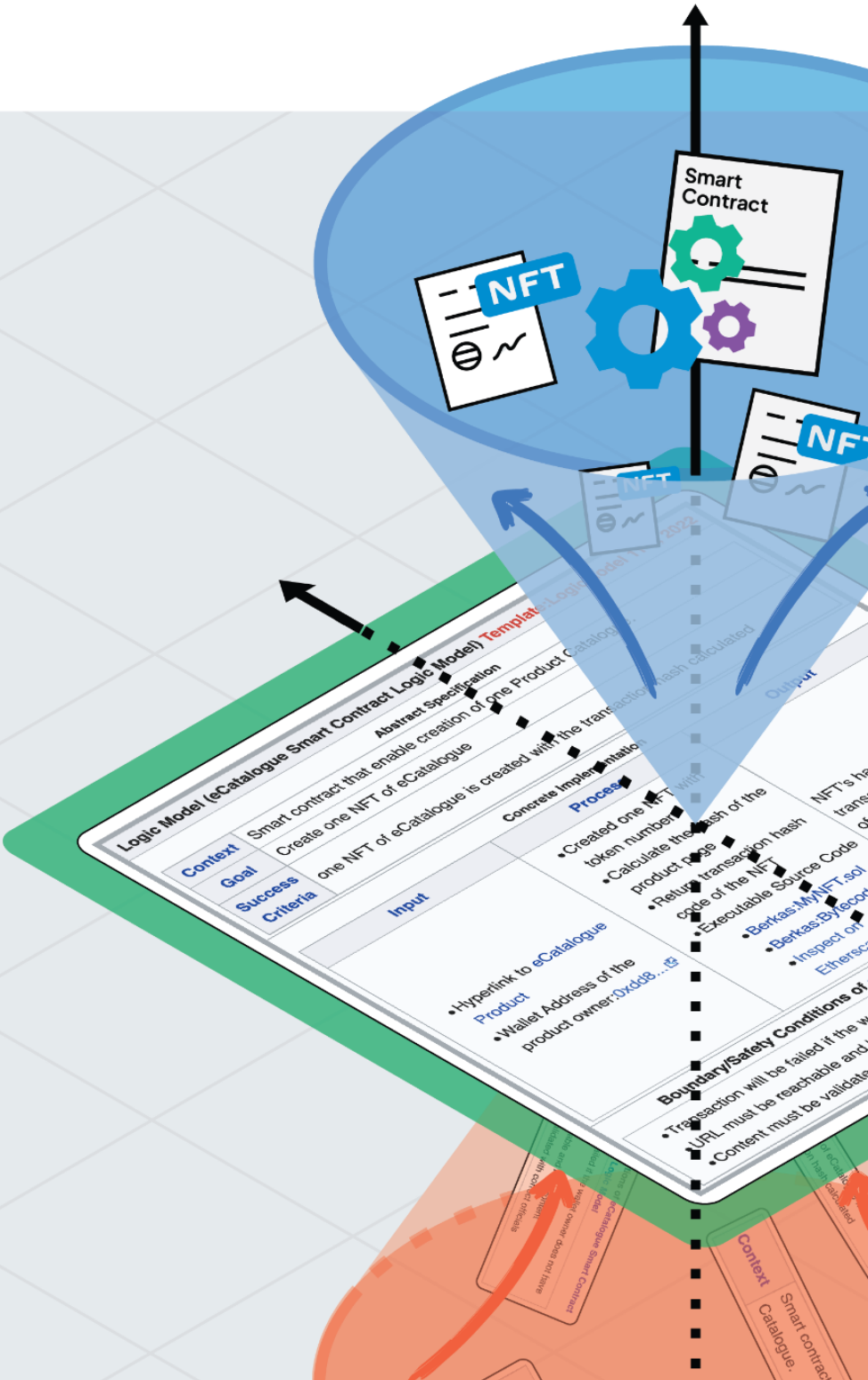
Science of Governance

Through self-administered data



From Sanskrit विविधतायां एकता ...

