

ARTICLE

A NEW WAY TO GOVERN FOR ETERNITY BASED ON SYSTEMS SCIENCE

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The pioneering work of the 2009 Nobel Prize Winner Elinor Ostrom on the governance of commonly owned resources continues to inspire researchers across many fields. In his third article for BESS®, Dr Shann Turnbull investigates how systems science can build on Ostrom’s ideas of *polycentric governance* to transform corporations into ecologically governed common pool resources (CPRs) to help counter environmental degradation and reduce economic inequality.

INTRODUCTION

This paper is motivated by the CEO of the largest asset manager in the world¹ writing to the CEOs of all his investee companies in 2018 raising the need for: “A new model for corporate governance” and that “companies must benefit all their stakeholders”.² A year later, 180 other CEO members of the US Business Round Table (BRT), who had received the 2018 letter from Fink, committed to “lead their companies for the benefit of all stakeholders – customers, employees, suppliers, communities and shareholders”.³

However, unlike Fink,⁴ the BRT did not suggest any “new model for corporate governance”. As pointed out by Bebchuk and Tallarita,⁵ Pistor⁶ and others, CEOs accountable to a variety of stakeholders can allow CEOs to become accountable to no one.

1. Fink became the founding chair and CEO of NYSE publicly traded company BlackRock that in 2021 had funds under management of \$US9.5 trillion dollars. This represents around ten percent of all globally traded 2020 equities of \$US94 trillion reported at https://en.wikipedia.org/wiki/Stock_market#Size_of_the_markets.

2. Fink, 2018

3. BRT, 2019

4. Fink, 2018

5. Bebchuk and Tallarita, 2020

6. Pistor, 2019

This suggests that the BRT CEOs do not possess a creditable process to achieve their purpose. A contribution of this article is to present a way to provide such a process, not just for CEOs but also for stakeholders, political leaders and the wellbeing of humanity and the planet.

Neither shareholders nor other stakeholders can exist alone. They are locked into a “Yin ~ Yang” existential independency in extracting benefits from corporations. However, the “asymmetry of power and information”⁷ between shareholders and other stakeholders introduces systemic problems and conflicts of interests. Evidence that these conflicts represent a systemic problem is provided by the substantial and frequently re-occurring fines reported by “Violation Tracker”.⁸

Economists had long assumed that competition for accessing life-sustaining common pool resources (CPRs) led to “the tragedy of the commons” denying benefits for everyone.⁹ In her Nobel Prize acceptance speech, Elinor Ostrom¹⁰ presented design principles for avoiding such tragedies. Ostrom identified how systemic conflicts of interest could be resolved by a polycentric system of self-governance without “markets and states” as occurred in premodern times.¹¹

A key contribution of this paper is to use the insights of Ostrom and systems science to design corporate constitutions and bylaws to allow corporations to creditably provide benefits for all their stakeholders. This would convert corporations into a CPR.

A second key contribution is to describe how polycentric governance can release and exploit the DNA hard-wired ability of living creatures to

possess dual paradoxical contrary ~ complementary behaviour described by system scientists as “tensegrity”.¹² Tensegrity is described by Ingber¹³ as the “architecture of life” and was identified by Turnbull and Guthrie¹⁴ as the most efficient way for individuals and organisations create or manage complexity.

A third key contribution of this article is to identify a self-funding tax incentive for shareholders to change their corporate constitutions to convert companies into self-governing self-reproducing CPR corporations to counter degradation of the environment locally and globally for eternity.

How these proposals might be introduced, and their broader impacts are considered in the concluding section.

Literature review

A review of literature reveals how this article makes contributions included in a list of 24 described in Turnbull.¹⁵ The Social Science Research Network (SSRN) archives in December 2021 contained over a million abstracts from more than 700,00 authors. They included 19,168 papers that possessed in their title, abstract or keywords, the phrase “corporate governance”. The only authors who had contributed *any* paper that associated corporate governance to the systems science concepts of “holons”, “holarchy” and “tensegrity” were Turnbull and Guthrie.¹⁶ Only four other authors had associated the concept of a “common pool resource” to “corporate governance”. None of these papers had been written before Ostrom’s research gained recognition through her Nobel Prize award in 2009.

7. Hayne, 2018, p. 269

8. Violation Tracker; <https://violationtracker.goodjobsfirst.org/parent/jpmorgan-chase>

9. Hardin, 1968

10. Ostrom, 2009b, p. 422

11. Angus 2017, Ostrom 1990, Thurston and Fernández-Götze 2021

12. Turnbull and Guthrie 2019, p. 54

13. Ingber, 1998

14. Turnbull and Guthrie, 2019, p. 55

15. Turnbull, 2021b

16. Turnbull and Guthrie, 2019

Vincent Ostrom, a political scientist and husband of Elinor, another political scientist, first used the term “polycentric governance” in Ostrom et al.¹⁷ The term was then used extensively in their many articles archived in Indiana University’s “Digital Library of the Commons”.¹⁸ There are only 38 articles in the SSRN archives that involve polycentric governance, with less than two dozen in relation to corporate governance. However, the term polycentric governance may be described with other words such as “network governance”¹⁹ or “bi-cameralism”, or the phenomenon is ignored.

Such ignorance was explained by Kuhn²⁰ with the following words: “No part of the aim of normal science is to call forth new sorts of phenomena; indeed, those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others”.

An example of using different words for describing polycentric governance is provided by the author’s PhD research^{21, 22} based on his experience and research into firms controlled by more than one board. The term “compound board” was used to “describe the existence of two or more control centres whether or not they were required by law, the constitution of the firm or created by relationships external to the firm”.

The corporate governance literature review in the author’s PhD dissertation was republished

as Turnbull,²³ and continues to be constantly cited. A second literature review, focused on the literature relevant to polycentric governance, is presented in the Appendix of Turnbull’s 2021 working paper *Do we need a new model of corporate governance?*²⁴ The scope of this second review is set out in Table 5 of Turnbull and Poelina²⁵ in this issue of *BESS*[®].

All the articles in the SSRN involving polycentricity and corporate governance are dated after Ostrom²⁶ authored a paper for the World Bank on “A polycentric approach for coping with Climate Change”. In her paper, Ostrom advised against top-down solutions by multinational institutions like the World Bank and United Nations. Ostrom specified the need to involve “small-scale to medium governance units”.

This bottom-up approach is confirmed by the laws of systems science that “absolutely prohibits any direct and simple magnification [of regulation] but it does not prohibit supplementation”.²⁷ Regulation of large systems, such as the global environment, can only be achieved by indirect means provided by a requisite variety of complementary co-regulators. This explains why Turnbull and Myers²⁸ supported the Ostrom bottom-up approach before becoming aware of her work. The bottom-up approach can be introduced by the self-funding tax incentive described in Turnbull²⁹ and Turnbull and Poelina.³⁰ There are significant wider benefits detailed below.

