From dichotomies to dialogues -
connecting discourses for a sustainable urbanism

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Collaborative Intelligence: the Tao of DAO

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Abstract: Rising trends in 'collaborative intelligence' opens new opportunities in rethinking how we may socialise ourselves into distributed problem-solving networks across disciplinary and territorial borders. This position paper maps the intricate relationships between The DAO (Decentralised Autonomous Organisation) and Tao (Taoism or Dao 道家) to comparatively analyse alternative forms of democratic practises and seek guidance in how we may synthesis various intelligences into collaborative governance models. The former is a 2016 blockchain initiative that focuses on crowdfunding and crowdsourcing data operations and protocols; the latter is an ancient Chinese thinking that learns the way of the cosmos and its relationships to individual beings. Although they emerged 2000-years apart, both schools-of-thought try to abstract 'rules' (i.e. Tao 道) of complex systems, social and natural, to rethink how we may self-organise as a society. This short piece aims to be a manifesto that inaugurates an urban research project for new planning models that search for an understanding between different cultural epistemologies and intellectual drivers. It briefly concludes by reformulating its research question and proposing next steps to further problematize how the theoretical standpoints may be translated in the big data era as participatory thinking.

Keywords: collaborative intelligence, democratic practises, The DAO, Taoism, participatory

1. Introduction

Collaborative intelligence (CQ) characterises 'distributed systems, where each agent, human or machine, is autonomously contributing to a problem-solving network'; it is an emerging discipline within planning theory and has be applied rigorously by Zann Gill (2012) (2013) in program development for a NASA-initiated Planetary Sustainability

Co•Laboratory and to the city of Kawasaki in Japan to transform it into an "information city of the 21st century". The CQ framework has three core pillars: 1) anticipating and understanding socio-technological **tools**, 2) proposing ecosystem innovation **theories**, and 3) crafting novel collaborative governance **methods**. CQ aims to complement domains of crowdsourcing and social computation, 'offering principles and frameworks to tap diverse expertise, autonomy and pattern recognition of non-anonymous contributors, from tagged sensors to geo-located devices to identified human experts in next generation social networks for collaborative problem-solving'. Its roots can be traced back to the AI pioneer Oliver Selfridge (1959), who proposed a self-organising learning system drawing from partitioned knowledge sources, and collective intelligence (CI) practises derived interdisciplinarily from evolutionary biology and complex system sciences.

The DAO (Decentralised Autonomous Organisation) exemplifies certain key aspects of CQ: it is an entirely stakeholder-driven system that enables large-scale crowdfunding and crowdsourcing for innovative projects. It was first proposed by Jentzsch (2016) to utilise blockchain - a distributed ledger technology - for the automation of governance. Since blockchain helps to store all peer-to-peer (p2p) transactions on users' local devices in an immutable manner, it enabled the secured crowdsourcing of system universal rules and protocols. The DAO was innovative in redefining the relationship between a network of investors and contractors through p2p operations; it's distributed, bottom-up nature shows prospects in facilitating participatory systems that engage citizens in urban planning processes; namely, how to efficiently comprehend large-scale data input for decision-making and implementation of design and planning. Nonetheless, The DAO model faced scalability issues that led to its inability in resolving difficult situations in real-time (Mehar, et al., 2019).

This paper proposes to review DAO technologies with Taoism - an ancient Chinese thinking that also concerns itself with questions of self-governance through universal rules (i.e. Tao 道), but rules that are not capped by an artificial scarcity, instead, learns from the cosmo and its nature. It's no accident that there have been an increasing number of papers published on 'The Tao of DAO', including Shakow's (2018) analysis on distributed taxation, Sulkowaski's (2019) work on digital business ethics, Palmer's (2021) work on collective investment, and many more. This paper specifically studies how Taoism knowledge in complexity may help us to understand top-down and bottom-up approaches not as dichotomies, but as correspondences in the reality of most p2p collaborations; also, how we may learn from the cosmos as a form of intelligence. It aims to ponder on participatory systems that may enable large-scale communication and decision-making amongst a network of actors: can the personal condition of data be escaped for the establishment of a common well through collaborative intelligent networks that inter-learn and self-organise?