Bhinneka Tunggal Ika
Tan Hana Dharma Mangrwa

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*In **Differences** there is only one,*
*and there is only **one unifying** thread of the truth.*

Version 0.1.4

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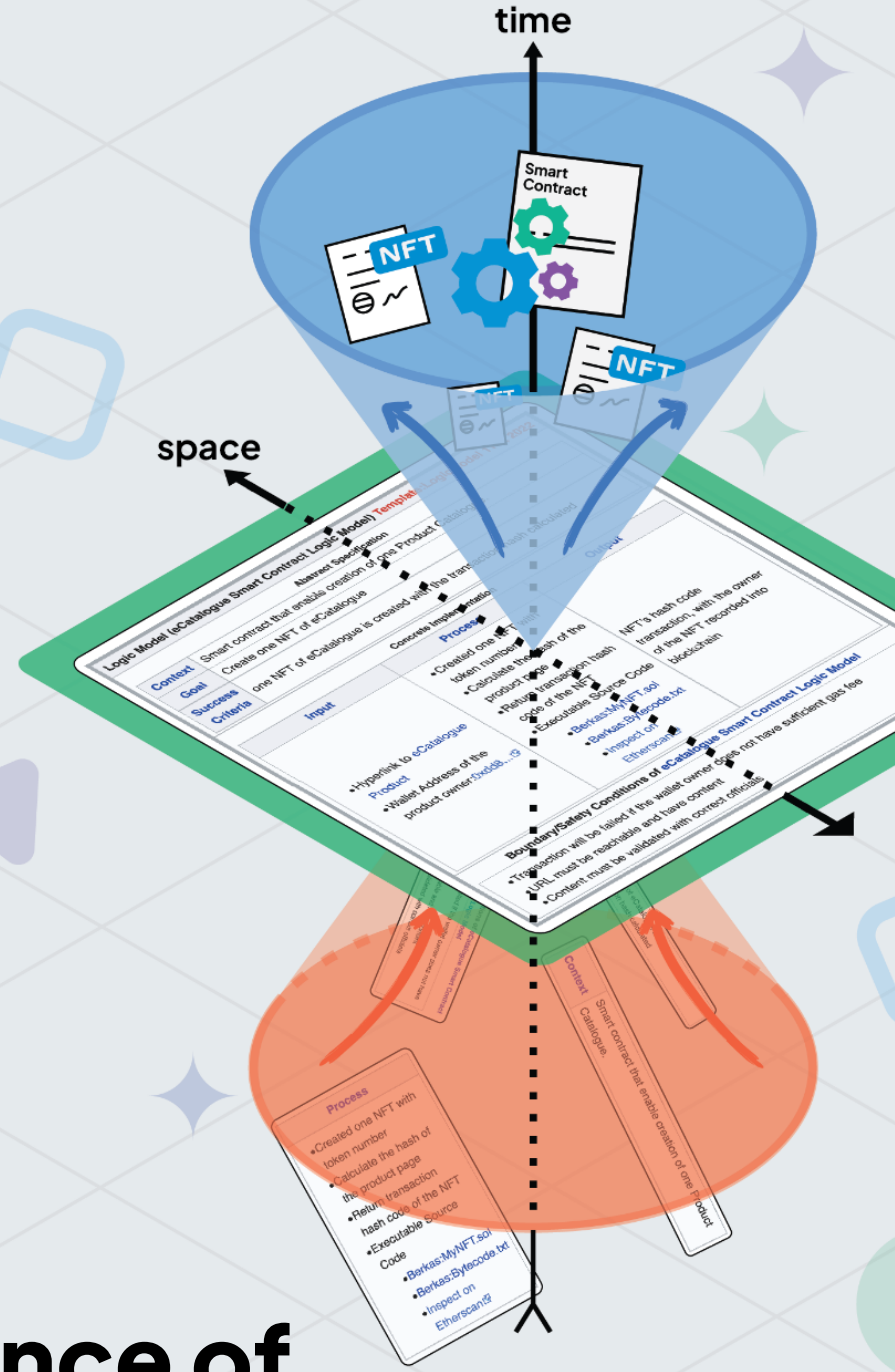
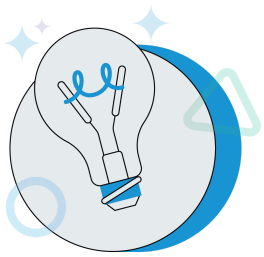