17. Ostrom et al., 1961

18. <http://dlc.dlib.indiana.edu/dlc/search>

19. Craven et al., 1996; Nohira and Eccles, 1992; Pirson and Turnbull, 2011b, 2015; Podolny, and Page, 1997; Turnbull 2014c; Van Alstyne, 1997

20. Kuhn, 1970, p. 24

21. PhD dissertation republished as a book (Turnbull 2014b) with three appendices: I Key words and concepts; II Examiners report; and III Citation of resulting literature, <https://www.morebooks.de/store/gb/book/designing-resilient-organisations/isbn/978-3-659-34586-9>

22. Turnbull, 2000d, p. 27

23. Turnbull, 2000a

24. Turnbull, 2021b

25. Turnbull and Poelina, 2022

26. Ostrom, 2009a

27. Ashby 1956, p. 268

28. Turnbull and Myers, 2017

29. Turnbull, 1975, Appendix; 2000c; 2020b; 2021e

30. Turnbull and Poelina, 2022

Also considered are neglected areas of research into bottom-up regulation,³¹ management³² and governance.³³ A point confirmed by the preeminent Academy of Management (AOM) which in 2021 held a Caucus to discuss “Education for Managing Existential Risks of Humanity” at its Annual Meeting.³⁴

The pitch document to the AOM contained an ecological form of polycentric architecture illustrated in Figure 1 of Turnbull and Guthrie³⁵ that is reproduced below in an upgraded version. Ecological governance arises when firms with polycentric governance replace static, exclusive and perpetual property rights with those that are dynamic, inclusive and time limited. How this form of governance could reduce or mitigate 20 systemic problems of hierarchies is set out in “Table 3. How mimicking nature can mitigate systemic problems of hierarchies” of Turnbull and Poelina.³⁶ The outcomes provide persuasive reasons for adopting “a new model of corporate governance” based on ecological governance.

Structure of this article

The next Section introduces case studies of polycentric governance created or identified by the author. The following third Section introduces conceptual tools for identifying, understanding, evaluating and designing polycentric self-governance systems. A fourth Section expands the reasons for adopting a new model. A concluding section consider the implications of adopting ecological governed CPRs to facilitate eternal governance for humanity.³⁷

CASE STUDIES OF POLYCENTRIC GOVERNANCE

Case studies of polycentric governance are identified in this section. They provide a basis for understanding the opportunities for organisations involved in sport, civil society and business to become CPRs subject to democratic self-governance without markets or state.³⁸

Polycentric governance in sport

In 1950, the author became one of two delegates to represent the State of Tasmania as a member of the unincorporated Australian National Ski Federation (ANSF). The ANSF made the rules for competitions between the states and represented Australia at international competitions.

In 1974, as the unpaid Chief Executive Officer of the ANSF, the author incorporated the organisation. This had the effect of federating the polycentric self-governing State Ski Councils that, in turn, had been formed by federating their self-governing ski clubs. In turn, the incorporated Australian Ski Federation became a polycentric self-governing member of the international body for skiing that was a polycentric self-governing unit of the self-governing Olympic Committee. No economic markets were involved, and hierarchies were minimal.

The above relationships created a five-level vertical chain of nested polycentric self-regulating and self-governing units. As political scientists, the Ostroms would describe each self-governing unit at each level as a “republic”. Systems scientists³⁹ describe self-governing units that possess paradoxical features

31. Turnbull, 2019a, 2021d

32. Turnbull and Pirson, 2019

33. Poelina et al., 2021

34. Alijani and Turnbull, 2021

35. Turnbull and Guthrie, 2019, p. 58

36. Turnbull and Poelina, 2022

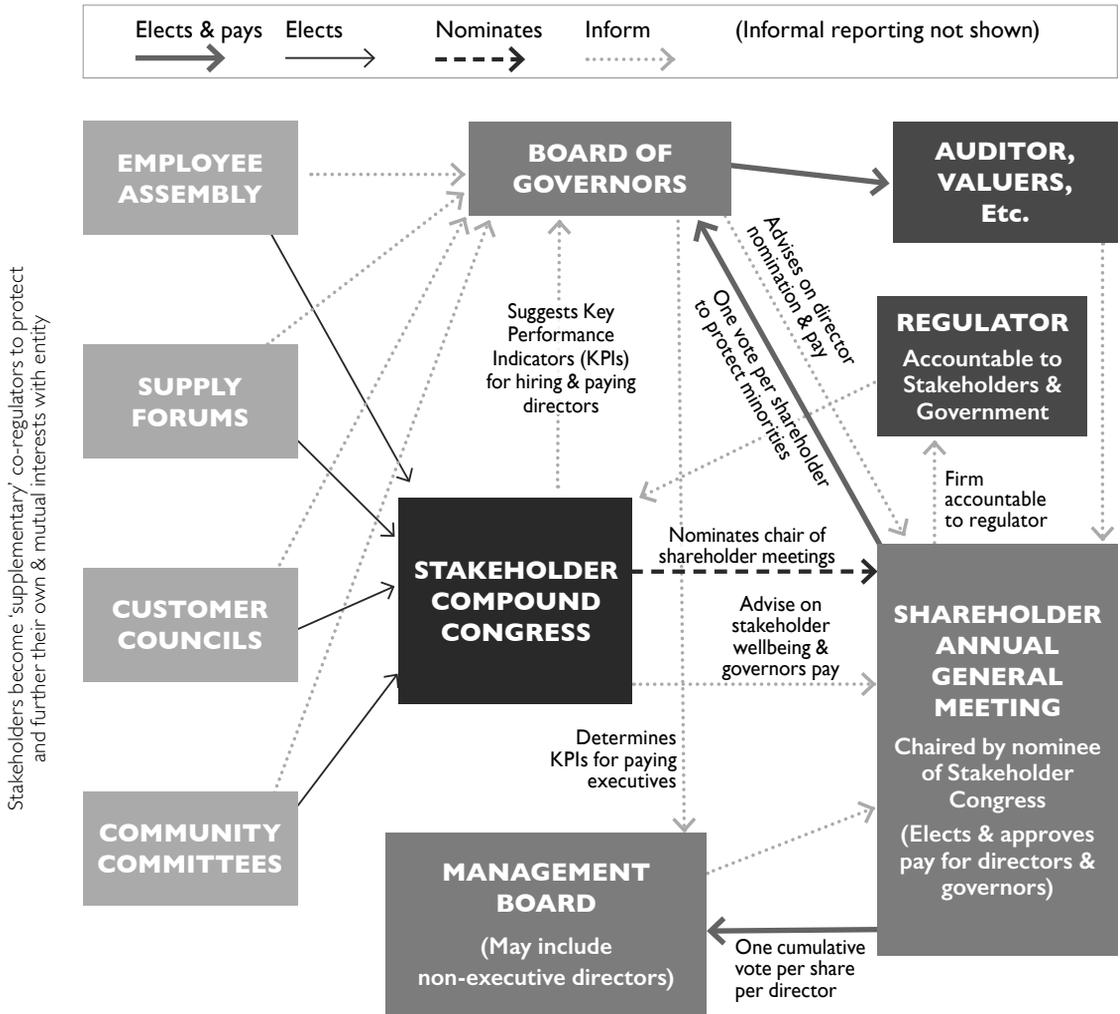
37. Turnbull, 2018a

38. Turnbull, 1994, 2014a, 2022

39. Turnbull and Guthrie, 2019, p. 55

FIGURE 1:⁴⁰ Ecological governance described by Ostrom can make corporations a ‘common good’ benefiting all stakeholders as sought by worlds’ biggest investor (Fink 2018)

Separation of governance powers from management allows independent bottom-up and outside-in stakeholder intelligence to integrate governance into Corporate Social Responsibilities to monitor and control misconduct. Systemic contestability of decisions protects and nurtures with less costs the interests of stakeholders, the firm, and society. Shareholder primacy is maintained for stakeholders who become shareholders.