2. Rethinking Democracy

What is democracy? Is it the 'greatest happiness of the greatest number' as defined by Jeremy Bentham (1789) - the father of hedonistic utilitarianism? A democracy that is established on the basis of elected representatives by individuals - one man one vote - is one version; but if it's the only, there may not be a need for the freedom of choice in governance (i.e. *-cracy*).

'Demos' came from ancient Greek, meaning the common people; 'kratia' meant power or rule; together, 'demokratia' is people power (OxfordLanguages, 2021). However, from Proto-indo-european roots, 'demos' came from 'da-', which had two meanings: 'cuts, divides' and 'people, land'. The Athenian democracy was established on the division by territory - those who are and who are not citizens - which were defined primarily as adult male who had completed military training (Simon, et al., 1999). It implies that those within a territory not only have rights to a city, but also responsibilities in problem-solving, especially in the protection of one's territory. It was a time much subject to warfare, affiliation towards a piece of land, rather than on sole kinship, was a matter of solidifying individuals into collectivity (Rhodes, 2004). Although only approximately ⅓ of Athenian residents were entitled citizenship (excluding slaves, women, etc.), which may seem little to a contemporary understanding of democracy, it was an incremental process to open up governance from a handful to the

many. Perhaps, democracy as a static state is less imminent than the continuous process of democratisation.

Although this piece of history dates far back, it is evident that such concepts are deeply embedded within western epistemology of democracy that has been disseminated around the world; so much so that it has been hard to imagine alternatives. This paper is interested in the sort of democratic practises more specific to collaboration in problem-solving between different forms of intelligences, taking diversity as freedom of choice.

Here, the focus is not so much in debating the right of contribution, but in the available means of contribution. Moreover, to synthesise not only through spatial practises but also through history. This was the reason why DAO and Tao were chosen as subjects of parallel concern: the former is being studied as a blockchain-accelerated utilitarian technocracy that understood collectivity as the aggregation of individualistic values; the latter is being studied as a system science that tries to understand ourselves as a cosmo and its many cosmopolitans. In common, is the study of the constitutions and practises of universal rules within sets of distributed entities - ways to people power.

3. Collective Intelligence (CI)

Collective Intelligence (CI) has been enchanting the realm of social computation since the 20th century (Malone & Bernstein, 2015). The discussion of which surrounds studies of self-organisation; in particular, of socio-biological nature, such as that in ant colonies. Characterised by anonymity and a strict division-of-labour in the community, ants' collectivity seems far from democratic, with each of its members born into their roles. Nonetheless, each role forms a collective dependency with one another, which are all significant to their socio-biological survival as a system. In one way, this may be how equity can be embodied within a hierarchical structure, synthesising dichotomies into a democratic society in its fundamental performance of people's power and their CI.

3.1. DAO (Decentralised Autonomous Organisation)

In Wiener's (1950) 'Human Use of Human Beings', he proposed sets of principles for self-generating CI networks through data control and communication; in comparable spirit, The DAO's (2016) mantra being 'Code is Law' performed CI through real-time coordinated data collection and management (Carroli, 2012). The DAO was a crowdfunded venture-capital fund, a distributed network that used voting mechanisms to decide which project to invest in. Distributed, meaning the system database was installed on sets of individual computers of each stakeholder, with logical connections between them that were protocolled by the blockchain, which was characterised by Proof-of-Work (contributing work in securing the network) and/or Proof-of-Stake (providing liquidity). This blockchain community crowdsourced protocols and stakes and transcended 'rule of law' to 'rule of code', eliminated human agencies as intermediaries in execution - a system of machines automated themselves and validated each other via a universal open-source code. This game theoretical approach facilitated interactions amongst rational decision-makers - the machines - in support of a democratic commons. DAO accelerated the act of vote, a utilitarian technocracy that defined the 'common' by a distributed ledger of records to all transactions - an immutable list of consensus that equated the common good with maximising total payoff. This constituted a trustless socio-economy, a new form of data market.

