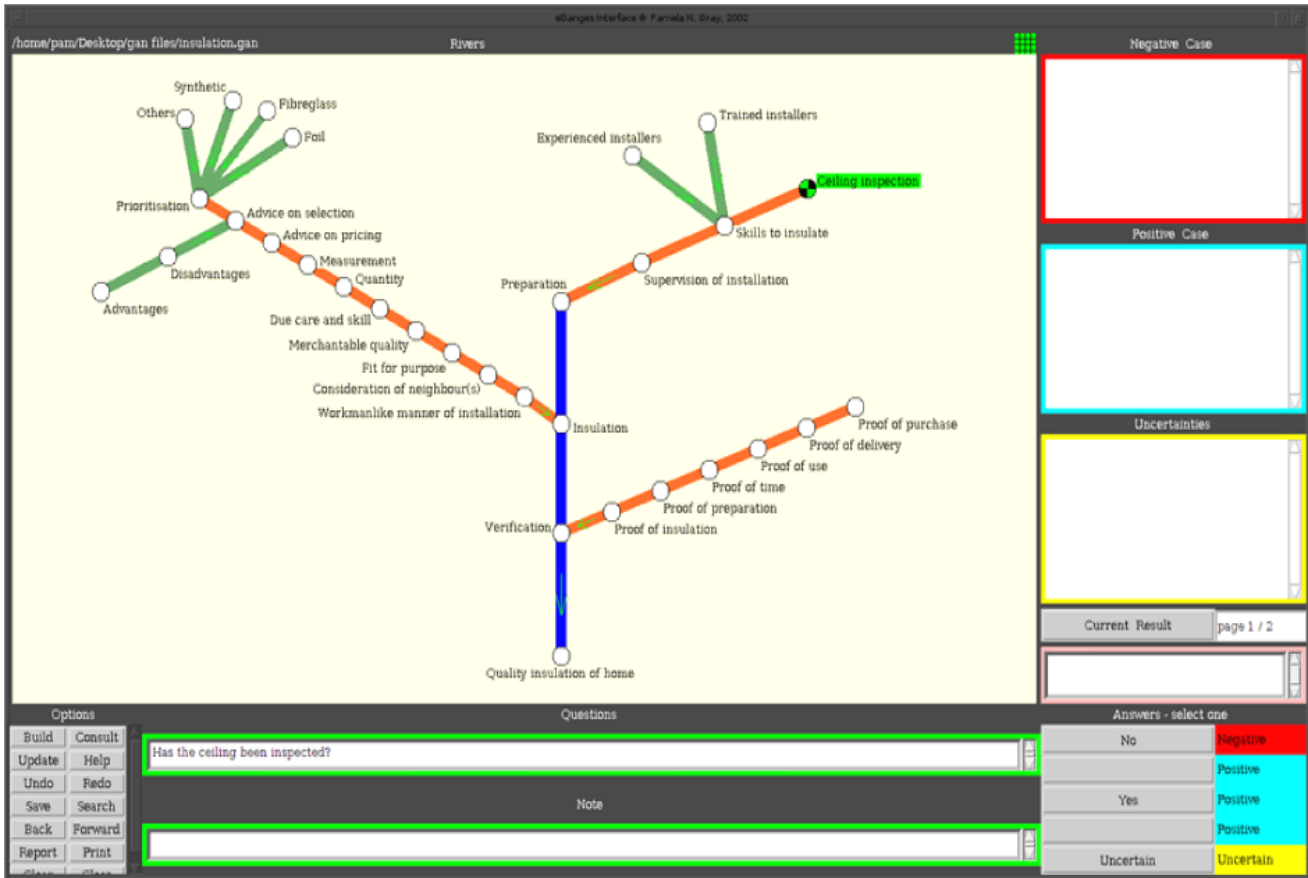

Figure 5: Initial map of insulation application in eGanges interface

leading to deaths, fires and other dangers, as well as incurring the unnecessary costs of exploitative entrepreneurs. The commonly experienced quality control practices of business have raised a public expectation of quality control government, both in civilisation design and in administrative operation, no matter how difficult this might be; technological aids are available and indispensable.

Figures 5-6 show a draft eGanges River map for a home insulation application. Figure 6 is a submap of the node, "ceiling inspection", in Figure 5. Submapping in nested graphics permits an expansion of the application to cover and manage all the requirements. In this real example, it can be seen that a condition such as "preparations" on the mainstream, may be particularised by conditions on the secondary stream which join the mainstream at the point of "preparations". The hierarchy of finer definition may continue upstream through tertiary, quaternary, quinary etc streams. As conditions are satisfied upstream, they flow down to establish the consequents in lower streams, until eventually the final objective is established.
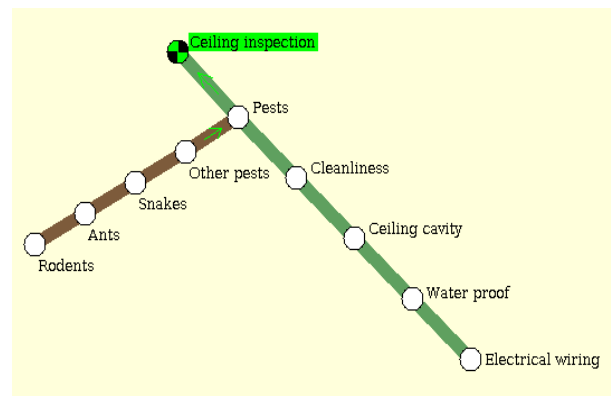
Figure 6: Submap of Ceiling inspection

text that explains, justifies or warns of some related matter.