Stakeholders become 'supplementary' co-regulators to protect and further their own & mutual interests with entity

For publicly traded, large private firms, non profits and government corporations to make shareholders and regulators responsible for the wellbeing of stakeholders

40. Developed by the author in various forms from 'Figure 5, Stakeholder council', in: S. Turnbull, 'Best practise in the Governance of GBES', in J. Guthrie (ed.), *Making the Australian Public Sector Count in the 1990's*, Sydney, IIR Conferences, 1995, p. 105

as a “holon” and the nested vertical hierarchy of holons as a “holarchy”⁴¹

Before the work of Koestler, Simon⁴² referred to this organisational architecture as “sub-components”. The founding CEO of VISA Inc, who designed its bottom-up stakeholder-governed organisation invented his own word. This was “chaordic” created from combing the words “chaos” and “order”.⁴³ Schumacher⁴⁴ noted that “all real human problems arise from the antinomy of order and freedom. Antimony means a contradiction between two laws: a conflict of authority; opposition between laws or principles that appear to be founded equally in reason”. This describes the “Yin ~ Yang” relationship noted above between shareholders and stakeholders.

The dual paradoxical interdependent complementary ~ contrary relationship has become described in a growing literature as “tensegrity”⁴⁵. The tilde sign “~” was introduced by Kelso and Engstrøm⁴⁶ to indicate complementary ~ contrary relationships. They reported “experiments that show that the human brain is capable of displaying two apparently contradictory, mutually exclusive behaviors at the same time”. This phenomenon is also observed with sub-atomic particles where it is described as “superposition”. A hypothesis of Turnbull⁴⁷ is that tensegrity is a fundamental characteristic of the universe as suggested in “Table 2. Identifying dual behaviour of Humans/ Biota/Holons/Holarchy and the universe” in Turnbull and Poelina.⁴⁸

The organisational architecture of skiing explicitly illustrates how competition ~ cooperation can constructively exist in each self-governing unit that systems science describes as a holon. A defining feature of holons is that they allow their constituent parts at each level to both compete and cooperate with each other as occurs in the human brain.⁴⁹

The skiing example of nested networks of self-governing independent components is commonly used by other sports and civic organisations that may not meet the test of possessing tensegrity, like the Red Cross and Rotary International. A civic example that had tensegrity built into its internal power structure was created by the author as is next considered.

Polycentric civic governance

In 1976, the author accepted an invitation to join three others on the Board of The Company Directors Association of Australia (CDA). The CDA was a not-for-profit organisation that both paid director’s fees and fees for any additional services such as writing modules for the first educational qualification in the world for company directors.⁵⁰

The CDA was formed in 1967 to compete for members with the autonomous branches formed in Australia by the London-based Institute of Directors (IOD). In response, the IOD branches were merged into an autonomous Australian entity in 1971. Its CEO was a sales representative of a London-based life insurance company. The founding Chair/CEO of the CDA was likewise a commission agent for an insurance company. The CDA founder

41. Koestler, 1967

42. Simon, 1962

43. Hock, 1999

44. Schumacher, 1973, p. 209

45. Fuller, 1961

46. Kelso and Engstrøm, 2006

47. Turnbull, 2021c

48. Turnbull and Poelina, 2022

49. Kelso et al., 2013

50. 1975 Chartered Directors Course brochure and other related materials: <https://drive.google.com/drive/u/0/folders/0B13bh2n3zrFAQnRZOWJZdWN4dDQ?resourcekey=0-H0IHjOhuSHfN3Cy29eHKjw>

had incorporated a private for-profit company named CDA Services P/L to provide insurance and secretarial procurement services to members of the CDA and for anyone else.

The discovery of this otherwise undisclosed conflict between private and public interests resulted in the founding Chair/CEO of the public CDA resigning in 1976. To reduce the opportunity for such conflicts arising and remaining undetected in the future, the author rewrote the CDA constitution that was adopted by a vote of members in 1978.

The amended constitution introduced a division of powers with each State Chapter becoming self-governing. Tensegrity in the form of competition ~ cooperation for individual members' power, status and influence (PSI) was introduced by State Chapters not being able to appoint their own President unless a contested election was held to elect the State Committee. There were also limited terms of appointment for office bearers that required a larger majority of votes to extend office holders appointment.

In 1990, the CDA merged with the IOD affiliate in Australia to create the Australian Institute of Company Directors (AICD). The merger arose because of the rapid growth in membership generated by local State Chapters promoting the Company Directors Course.⁵¹ The merger retained the State Chapters, and the AICD now has over twice the number of members than similar organisations in the UK or the US whose total populations were respectively over two and half times and 13 times larger.⁵²

Polycentric corporate governance in three different jurisdictions

Substantial firms that illustrate a polycentric governance architecture can be found in major jurisdictions like the US, UK and Europe.⁵³ They demonstrate that: (a) no changes are required in public law to introduce polycentric governance, only a change in corporate constitutions that only involves private law; (b) the ability of polycentric governance to be competitive with mainstream forms of governance, and (c) the ability of polycentric governance to be resilient, survive and prosper over business cycles during the last half-century.

One US example is the credit card company VISA International Inc created in 1970 by banks that had been competing in issuing their own credit cards. Its polycentric governance allowed each stakeholder bank to obtain exclusive control for issuing cards in their territory but cooperate with other banks in promoting and managing their mutually owned and controlled business.

Hock⁵⁴ explained that the organisation possessed "multiple boards of directors within a single entity, none of which can be considered superior or inferior as each has irrevocable authority and autonomy over a geographical or functional area". "No part knew the whole and the whole does not know all the parts, and none had any need to" because they were self-regulating. This illustrates Mathews⁵⁵ statement regarding holonic systems that "no part of the system will possess complete information about any other part". This partly

51. The rapid growth in CDA membership arose from small traders incorporating to obtain limited liability who knew they had an educational deficit in corporate matters. Members of the IOD in Australia were mainly qualified accountants and lawyers acting as non-executive directors for local and foreign firms. This explains why the CEO of the IOD in Australia declined the author's invitation arising from Turnbull (1971) to host the first educational qualification course in the world for directors as it would be seen to be demeaning of its members.

52. The 2021 membership reported on the webpages of the AICD, US-based National Association of Corporate Directors, and IOD are 46,000, 22,000 and 20,851 respectively.