Unfortunately, in the same year, The DAO was 'hacked' and had its funds completely drained. Ng (2020) studied that what had led to this incremental event was the same reason for its scalability issue. Although DAO used voting as a mechanism design to direct centrality in a decentralised network, it was still much too slow in decision-making when it came to attacks or other emergencies. Most in the community argued that in the spirit of code-is-law, if the system has a problem, it means the code was the problem (Chohan, 2017). While it remains true that loopholes are problematic and should be minimised, certain aspects of the ontological challenge in voting mechanics seem to be overlooked. One of which is the underlying value that is being exchanged - attention.

Voting as the main operational mechanism for CI practice inevitably reinforces an attention economy, where large numbers of stakeholders might vote for invalid projects or even scams because of eye-catching ideas that consistently reinforces itself, creating excessive positive feedback in a singular direction. As in The DAO Hack, the system at

the time was already flooded with ‘proposal to loan 100 ETH from the DAO’s treasury to [insert promising new startup here], to be paid back 110 ETH in 6 months…’ (CoinMarketCap, 2021). Not only does it unveil problems in mistaking large-scale speculative financing as collectivity, it also hints at a fundamental problem in CI: can we presume that all humans in a market are rational decision-makers? The work of Nobel Prize recipients Vernon Smith and Daniel Kahneman (2002) provided a basis of reference, which hypothesised idiosyncratic and systematic deviations from rationality. At the same time, is voting the only measure of democracy? Isn't it a paradox that the principle of the system was to ‘**rationalise**’ common good with individual ‘**pleasure**’?

3.2. Taoism

It was not by chance that ‘The DAO’ was synonymous with the ancient Chinese thinking of Taoism. The word ‘Tao’ (or Dao) means rules, paths, or ways; Taoism is a system science that observes the hidden ‘rules’, ‘paths’, or ‘ways’ of the cosmos, and the delicacy of co-existence operating within universal rules ‘在道家思想中, “道”代表自然律, 是道家世界观的核心；“德”代表顺应自然律的法则，是道家方法论的核心’ (vividict, n.d.).

The word ‘Tao’ 道 was first used on oracle bones, dating as far back as 17th century BC. It was first written as a man 人 (fig. 1C) walking 行 (fig. 1B) in the middle of a cross path 四通的大路 (fig. 1A). It was then transformed into a ‘mind’ 首 (fig. 1F) at a cross path ‘walking’ and/or ‘stopping’ 止 (fig. 1G). It’s connotation is to think and walk 且思且行 (fig. 1E); walk one moment and stop the next 忽走忽停 (fig. 1D). Some would replace ‘walk’ with ‘pull’ 爪 (fig. 1I), meaning to lead and be by ‘the way’ (i.e. the Tao) 牵拉引路 (fig. 1H).

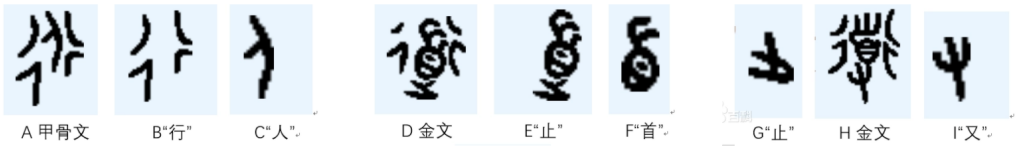

Figure 1. Etymology of ‘Tao’. Image Source: vividict

Tao’s ‘commons’ emphasises homeostasis and harmony as cosmology. Humanity and its society as part of the cosmo renders the dichotomy between artificial and natural oblivion. Homeostasis also means a constant feedback into equilibrium, a dynamicity that constitute the non-discursiviness of universality 道可道, 非常道;名可名, 非常名《道德經》(Laozi). This can be understood also within the context of norms or culture, which cannot be definitively told or named in many ways. A notable one in chinese tradition is 忠孝 loyalty and filial piety. The former can be understood as being loyal to the system of society; the latter is the practise of the duties to one’s parents (肖剑锋, 2007). Traditionally, it is often said that the two is difficult to be both completed by one 自古忠孝俩难全, but why?