Theory:

The Science of Governance (SoG)



I. Context:

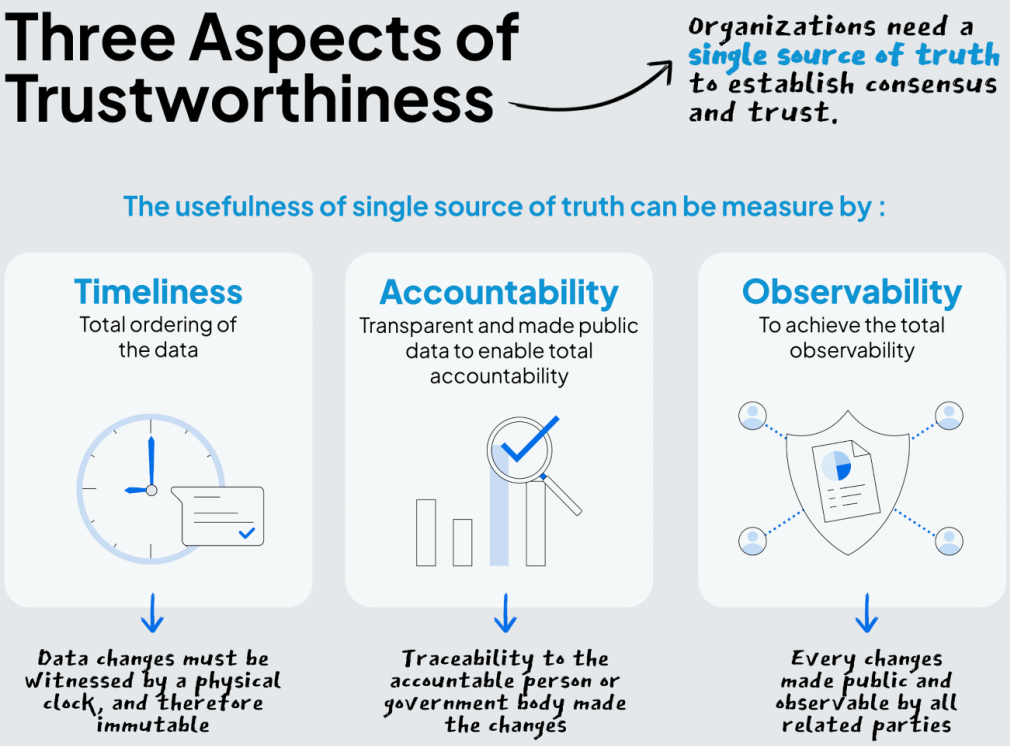
Digital Transformation challenges Social Stability

Time is a universal medium to connect events; knowing when events happen is integral in our conception of everything. This is shown through sequencing and recording information, hence why both "time is money" and "knowledge is power." Everyday, people around the world are persuaded by others who simply have more information. This is known as ***information asymmetry***, where one entity has better access to knowledge while the other entity does not. Examples of this phenomenon range from car salespeople selling bad cars to unwary buyers,[1] to developing countries getting overly high interest rates from lenders, crippling their economy. Information asymmetry can be used with good intentions, and could also lead to exploitation.[2]

Currently, data processing technologies are increasing information asymmetry in ways that are becoming a major problem in public administration. Malicious and systematic data technology exploitation can be conducted by individuals or public institutions that have more access to data or data processing technologies. To ensure sustained justice in modern societies, the notion of governance must be grounded to the power of persuasion's root: information asymmetry. We call this scientific endeavor the Science of Governance (*SoG*). *SoG* focuses on the fundamental properties of information asymmetry: the timeliness, accountability, and observability of public data.