53. Turnbull, 2000d, pp. 179, 186, 200; Turnbull and Guthrie, 2019, pp. 56, 57

54. Hock, 1999, p. 191

55. Mathews, 1996, p. 40

explains how “the reduction in data transmission, and in data complexity, achieved by the holonic architecture, is prodigious”.⁵⁶

Hock⁵⁷ described VISA as an inside out holding company in that it does not hold but is owned by its functioning parts. The 23,000 financial institutions which create its products are, at the same time, its owners, its members, its customers, its subjects and its superiors.” In 2008, VISA made the then biggest IPO in history⁵⁸ to prove investor confidence in what represented “a new model of corporate governance”.⁵⁹

The John Lewis Partnership (JLP) provides a UK example of a business with a polycentric self-governing architecture. It is one of the largest retail businesses in the country, operating chains of supermarkets and department stores. In 1929, the son of the founder entered into a 21-year agreement with the employees for them to acquire all his shares in the business he had inherited. Since 1950, JLP has been employee-controlled with carefully crafted polycentric distributed decision-making centres. This introduces the checks and balances required for stakeholder self-governance and also minimises information overload.

The architecture of JLP is described in Turnbull's doctoral dissertation “The governance of firms controlled by more than one board: Theory development and examples”.⁶⁰ Like VISA, the polycentric decision-making centres are distributed geographically as well as functionally. As with VISA, this also creates bottom-up governance to challenge top-down control. In this way, tensegrity

is systematically embedded vertical with horizontal tensegrity arising from cooperating units competing for superior operating performance. The benefit of such internal competition is noted by Smith and Lewis⁶¹ who describe how “paradoxical tensions enable sustainability – peak performance in the present that enables success in the future”.

The Mondragón Corporacion Cooperativa (MCC) is a European example of polycentric bottom-up governance guided by top-down control. Located in the Basque region of Spain, its first worker cooperative was established in 1957. The MCC now contains almost 200 self-governing multi-stakeholder primary cooperatives. These become federated in a second level coordinating cooperatives that, in turn, are coordinated at a third level of the holarchy.⁶² However, like the communication and control architecture of human bodies, the MCC contains lateral “service” holarchies like a bank, research and development cooperative, a social security business, and an entrepreneurial business creating new cooperatives described by Ellerman⁶³ as a “factory factory”.

Details and MCC analysis are presented in Turnbull (2000d).⁶⁴ Notable elements are described in: “Figure 6.1. Mondragón Cooperative System: With dates of establishment”. Like other Figures detailing the governance architecture of the other case studies of stakeholder-controlled organisations, these do not explicitly reveal their polycentric governance architecture. The polycentric governance architecture is vividly revealed in Figure 6.3 of Turnbull.⁶⁵ Table 6.1 of Turnbull⁶⁶

56. Mathews, 1996, p. 30

57. Hock, 1995, p. 7

58. Reuters, 2008

59. Fink, 2018; Turnbull, 2002

60. Turnbull, 2000d, pp. 190–194

61. Smith and Lewis, 2011, p. 381

62. Turnbull, 2000d, p. 218

63. Ellerman, 1982

64. Turnbull, 2000d, pp. 200–225

65. Turnbull, 2000d, p. 218

66. Turnbull, 2000d, p. 221

provides a holon typology of the MCC (reproduced in Turnbull and Poelina⁶⁷). How the MCC component holons integrate into the architecture of the universe is presented in its “Table 3.8, Hierarchy: Hierarchy of Holons”.⁶⁸ How the MCC decomposes the decision-making labour of a single board into five different decision-making centres is shown in Figures 7.1, 7.2 and 7.3⁶⁹ reproduced in Turnbull and Guthrie.⁷⁰ The decomposing and distributing of decision making in this way is another process for minimising information overload.

A methodology for evaluating and explaining polycentric governance in nature or society was developed in Turnbull⁷¹ described as “Transaction Byte Analysis” (TBA). A table showing how TBA subsumes and extends Transaction Cost Economics (TCE), developed by Williamson,⁷² to any social system in any forms of life is reproduced in Turnbull and Poelina.⁷³ TBA grounds the analysis of complex organisations in the natural sciences. The following Section introduces related concepts from systems science to provide a basis for further research, design, experimentation and evaluation based on systems science and so the laws of nature. This illustrates the value of “biomimicry”.

NEW CONCEPTS REQUIRE NEW WORDS

As reported in the literature review above, it seems that social scientists have not concerned themselves with the words, concepts and

phenomena described by holons, holarchy and tensegrity. These words and concepts have been introduced by BESS® in the contributions by Turnbull and Guthrie⁷⁴ and Turnbull and Poelina.⁷⁵

Mathews⁷⁶ describes the existence of intellectual bubbles arising within groups of scholars using different words to describe similar concepts, so their research becomes disconnected and neglected. In other words, different authors may be researching the same phenomenon but use different terms. As noted above there was no need for new words to be created like “tensegrity” and “chaordic” when the word “antinomy” already existed.

Tensegrity

Mathews⁷⁷ stated: “It is striking how organisational science has tried to discuss this most fundamental and basic of problems without adequate terminology”. A point he was unwittingly illustrating by omitting the word “tensegrity” in his article when it so fully described its features that led to his cited statement. Mathews shared the speculation of Ingber,⁷⁸ Hock⁷⁹ and Wilson et al.⁸⁰ that tensegrity could explain “the origin of life itself”. Support for this speculation is also presented in Turnbull.⁸¹

Innovations of evolution seem to arise from the variety introduced by tensegrity being challenged in various contexts to allow novel changes to emerge to form new entities by mutation or symbiosis that is better suited while also reproducing

67. Turnbull and Poelina, 2022

68. Turnbull, 2000d, p. 130

69. Turnbull, 2000d, pp. 244–245

70. Turnbull and Guthrie, 2019, pp. 65, 66, 67

71. Turnbull, 2000d, pp. 83–140

72. Williamson, 1975

73. Turnbull and Poelina, 2022, Table I

74. Turnbull and Guthrie, 2019, pp. 54–59

75. Turnbull and Poelina, 2022

76. Mathews, 1996, pp. 36–38

77. Mathews, 1996, p. 31

78. Ingber, 1998

79. Hock, 1999

80. Wilson et al., 2013, S24

81. Turnbull, 2021c

tensegrity to maintain the evolutionary processes. Tensegrity is a process inhibited, denied or punished in hierarchies of “authority” on which the theory of firms was developed by Coase.⁸²

Buckminster Fuller⁸³ coined the word “tensegrity” by combing the words “tension” and “integrity” for describing physical structures, not social ones. This concept has since been recognised by natural scientists but neglected by social scientists. One exception is Pound,⁸⁴ who recognised its need, but not its name, when stating: “always have an opposition viewpoint” and “There must always be an opposition party and the prospect of insurgency”.⁸⁵ In other words, unlike hierarchies, checks and balances need to be embedded in survivable social systems. The relevance of tensegrity to social organisations was identified in Turnbull⁸⁶ and confirmed by Kelso and Engstøm⁸⁷ with support from Judge,⁸⁸ Hock⁸⁹ and Muresan.⁹⁰

“The science of governance”⁹¹ explains why the laws of nature found in the physical world also apply to individuals, society and institutions. They explain the similarities noted between biology and economics tabulated in Turnbull.⁹² Ashby⁹³ explains why identical phenomena arise in both social and natural science by observing that “The truths of cybernetics are not conditional upon them being derived from another branch of science. Cybernetics has its own foundations.”