If we understand the household as a subsystem to a complex system of society, then society is the emergence of interacting subsystems that are largely heterogeneous. In such a way, aspects of subsystems must be somehow compromised and maintained at different times to form the larger structure. Laozi, one of the founders to Taoist thinking, wrote:

> *'Men are born soft and supple; dead they are stiff and hard. Plants are born tender and pliant; dead, they are brittle and dry. Thus whoever is stiff and inflexible is a disciple of death. Whoever is soft and yielding is a disciple of life. The hard and stiff will be broken. The soft and supple will prevail.' 人之生也柔弱,其死也坚强.万物草木之生也柔脆,其死也枯槁.故坚强者死之徒,柔弱者生之徒.是以兵强则不胜,木强则兵,强大处下,柔弱处上.*
>
> *~ Tao Te Ching (The Book of Tao and Virtue) 道德經*

Although Bentham and Laozi lived 2000-years apart, they were both born into a time that was characterised by numerous major wars. The birth of utilitarianism was an enlightenment to the theological basis of morals, 'the desire to see useless, corrupt laws and social practises changed' (Driver, 2014). Analogically, the birth of Tao was an attack on Shamanism, which broke the Chinese away from its middle-ages - a Sino-Renaissance 2000 years ago. Tao focuses on self-cultivation as governance, a freedom that is based on culturing the self as a collective and its everyday practise as consensus - 理教 - from logics and thinking about the larger environment.

Its critique is that the immense body of non-discursive knowledge gave rise to many ritualised practises that lost their original meaning, becoming social burdens and rigidity, manifested itself as elite and orthodoxical customs. Whereas Bentham's utilitarian democracy identified the good with pleasure, a hedonist in the aggregation of individualistic values' its critique is that its normative ethics marginalised the non-commons and formed part of the basis for a liberal consumption of commodities, which realised pleasure almost instantaneously. This analysis begins to scratch the surface of the theoretical opportunities and potential implementation downfalls of these thinkings within CI practises.

4. Collaborative Intelligence (CQ)

How does CQ differ from CI in its self-organisation? Self-organisation refers to processes by which 'individuals organise their communal behaviour to create global order by interactions amongst themselves' (Willshaw, 2006). Emergence from interacting subsystems implies the study of complexity. The shift from collective to collaborative may provide an alternative approach to understanding complexity and co-dependency, especially in reviewing anonymity and division-of-labour.

Collective	'gather' (legere) + 'together' (com-)
Collaborative	'work' (laborare) + 'with' (com-)
Intelligence	'between' (inter) + 'choose / pick out / read' (legere)

Figure 2. Etymology of CI and CQ, their connotations become more apparent when we compare 'mass collective' with 'mass collaboration' (OxfordLanguages, 2021).

4.1. CI & CQ

The concept of 'anonymity' is closely related to the operating principles of blockchain. Blockchain is pseudonymous rather than anonymous. In the case of The DAO, identities are not linked to social credits nor any kind of subjectivity, but to credits of investments - be it stake or work - which are numbers; and to an IP address, which is great for trace-and-track, but generates a sense of detachment, escaping social contracts with smart contracts. In this sense, blockchain works well as a ledger tool, but becomes reductive when the working of the technology is directly equated with social production. The DAO system rationality as a trustless economy with an immutable list of consensus based on aggregated transaction renders meaning (e.g. semantics, culture, etc.) irrelevant. It is applying objective means of accounting for something that is intrinsically social, creating an asynchrony between the system and the reality of socio-economy. CQ differs from CI by its next-level social network, distinguishing 'anonymous homogeneity in collective prediction systems and non-anonymous heterogeneity in collaborative problem-solving systems' (Gill, 2011).