If each tributary stream in the River is seen to represent a rule, a hypothetical proposition or a conditional proposition, then the logic of the River expertise can be understood. For example, in Figure 5, the mainstream rule is:

If there are preparations, insulation and verification, then there is quality insulation of home.

The secondary stream that establishes preparations is a rule that:

If there is ceiling inspection, skills and supervision, then there are preparations.

The tertiary stream arising from ceiling inspection is a rule that:

If there is (inspection of) electrical wiring, waterproofing, (ownership of) ceiling cavity, cleanliness and pests, then there is ceiling inspection.

And so on.

Each antecedent in the rules, has a question that is put to establish the condition, and the user is given a choice of three possible answers: yes, no or uncertain. Each answer is associated with either a Positive, Negative or Uncertain final result i.e. that there is the Positive result of Quality insulation of a home, the Negative result of Failure of quality control, or an Uncertain result of uncertain quality control. The questions provide an opportunity for the user to give input that is the categorical premise of a *modus ponens* argument. Thus if the input answers establish all the conditions for the requirement of ceiling inspection, then the rule consequent of ceiling inspection is established. The River is a hierarchy of *modus ponens* syllogisms, the final consequent of which is quality insulation of home.

The user is advised of outcomes that should be expected for each possible selection of input, and the interim and cumulative outcome is given as feedback.

The sphere

All input may be Positive; this produces a Positive Final result. However, all input may be Negative and this produces a Negative Final result. Alternatively, all input may be Uncertain and this produces an Uncertain Final
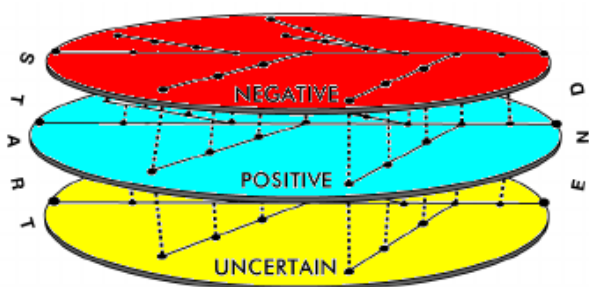
result. Where some input is Positive, and some is Negative or Uncertain, there is a combinatorial explosion of possible alternative situations. A spherical structure is required to represent not just the Positive River, as shown in Figure 5, but also the corresponding Negative and Uncertain Rivers.

Figure 7: Triad of rivers with spectral links

Figure 7 shows the corresponding Positive, Negative and Uncertain Rivers which require 3d logic space for their representation. Figure 8 shows the complete logic sphere, with its two poles that represent the Partial Negative and Partial Uncertain results.

Figure 8: Sphere of total fishbone quality control logic

The Ishikawa fishbone captures only the limited logic of achieving a single objective in predetermined ways that permit the setting of goals that collectively achieve the objective, and targets that collectively achieve each goal. It does not consider failure as an objective which has
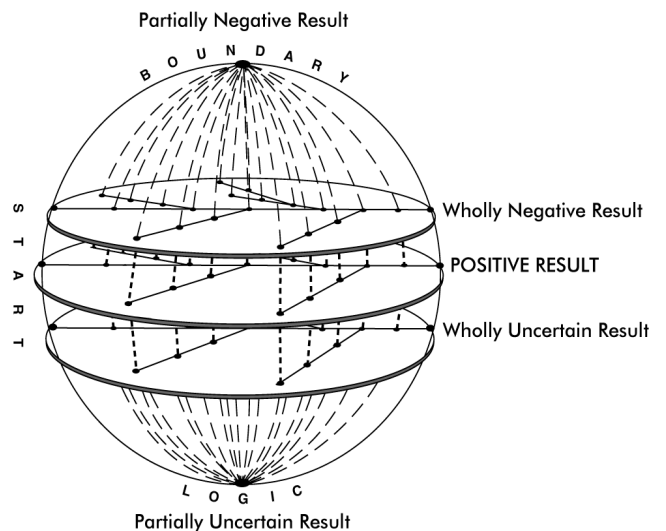
failure goals and targets. However, business is increasingly concerned with risk management and failure. As the world becomes increasingly complex and uncertain, so, too, government is drawn into risk management and failure concerns.

The River system of eGanges was expanded to capture quality control of failure and uncertainties through the total fishbone quality control of a sphere. This fishbone was like a logic River system that could be contrasted with alternatives of contradictories, uncertainties and consistencies[6]. Graphical representation of the totality of these contrasts took the structure of a sphere[7].

The River is a communication paradigm for complex micro systems of legal choice and legal consequences of selection. Spherical quality control can manage micro law so that it is designed, communicated, and maintained, with ready public access. In the Australian insulation scheme, the logic required was spherical and the combinatorial explosions should have been managed systematically.

eGanges processing heuristics

Spherical logic was used to determine processing heuristics in the doctoral design[8] of the legal expert system shell, eGanges, which is also an enhanced quality control tool that can be used to assist communication and education. The operation of these computational heuristics can be viewed by trialling the online eGanges applet[9].

As a quality control tool for government, the capacity of eGanges accommodates information as large and as complex as required, and processes the inherent combinatorial options of *pro tem* possibilities as well as data retrieval of information about potential and expectations for change or adaptation, at its precise point of relevance. In an age of globalisation, science and technology, lawmakers and administrators must upgrade their precision and effectiveness to manage an increasingly complex and dynamic real world. Now, civilisation must be designed for sustainability with collective intelligence aids.

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[8] Ibid (Gray 2007)

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