Extending the remit of cybernetics to governance

The initial remit of cybernetics was “The science of communication and control in the animal and the machine”.⁹⁴ “The science of governance” has subsumed the science of cybernetics by being the science of communication and control in the animal, machine and social organisations of any species. The science of governance was established by using “bits”⁹⁵ or bytes as a physical unit of analysis. Today, this unit is ubiquitously revealed in countless devices and by Internet service providers.

Bits are perturbations in energy or matter that make a difference. This makes governance a natural science, not social science, and so independent of social constructs like “information” or “costs” used by Williamson⁹⁶ and others. It would have been more appropriate for the word “disadvantage” to be used to replace the word “cost” in the literature developed from the work of Ostrom. This is because economic value and so costs cannot be defined by any one or more specified real things.⁹⁷

To minimise the materials and energy for DNA to communicate how living things are created, survive birth and reproduce in unknowable dynamic complex environments, evolution has developed processes for minimising the material and energy required. The importance of this statement is because “The brain makes up only 2 percent of

82. Coase, 1937

83. Fuller, 1961

84. Pound, 1992, 1993, p. 11

85. Pound, 1993, p.18

86. Turnbull, 2000d, pp. 8, 69, 134

87. Kelso and Engstøm, 2006

88. Judge, 2021

89. Hock, 1999

90. Muresan, 2014

91. Turnbull, 2008

92. Turnbull, 2000d, p. 68

93. Ashby 1956, p. 1

94. Wiener, 1948

95. Shannon, 1948, p. 1, Ashby 1956, p. 126

96. Williamson, 1975, p. 1

97. Turnbull, 2019b

our body weight, but it consumes 20 percent of the oxygen we breathe and 20 percent of the energy we consume".⁹⁸ The human brain is thousands of times more efficient than the most advanced computer chips that cannot match its performance, even if their dependence on external power sources is ignored.⁹⁹

Unlike the social science of economics that seeks to minimise the undefinable social construct of cost, the science of governance is based on minimising materials or energy.¹⁰⁰ In this way, Transaction Byte Analysis (TBA) subsumes and extends the Transaction Cost Economics (TCE) developed by Coase¹⁰¹ and Williamson¹⁰² for analysing only hierarchical organisations. TBA provides a method for analysing any type of organisation and any type of collective activity by humans or any other species. No collective action can occur in society or any form of life without data processing within and between coordinating entities. This statement includes plants. For example, Wohlleben¹⁰³ describes the communication and control processes in trees.

While tensegrity is inhibited or denied in hierarchies, it is a defining feature of holons that are next considered.

Holons

Holons and their holarchies possess radically different properties from social hierarchies of authority. This is revealed by Hock's¹⁰⁴ description of chaord/holon that he described in two different ways: 1) Any self-organising, self-governing, adaptive, nonlinear, complex organism, organisation, community or system, whether physical, biological,

or social, the behavior of which harmoniously combines characteristics of both chaos and order; 2) An entity whose behavior exhibits observable patterns and probabilities not governed by the rules that govern or explain its constituent parts.

In the inside cover of his book¹⁰⁵ describes "chaordic" in three ways: 1) The behaviour of any self-governing organism, organisation, or system, which harmoniously blends characteristics of order and chaos; 2) Patterned in a way dominated by neither chaos nor order; 3) Characteristic of the fundamental organising principles of evolution and nature.

There are many ways distributed decision making can be introduced that do not meet the tests of Hock or Mathews of creating holonic behaviour that as are considered next.

Other alternatives to hierarchies

Beer¹⁰⁶ pioneered the application of cybernetics analysis to management. He developed the Viable Systems Model (VSM) to describe any organisational structure that can produce itself and survive in a changing environment.¹⁰⁷ However, as VSM described by Beer are created in hierarchies at the discretion of management they cannot systemically reproduce themselves as described below with an ecological form of polycentric governance. Because of their cybernetic heritage, several VSM features are found in holons, but the reverse does not apply. VSM lacks tensegrity that is a defining feature of holons. Likewise, holacracy¹⁰⁸ does not offer an adequate basis for a new model of corporate governance as it neglects stakeholders and so the possibility of being a CPR.

98. NCBI, 2021

99. The Economist, 2020, p. 9

100. Muresan, 2014

101. Coase, 1937

102. Williamson, 1975

103. Wohlleben, 2017

104. Hock, 1999, p. 30

105. Hock, 1999

106. Beer, 1959

107. Beer, 1995

108. Holacracy, 2020

However, Bernstein et al.¹⁰⁹ and Velinov and Denisov¹¹⁰ describe how holacracy could provide helpful “auxiliary” guidelines. Bodie¹¹¹ reports that Delaware Law would allow elements of holacracy and sociocracy¹¹² to be recognised in corporate constitutions.

Beer developed VSM before the concept of corporate governance became a discipline recognised by social scientists.¹¹³ Beer did not envisage VSM being embedded into the constitutions of organisations as in VISA, JLP or the MCC.

Beer¹¹⁴ was aware of the concept of tensegrity that inspired him to develop “team synte-grity”¹¹⁵ as process of small group decision making. However, like VSM, its introduction was at the discretion of management and to small scale of around 30 individuals.

Kelso et al.¹¹⁶ identified how the human brain possesses different decision-making areas like a computer that possesses parallel data-processing capability. Tensegrity is created by different brain areas, competing ~ cooperating with each other to take control according to internal or external needs, risks and opportunities. The brain has no “Chief Executive Officer neuron”.¹¹⁷ Different decision-making centres compete ~ cooperate to take control according to the context.

Indigenous Australians likewise practice fluid relationships as indicated in Table 2 of Turnbull and Poelina¹¹⁸ and “Aboriginal attitude” described by Turnbull.¹¹⁹

Tensegrity naturally arises in mutual organisations from conflicts arising within and between stakeholders. Tensions can arise between similar stakeholders, like the member banks of Visa, or between different stakeholder classes. Examples of the latter are customers, distributors, suppliers, contractors, employees, executives, shareholders and host communities. Tensegrity is mostly extinguished in centralised command and control hierarchies. This could explain why management scholars and practitioners promote collegiate and cooperative relationships that obscure even further how DNA embeds tensegrity into human behaviour.¹²⁰

Polycentric governance provides a way to separate various conflicts and constructively focus on providing checks, balances and adaptive outcomes that may not otherwise become available in simple hierarchies. Tensegrity forces a cultural change that also exploits rather than inhibits the various types of human contrary ~ complementary behavior shown in Table 2 of Turnbull and Poelina.¹²¹ The following Section expands on the reasons adopting a new model for corporations.

109. Bernstein et al., 2016

110. Velinov and Denisov, 2017

111. Bodie, 2018

112. <https://en.wikipedia.org/wiki/Sociocracy>

113. Beer met the author in Toronto on August 3, 1996. After reading a version of Turnbull (1997) he advised that he had not extended his cybernetic insights to the governance of firms. Beer had been President of the World Organization of Systems and Cybernetic (WOSC) since 1987. He encouraged the author to publish in the Systems Science literature as undertaken in Turnbull (2005, 2007, 2013), Turnbull and Guthrie (2019).