[1] See "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism." by George A. Akerlof.

[2] The scaffolding of information asymmetry to make it more understandable was inspired by Luke Dallafior, over multiple conversations.



Power structures always needed tools and methods in guiding timely actions, creating accountability for policy outcomes, and observing progress. Models of thought were utilized to create and execute policies shaped by power structures. These include: "Objective and key results (OKR);" used to define measurable goals and measure outcomes,[3] "Management by objectives (MBO);" defining specific objectives and sequentially how to achieve each objective,[4] and "logic models," describing the chain of causes and effects leading to an outcome.[5] Without adopting secure and field-tested information systems, political structures are still mostly functioning under verbal debates, creating their offline codes in human readable texts only, and storing information on mediums that cannot be automatically checked and retrieved by relevant parties.

[3] See *Measure what Matters: OKRs - the Simple Idea that Drives 10x Growth* by John E. Doerr.

[4] See *The Practice of Management* by Peter Drucker.

[5] See "Logic Models" by Joy A. Fretchling in Works Cited.

A hyperlinked logic model is shown below:

Logic Model (eCatalogue Smart Contract Logic Model) Template:LogicModel 11 2, 2022		
Abstract Specification		
Context	Smart contract that enable creation of one Product Catalogue.	
Goal	Create one NFT of eCatalogue	
Success Criteria	one NFT of eCatalogue is created with the transaction hash calculated	
Concrete Implementation		
Input	**Process**	**Output**

• Hyperlink to eCatalogue Product
• Wallet Address of the product owner:0xdd8...
	• Created one NFT with token number
	• Calculate the hash of the product page
	• Return transaction hash code of the NFT
	• Executable Source Code
	  • Berkas:MyNFT.sol
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		NFT's hash code transaction, with the owner of the NFT recorded into blockchain

Boundary/Safety Conditions of eCatalogue Smart Contract Logic Model		
• Transaction will be failed if the wallet owner does not have sufficient gas fee • URL must be reachable and have content • Content must be validated with correct officials		

Large-scale digital technology uses these logic models; even modern information technology like smartphones and blockchains were built on a foundation of prior inventions and systems specified using similarly formatted models. A logic model is a domain-independent specification format allowing any self-governing body to utilize contemporary technologies to represent the timeliness of information distribution, accountability of data changes, and observability of policy outcomes. To start, existing governance tools such as the OKR/MBO models can be integrated with hyperlinked documents to help keep policies and execution results timely, accountable, and observable. To do this with a formalized framework, we name this new field, *SoG*.

II. Goal:

Ensure Governance Correctness by Logic

SoG works on establishing a fair and just political process in a world overwhelmed by the asymmetric distribution of data governance technologies. It should provide a trustworthy foundation to help governing bodies allocate resources to execute policies efficiently, utilizing different aspects of established governance theories and creating new governance theories, while employing readily available technologies to deploy solutions in the real world. In other words, an End-to-End solution for governance must have a scientific basis that can be scaled up in applications through technology and have a unifying policy decision frame that can be applied to all application domains. This requires the Science of Governance to be abstract, so that it doesn't associate itself with a specific application context. It also needs to be concrete, so that all policy decisions are observable and accountable in terms of socially and physically meaningful data. The only medium to deal with this dualism is nothing but ***logic***, more precisely, the logic of *Correct by Design* ***(CbD)***.