In division-of-labour practises, the concept of boundary is as apparent as can be found in the Greek heritage of democracy. Wiener (1948, pp. 21) in his cybernetic studies - a science of complex systems - delineated the intricate relationship between boundary and collaboration, which are in essence, not dichotomies, but two sides of the same coin, especially in fields of problem-solving:

> **It is these boundary regions of science which offer the richest opportunities to the qualified investigator. They are at the same time the most refractory to the accepted techniques of mass attack and the division of labor. If the difficulty of a physiological problem is mathematical in essence, ten physiologists ignorant of mathematics will get precisely as far as one physiologist ignorant of mathematics,**

Nonetheless, a simple shift of framework from collective to collaborative does not guarantee that a system would not fall into the same trap our attention economy currently does, unless it focuses on means to decentralised autonomous organisations that are intelligent (inter-learn/comprehend), constituted by a common way (i.e. Tao).

4.2. DAO + AI = Distributed Learning Networks

The use of big data in studying the essence 精氣 of cosmology into models is one way of operationalising these theoretical standpoints. CQ prompts a rethink in AI and a reformulation of the research question: *as opposed to escaping the personal condition of data, can we think of intelligence not as an individual or a piece of machinery, but as sets of distributed learning networks (DLN)?* A DLN can be designed according to:

1. notions of intelligence:
    a. entropy, as put forward by Wiener (1950), that 'globally increases, locally decreases'. In thermodynamics, entropy is a measure of unavailable energy to do useful work; whereas in information theory, entropy is a measure of disorder. Within a DLN, positive entropy is the increase of disorder by an increase of data within a network, and negative-entropy (or negentropy) is the decrease of disorder by the abstraction of data into information.
    b. negentropy, first problematised by Erwin Schrodinger (1944), as a form of self-organisation where a system uses an internal generative model to predict incoming sensory data - an observer explaining the system to itself - a study of Tao. In this sense, design and planning is the definition of a system's statistical boundary that enables sensing, rather than the reinforcement of a grid in structuring. To situate such data networks within governance, positive entropy is the increase of options, and negative-entropy is the abstraction of available options into a consensual boundary.
2. Tao's emphasis on homeostasis and harmony as structures that dynamically compromises subsystems into a larger whole, which does not contradict with the western epistemology in the iterative feedback loop between entropic and negentropic measures. Such self-organisation is not directed by aggregated self-interests or 'invisible hands' as coined by Adam Smith (1759), but an aggregation of CQ - Wu Wei 無為. Here, Wu means 'non-' and Wei means 'self-interest'; thus, a democratic practice of leading and being led by the emerging Tao of a system.
3. value production not as capital or stake that direct governance, but as data and compute, where individuals may p2p exchange data and computational power to do work for certain problems. Not simply in solving algorithms for encryption (as in the case of blockchain's Proof-of-Work), but also in the training of AI and other computationally heavy tasks (e.g. rendering, visualisation, proceduralism, etc.).

5. Conclusions

This paper discussed a synthesis between Taoism thinking and DAO technologies in constituting collaborative intelligences (CQ). It defined itself from socialist/liberalist approaches to blockchain, but a 'Tao' (i.e. the way) to autonomous organisation - a practise of self-cultivation through a global brain of distributed learning networks (DLN) 每日三省吾身《論語·學而》.

'Distributed', meaning data can be stored on individuals' local devices in tackling data privacy problems. At the same time, the training of AI algorithms would be drawing from partition knowledge sources on local devices and only sharing the trained model to the central cloud. This means individuals may contribute their computing power for the construct of the larger infrastructure. The concept of 'learning' goes beyond the training of AI algorithms, defined here as both rule/agent-based and machine learning systems that are inductively trained on evident-based data, to the intelligence of the crowd, capable of deductive/abductive and other forms of reasoning that may integrate discriminative and generative approaches within big data practises. In this sense, a 'network' helps a targeted crowd to inter-learn - a collaborative intelligence that pertains to the idea of 'globally virtual, locally physical'.

Rather than using machines to automate code-as-law immutably, a DAO that learns the Tao of our socio-economy and its larger environment for collaborative problem-solving, constituting consensus beyond the attention economy of vote. By helping us in constituting models of self understanding as a cosmo and its cosmopolitans; models that act as system boundaries rather than mechanical execution of protocols; models of knowledge that are democratised to the common; models that enable a system to never stop at a singular version of normative ethics "大學之道, 在明明德, 在新民, 在止於至善。"《禮記·大學》.

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