114. Beer, 1994

115. Espinosa and Hardin, 2007

116. Kelso et al., 2013

117. Kurzweil, 1999, p. 84

118. Turnbull and Poelina, 2022

119. Turnbull, 1980, pp. 56–58

120. Kelso and Engström, 2006

121. Turnbull and Poelina, 2022

ADDITIONAL BENEFITS FROM A NEW MODEL

While polycentric governance provides a way to constructively manage the systemic conflict that exists between shareholders and stakeholders to allow corporations to become a CPR benefiting all stakeholders, many other powerful additional benefits emerge.

The most important is the prospect of creating a requisite variety and number of self-governing CPR agents acting locally to counter degradation of the global atmosphere, oceans, soils and biodiversity that through climate change that are introducing existential risks to humanity.

The more immediate but hidden benefit is providing a systemic way of reducing inequality. This arises from corporate investors being overpaid in a way accountants cannot report and so are not known to economists nor taxed by governments as discussed below.

Another crucial benefit of polycentric distributed power is that it releases and constructively exploits the DNA hard-wired paradoxical dual contrary ~ complementary behaviour of individuals. This empowers, motivates and reward individuals to change their corporate culture required to survive in centralised command and control pyramids of power favoured by dictatorships. Details on how changing the power structure changes culture is presented below.

The operational benefits from changing both the architecture of corporate power, and so also corporate culture, offers superior operating performance, especially in identifying and managing risks, opportunities, threats and harms. These

concerns become crucial when corporations obtain local and global responsibilities in managing existential risks to the environment and biodiversity. Risks that need to be shared as equally as possible as next considered.

Funding universal wellbeing from overpayments to investors

The unreported overpayment of investors is described as “surplus profits”¹²² because they are not required to attract investment. As there may be no limit to human greed, economists have apparently not yet accepted that such surpluses can exist.¹²³ But in practice, investors cannot foretell the future, so they will not rely on obtaining any cash back after their foreseeable future, described a time horizon, to obtain a competitive return.

All intellectual property is time limited. This can be twenty years for patents, even if the knowledge is useable for a much longer time. International investors exposed to indeterminate political, social and foreign exchange volatility typically limit their time horizons to ten years or less.¹²⁴ The author has been able to raise millions of dollars of high-risk funds for new ventures with property rights limited to 15 years or less.¹²⁵

Surplus profits are not trivial. They can be many times greater than the initial investment cost.¹²⁶ The unlimited extent of surplus profits was implicitly recognised by Penrose.¹²⁷ She stated that foreign investment introduces to its host country “the acceptance of an unlimited, unknown and uncontrollable liability”. As accounting doctrines do not report investment time horizons, surplus profits cannot be reported or taxed. It also means governments who accepted foreign investment

122. Turnbull, 2000c, p. 403

123. The concept of Surplus Profits was first presented to economists in Turnbull (1975a, b, p.21)

124. This was the limit used in a much less volatile world of 1964 with fixed exchanges rates when the author worked as a financial investment analyst in the New York office of Esso Standard Eastern.

125. The start-up ventures were Saxonvale Vineyards Limited founded 1969, publicly traded 1975; Barwon Cotton Limited, founded 1979, publicly traded 1984. Australian Film Underwriters Pty. Limited, operated from 1980 to 1983. Both public companies were funded with 15-year leases. Film copyright was transferred from investors to the producer after seven years to avoid administrative costs after investor time horizons.

126. Turnbull, 1973, 2017

127. Penrose, 1956, p. 235

without requiring ownership to “boomerang”¹²⁸ back to capture surplus profits are undermining domestic prosperity in a way unknown to economists.

Surplus profits could explain why Picketty¹²⁹ raised a question without a convincing answer as to “Why is the return on capital greater than the growth rate?” The difference is consequential. Picketty reports that “through most of human history, the inescapable fact is that the rate of return on capital was always at least 10 to 20 times greater the rate of growth output (and income).”

Picketty only considered the use of taxes to reduce inequality. Ecological corporations provide a more efficient and politically attractive option by *reducing* taxes. At the same time, a process is established to deliver a universal wellbeing dividend to all voters as has been achieved in Alaska¹³⁰ since 1982. Another benefit is to enrich democracy as is next considered.

The nature of human behaviour

Despite established empirical evidence by professional psychologists like Wearing,¹³¹ economists have developed multiple models of human behavior. Influential examples are the five discussed by Jensen and Meckling.¹³²

However, none of their five models can be relevant all the time, or for every individual. This is because Wearing¹³³ identified that “differences between individuals are significant and important”, rather than there being “no significant differences between individuals” as assumed by economists. Wearing states that human “needs are simple and many”, rather than “simple and few”, and that humans

are also “sometimes competitive, sometimes collaborative, usually both”, rather than just being competitive. Importantly, Wearing pointed out that humans “stand in an interactive cybernetic relationship to his/her environment and is changed as a result of any interaction”, rather than “not explicitly related to the world as an element in interactive system and remains unchanged as a result of any interaction”.

The experiments by neuroscientists Kelso and Engstrom,¹³⁴ cited above, has proved the views of Wearing. To illustrate the defining dual paradoxical nature of holons in nature, it is relevant to note that Kelso et al.¹³⁵ reported: “Our approach is both top-down and bottom-up and aims at ending up in the same place: top-down to derive behavioural patterns from neural fields, and bottom-up to generate neural field patterns from bidirectional coupling between astrocytes and neurons.” In a similar manner, Mathews¹³⁶ reported that Czech engineer Jozsef Hatvany had created a design methodology relevant for creating a new model of governance. It “combined a thorough top-down functional analysis with an ordered bottom-up stream of implementational decisions”.

A fundamental reason for humans to possess a variety of behaviour is to provide them with a requisite variety of responses to survive birth, mature and reproduce in unknowable dynamic complex environments. Likewise, organisations also need to obtain these characteristics to survive and thrive.

DNA needs to create instincts for creatures to survive their birth and processes for learning how to survive and mature. To reduce the size and

128. Turnbull, 2011

129. Picketty, 2017, p. 353

130. <https://knowledge.wharton.upenn.edu/article/alaskas-experience-shows-promise-universal-basic-income/>

131. Wearing, 1973

132. Jensen and Meckling, 1994

133. Citations are from a Table presented by Wearing (1973) reproduced as “Table 3.4, Differences between ‘economic’ and ‘real’ people” on page 103 of Turnbull (2000d).

134. Kelso and Engstrom, 2006

135. Kelso et al., 2013, Abstract

136. Mathews, 1996, p. 38

complexity of DNA, it needs to hardwire processes for creatures to “amplify” their survival behavioural repertoire. In explaining “Amplification of regulation in the brain”, neurologist Ashby states:¹³⁷

The indirect use occurs when the gene pattern builds a regulator (R1) whose action is to build the primary regulator (R2), primarily if this process is raised through server orders or levels. By achieving this ultimate regulation through stages, the possibility of large-scale supplementation occurs, and thus the possibility of an ultimate regulation, far more significant than could be achieved by the gene pattern directly.