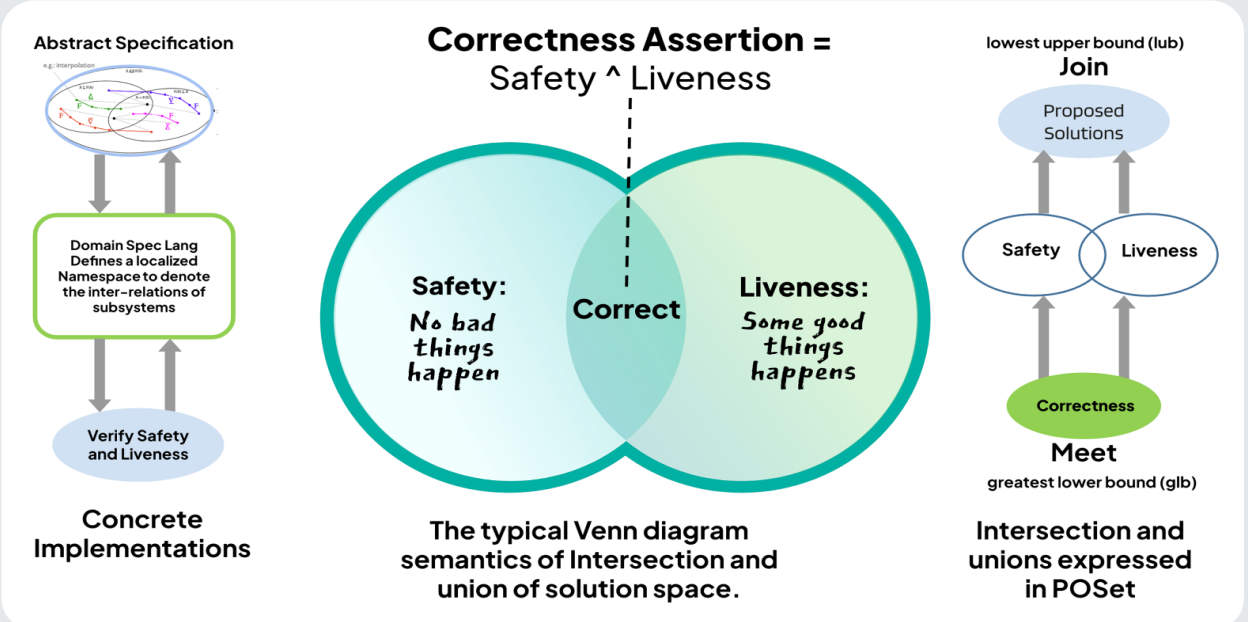
The Science of Policy Correctness

Before ***CbD*** is explained, one must understand the term "correctness." There is a logical way to express correctness that is scale-free and domain independent: the Venn Diagram representation of correctness in the diagram on the next page. It shows that correctness is the logical intersection of safety and liveness conditions. From a scientific viewpoint, ***correctness*** should be objectively determined according to explicitly encoded safety and liveness "social contracts".

Safety means nothing bad happens: a system or policy is considered safe if nothing bad happens from its execution. If one plays a football game, and throughout the game, the player is not injured, the game is considered to be safe.

Liveness means something good happens during the execution of a system or policy. The football game example of this would be the player scoring a goal during the game. That would be considered to be a liveness condition. The intersection between safety and liveness is clear in this example, a person is uninjured and scores a goal in the game. This is "correctness."