Amplification allows the volume of data/bytes coded in DNA to be reduced to minimise the matter or energy required to reproduce self-regulating self-governing entities.

However, the ability of humans to seed their organisations with tensegrity depends on organisations being designed so that the variety of human behavior patterns may co-exist to systemically maintain tensegrity. This also requires embedding a division of powers within organisations to legitimate, facilitate and empower different stakeholders expressing a requisite variety of contrary ~ complementary behaviours. In this way, symbiotic virtuous feedback processes are established to provide requisite variety in data communications, controls and decision making to assure sufficient accuracy for survival.

Just as in nature there can be countless designs for living things, so it would be with polycentric organisations. This means that organisational architects are needed to be custom design

firms to become best fit for its purpose.

No one size may fit every context. This explains the importance of filling the educational gap for “governance architects”.¹³⁸

Figure 1¹³⁹ only indicates generically how a division of corporate powers could be introduced. Some of the operating advantages are explained in Turnbull¹⁴⁰ for “Non-Executive (Independent) Directors”, “Auditors”, “Management”, “Stakeholders” and “Regulators”. How the different power relationships are expected to change the behavior of individuals and the corporations is presented in Turnbull and Poelina.¹⁴¹

The stakeholder boards identified in Figure 1 with bold titles create the symbiotic polycentric republics. They introduce systemically bottom-up and outside-in challenges to top-down shareholder interests with a requisite variety of communication or control channels to reliably and comprehensively regulate and govern complexity. In practice, there would be a need for each stakeholder constituency to possess different geographic and functional sub-comments.

Systemic governance failures

Nearly all publicly traded companies undermine democracy. This arises from plutocratic voting with one vote per share electing a single board controlling a command and control hierarchy. These arrangements create 27 ways, as detailed in Turnbull¹⁴² for introducing corruption.

Turnbull and Guthrie¹⁴³ identified why the systems science Law of Requisite Variety (LRV) makes it impossible for hierarchies to reliably simplify complexity and so incapable of reliably managing

137. Ashby, 1956, p. 270

138. Turnbull, 2010

139. Turnbull and Guthrie, 2019, p. 58

140. Turnbull, 2012, p.4

141. Turnbull and Poelina, 2022

142. Turnbull, 2000d, p. 115

143. Turnbull and Guthrie, 2019

risks. Turnbull and Poelina¹⁴⁴ identified nine “systemic problems of hierarchies”, and in their Table 3 identified 20 “toxic problems of hierarchies” and how each could be either avoided or mitigated by adopting polycentric self-governance.

The failure of the existing system of so called “good governance” in the 2008 US financial crisis was documented in the “Conclusions”¹⁴⁵ of the 2011 Financial Crisis Inquiry Commission Report. The cause of the financial crisis was typically attributed to excessive risks in sub-prime mortgages. However, while such risks existed, it was an aspect of the problem and not the “key cause of the crisis”. Instead, the inquiry reported that the “key cause” was the “dramatic failures of corporate governance and risk management”. Another conclusion was “widespread failures in regulation and supervision”. Both these conclusions reinforce the point of the impossibility of reliable regulation being achieved by centralised command and control hierarchies be they be in the private or public sectors.

The spread of monotheism in advanced societies may have encouraged the mindset that top-down management is the natural order of things. A compelling reason why bottom-up management, as found in stakeholder-owned or controlled enterprises, is not taught by leading education institutions was provided by the Dean of Harvard Business School in 1988. He insightfully and correctly advised the author that a market did not exist for this type of education, but this situation has now changed.

Thirty years later, a market has now been created by influential practitioners like Fink¹⁴⁶ and the

BTR.¹⁴⁷ This should provide the incentive for scholars to initiate research and teaching to educate “governance architects” capable of introducing polycentric governance. However, the author is not aware of any graduate school of business, management or government that is yet planning to fill this gap of educating “governance architects” as pioneered by Guthrie and Turnbull.¹⁴⁸ Because of this gap, our most gifted future leaders are being educated on how to perpetuate and spread toxic hierarchies.¹⁴⁹ These undermine democracies and inhibit variety in individual and organisational behaviour; innovation and adaptation required for survival.

The systemic introduction, testing, evaluating, revising and testing design principles are raised in the following section.

INTRODUCING ECOLOGICAL GOVERNANCE

Applying Ostrom design principles to corporations

A review of the literature relevant to the design principles of Ostrom¹⁵⁰ with suggested modifications and applications of them are presented in Turnbull.¹⁵¹ However, the option of involving corporations as a CPR was not considered by other authors.

The use of incorporated bodies as CPRs requires the insights of Ostrom¹⁵² also to become embedded in the constitutions and bylaws of corporations. While Ostrom¹⁵³ discussed property rights they were not recognised in her design principles, as the context for her analysis was mainly for unincorporated CPRs like rights to water, fishing,

144. Turnbull and Poelina, 2022

145. CFCI, 2011, p. xviii

146. Fink, 2018

147. BTR, 2019

148. Presented as an elective MBA unit at the Macquarie Graduate School of Management during 2003 and 2004. Refer to “Educating Governance Architects” at <https://docs.google.com/document/d/1c9gt9jsSL7i-JovneNfFiGjvxcj2V8Jz98Ku461aHmk/edit?usp=sharing> and Turnbull (2014d).

149. Carucci, 2018; Turnbull, 2014b

150. Ostrom, 2009b

151. Turnbull, 2021b

152. Ostrom, 2010a, b

153. Ostrom, 2009b

grazing, or hunting and gathering, or use of modern urban infrastructure and services.

Figure 1 provides a generic outline of how to include Ostrom's insights into corporations. The added features are:

- (a) Embedding polycentric governance into corporate constitutions and bylaws,
- (b) Embedding other insights of Ostrom into corporate constitutions and bylaws,
- (c) Introducing property rights not included in the Ostrom design principles,
- (d) Introducing ecological form of polycentric governance,
- (e) Formally integrating stakeholder interests into corporate constitutions/bylaws to become supplementary co-regulators in promoting self-regulation, self-management and self-governance to reduce reliance on markets and state,
- (f) Introducing the rights of stakeholder to share corporate ownership and control while maintaining shareholder primacy for all stakeholders,
- (g) Explicitly recognising the laws of systems science in managing complexity,
- (h) Introducing and embedding the concept of tensegrity into corporate constitutions,
- (i) Introducing a size limitation to organisational entities neglected by Ostrom and associated literature except by Dunbar¹⁵⁴, Turnbull¹⁵⁵ and Whyte and Whyte.¹⁵⁶

The various ways and stages for introducing the proposals in Figure 1 are discussed in Pirson and Turnbull,¹⁵⁷ Turnbull¹⁵⁸ and Turnbull and Guthrie.¹⁵⁹

The political, social and operational considerations for their introduction is next considered.

Implications arising from introducing a new way to govern

By offering a tax incentive for shareholders to introduce ecological corporations creates a process for shareholders to learn by doing how to become governance architects. Whether an incentive is introduced or not, one way to initiate the process would be to create a competition among corporations for adopting the most promising processes for introducing elements of ecological governance.