Visual Representation of System Correctness

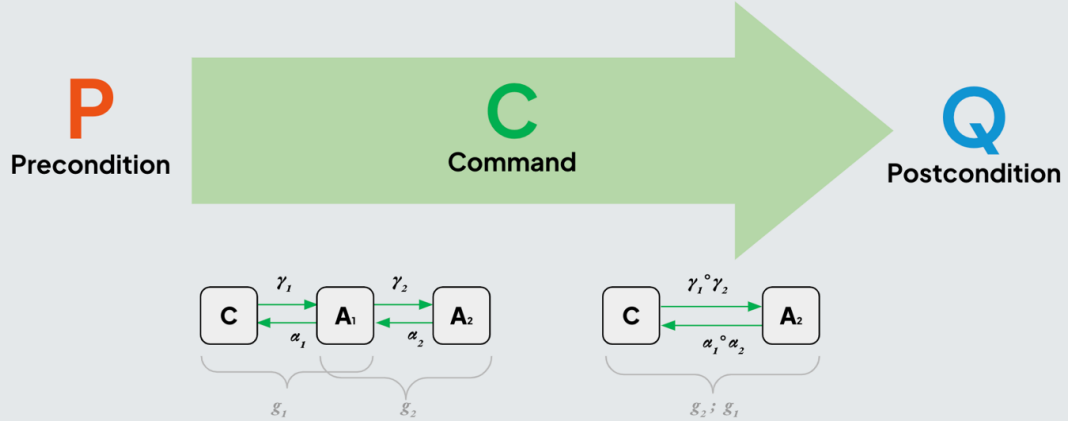


This generic, domain-independent statement of ***correctness*** is not only applicable to computer science, but to governments as well. It allows policy designers to separately list the conditions of what are considered to be bad, and then list the conditions that are considered to be good. This logical decomposition of correctness is a powerful intellectual construct that enabled system engineers and computer scientists to build systems as complex as the Internet. Whether a governing body can consistently apply this construct in policy framing decides how well an organization may be governed by explicit rules. With an increasing amount of conditions, however, organizations need an additional way to ensure correctness, particularly in contracts. This is where Hoare Logic, Hoare triplets, and CbD comes in.

CORRECT functions (C) must satisfy both {P} and {Q}:

$$\{P\}\ C\ \{Q\}$$

Hoare Triples can be composed to create other composite "functions" with computationally verifiable correctness specifications.



When more possible conditions were being created in computer programming, Tony Hoare in 1969 created a logic system to rigorously clarify system correctness. Key to this system was the Hoare Triple, expressed as ***{P} C {Q}***.[6] ***{P}*** is the precondition, what caused the command. ***C*** is the command, the action that takes place. ***{Q}*** is the postcondition, what happened due to the command's occurrence. In terms of System Correctness, safety would be the precondition, the event occurring due to satisfying safeness would be the command, and liveness would be the postcondition. When ***C*** satisfied both ***{P}*** and ***{Q}***, the system worked as planned, as in, it was ***Correct by Design***.

In our football game example, ***{P}*** would be a person who is physically fit to play and that person does not have an intention/history to hurt other players. ***C*** would be playing the game, and ***{Q}*** would be the player scoring goals and playing at least 90 minutes. We know this example is ***Correct by Design*** if these parameters occurred accordingly. But if ***{Q}*** was the game only being played for 10 minutes and fog stopping the game, then we know the system did not attain correctness in terms of ***Correct by Design***! CbD provides logical ***symmetry*** to all systems of any kind by using a ***consistent*** set of rules to classify the safety and liveness conditions of the system. This naming convention allows any system to identify errors (safety) and recognize accomplishment (liveness). As Henry Poicare once said: "Mathematics is the art of giving the ***same*** name to different things"[7]. CbD is a rigorous way to assign consistent naming schemes (safety, liveness, and correctness) to all governance structures in casual categories.

Hoare Triples can go beyond computer programming, however, because **every action made by every individual, group, government, etc. can be turned into a Hoare Triple**. This includes something as simple as eating food. "Hunger" would be the pre-condition, "eating digestible food" would be the command, and "increased energy" would be the post-condition. Governance concepts like Rousseau's Social Contract can be turned into a triplet as well. People giving power to a government would be the pre-condition, the creation of a Social Contract would be the Command, while the government receiving

[6] See *Communicating sequential processes* by C. A. R Hoare in Works Cited.

[7] See Mathematics is the art of giving the same name to different things by Verhulst and Poincare in Works Cited.

power would be the post-condition.[8] These triplets can be as simple or detailed as one wants, and one can even form a chain of triplets using the post-condition as the new pre-condition for a new triplet. One can easily imagine these Hoare Triples to be linked/composed to express more complex policies or programs. It is the complexity of these composable arrows[9]/Hoare Triples that make it a domain-independent way to organize correctness in a formalized data structure. This logic system is instrumental in guiding people in a world of increasingly complex contracts.