There are many initiatives that management could introduce without changing corporate constitutions and bylaws. These involve formal engagement with stakeholders as proposed by Fink noted above to reduce "groupthink", improve innovations and risk management as outlined by Turnbull.¹⁶⁰ Annual awards could be made that introduced the most promising ways of introducing self-regulation, self-management and self-governance to companies that were private, publicly traded, non-profit or government-owned entities.

An example of this approach is the Annual Company Reporting awards that began in Australia in 1950.¹⁶¹ Another example were annual Reputation awards of the largest business organisations of any type initiated in Australia in 1999 by a commercial consulting business. As a member of one of their judging panels involving governance, the author developed a methodology for evaluating the integrity of corporate processes that could lead to self-governance.¹⁶²

154. Dunbar, 1993

155. Turnbull, 1973, 1975b, 1997, 2002, 2014a

156. Whyte and Whyte, 1988, p. 259

157. Pirson and Turnbull, 2011a, b; 2012, 2015, 2016

158. Turnbull 2017a, Turnbull 2020a, b

159. Turnbull and Guthrie, 2019

160. Turnbull, 2008, 2018b, 2019a

161. <https://www.arawards.com.au/>

162. Turnbull, 2000b

An academic competitive role model has been provided by Oxford Said Business School. For the last 25 years, it has been issuing awards for "significant scholarly contributions to the literature on corporate reputation."¹⁶³ The pioneering course to educate governance architects was established as an elective MBA unit at Macquarie University Sydney which introduced competition between students to both design and evaluate self-governance innovations.¹⁶⁴ Students were required to redesign the constitutions of corporations in the private, publicly traded and non-profit/government sectors of their choosing to improve their case study abilities to become self-governing to reduce the role of markets and state. Student syndicates were also required to apply systems science to develop methodologies to rate the design proposals of their peers with their methodologies also being critiqued by their peers.

The above practices and education are required globally to meet the requirements of the BRT. It is now becoming even more importantly required to custom design corporate constitutions to convert them to CPRs for countering the degradation of the atmosphere, oceans, soils and biodiversity. These introduce self-reinforcing processes to initiate change as next considered.

Policy implications

A critical condition for obtaining support is acceptance and widespread adoption from the voting public and their academic and policy thought leaders. It is for this audience that the following points are raised.

Leading jurisdictions have already introduced tax incentives for employees to obtain shares in their employer corporation. In the US, around 10% of private sector employees own employer shares valued at \$1.4 trillion.¹⁶⁵ Extending share-owning benefits to all citizens, with the support of shareholders, should provide irresistible appeal for aspiring political leaders.

Universal share ownership would democratise capitalism to include all voting citizens. It provides a way to build a universal dividend income for all citizens as presently enjoyed by citizens of Alaska.¹⁶⁶ Instead of increasing taxes to provide universal welfare, ecological corporations distribute surplus profits directly to all citizens to reduce the need for welfare and government. The size and intrusiveness of government is also reduced, with stakeholders becoming co-regulators of corporations to protect and nurture the wellbeing of both citizens and their local environment.

The power and motivation to protect local environments arises from the ability of ecological endowment corporations to replace alien shareholders for locally resident citizen stakeholders. This enriches both the political and economic interests of corporate host bioregions providing the power, incentive and means to enrich local political self-determination to build more independent, resilient, sustainable circular economies locally and globally for eternity.

The idea of limited life business ownership may be confronting for analysts who are not aware that all intangible property rights have limited life. Except for land, all business assets wear and/or become obsolete. The knee jerk objection to time limited

163. <https://www.sbs.ox.ac.uk/research/centres-and-initiatives/oxford-university-centre-corporate-reputation/annual-awards>

164. Refer to footnote 147

165. <https://www.nceo.org/articles/employee-ownership-by-the-numbers#6>

166. <https://knowledge.wharton.upenn.edu/article/alaskas-experience-shows-promise-universal-basic-income/>

investments is how would new enterprises become funded? The answer is in the normal way. The author has funded two high-risk start-up ventures and films with property rights of 15 years or less.¹⁶⁷

The limited property rights of ecological corporations acting as CPRs would create a compelling incentive to fully pay out all their profits like cooperatives, partnerships and many trusts. But to provide succession planning for investors, management and growth opportunities for all, dividend re-investment plans would be introduced to fund “offspring” enterprises. This would also keep CPRs to human scale.¹⁶⁸ It would also create sibling businesses promoting competition and local control. In this way, local diversity and resilience could be built up to cope with what scientists are describing the “ghastly future of mass extinctions”.¹⁶⁹

Surviving the people plague

Other scientists believe that the perpetual carrying capacity of our planet is 1.9 billion¹⁷⁰ individuals with existing resources. Planned population downsizing to this level could take three or four centuries, during which time the carrying capacity of the planet could be further reduced. With “overshoot”¹⁷¹ of sustainability increasing the need for an eternal system of governance may become problematical unless humanity can survive during centuries of de-growth. Eternal systems of governance are required today to give hope for survivors of our “ghastly future”.

Ecological corporate CPRs can make important contributions today in reducing the planetary populations in three ways:

1. Providing universal wellbeing incomes to avoid the need for have children in their old age,
2. Provisioning of birth control education and methods,
3. Providing a locus of community solidarity to protect both their home bioregions and their progeny beyond the seventh generation as practiced in many pre-modern societies.

This article has identified self-funding tax incentives for transforming corporations into ecologically governed CPRs providing benefits for all stakeholders as desired by the BRT. It has identified compelling political, economic, social, environmental and existential reasons to act. While this provided the motive for this article, many of other attractive benefits have been identified.

Of widespread immediate interest is how to democratise the wealth and wellbeing of individuals with less taxes and less government in a manner not known by influential economists and most other policy advisors.

A socially important contribution is identifying how polycentric governance provides a way to change business culture by introducing a division of powers with checks and balances. It also provides systemic ways to identify and correct harms, mistakes, mismanagement and malfeasance to enhance individual wellbeing, operating performance, risk management, adaption, innovation and resilience.

Another contribution is to identify for business leaders, political leaders, political constituencies concerned with either business or citizen wellbeing a self-reinforcing congruence of interest to take action to make the world a better place today and for eternity.

167. The start-up ventures were Saxonvale Vineyards Limited founded 1969, publicly traded 1975; Barwon Cotton Limited, founded 1979, publicly traded 1984. Australian Film Underwriters Pty. Limited, operated from 1980 to 1983. Both public companies were funded with 15-year leases. Film copyright was transferred from investors to the producer after seven years to avoid administrative costs after investor investment time horizons.

168. Dunbar, 1993; Schumacher, 1973

169. Bradshaw et al., 2021

170. “How many humans can Earth sustain? And what does it mean if we’ve already passed it?”, <https://www.abc.net.au/news/science/2019-07-25/population-growth-world-overshoot-day/11320990>

171. Collapse in a Nutshell, <https://www.youtube.com/watch?v=e6FcNgOHYoo> and, Overshoot in a Nutshell, <https://www.youtube.com/watch?v=IPMPINPrdk&t=0s>

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