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Abstract Specification

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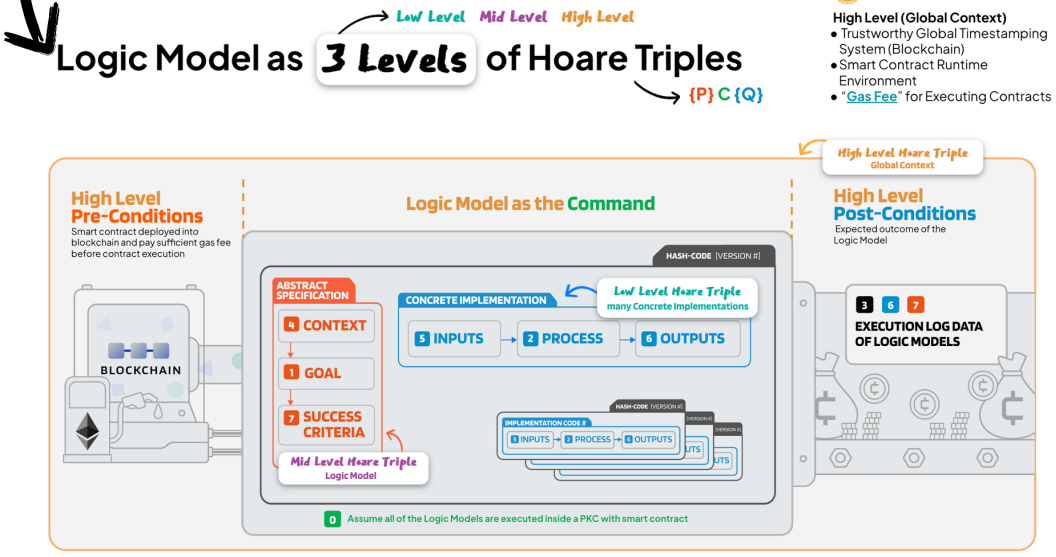
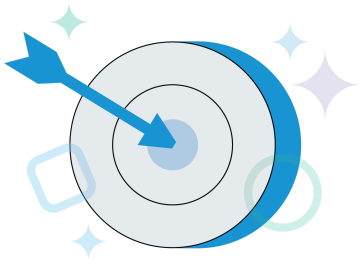


[8] See *The Social Contract: And, The First and Second Discourses* by Jean-Jacques Rousseau in Works Cited.

[9] See *Seven Sketches of Compositionality* by Spivak and Fong in Works Cited.

Writing down satisfactory conditions in contracts is not new. What *is* new are the many possible conditions in this already highly interconnected world. Yet all these possibilities can be symmetrically dealt with through Hoare logic and concepts that formally frames correctness like ***CbD***. Due to its composability, Hoare Triples may serve as the universal data primitive to encode arbitrary large-scale social and industrial governance challenges. Due to its simplicity, they can scaffold application scenarios that deal with the complex interactions of many knowledge domains. The Hoare Triple is a Universal Construct:[10] It is everywhere and has been already adopted by many popular governance tools, such as the Logic Model (see ***Appendix*** on ***Logic Model as Multi-Level Hoare Triples***).

[10] Universal Constructs have been explained by Leibniz's Monadology and Discrete Mathematics with Applications by Epp, references can be found in Works Cited.

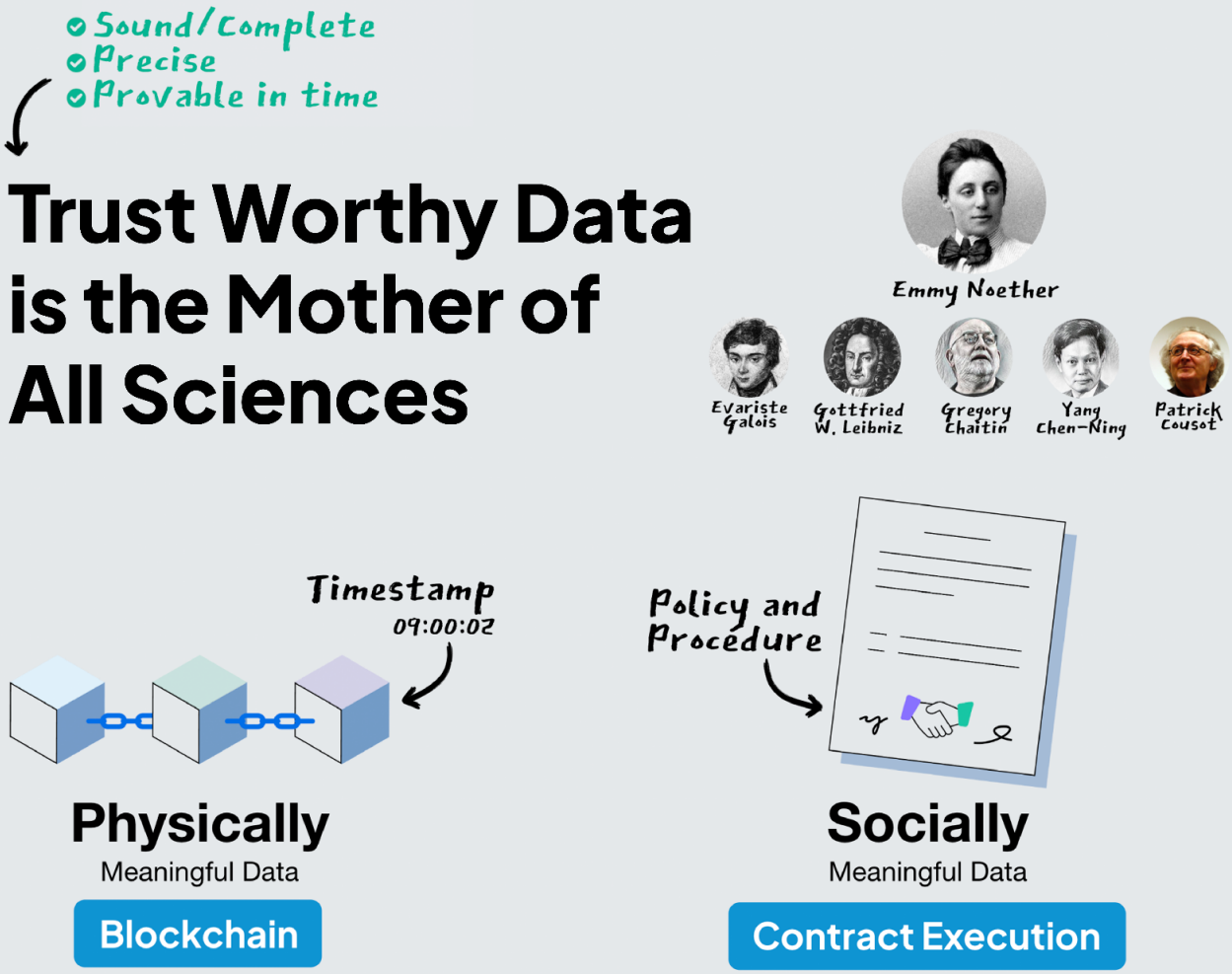


III. Success Criteria:

Associate social and physical meaning to Data

Only after recognizing that a unifying logical primitive, a Hoare Triple, is a grounding representation of scientific judgment can one consider policy framing and governance practice as not just an art form, but also a scientific endeavor. It also marks a new era of Digital Transformation by actively applying ***Correct by Design*** methodology to not just engineer inanimate objects, but also use the same principles and tools to logically reason on ***ethical integrity***. In a highly connected world, we should be allowed to adopt technologically sophisticated thinking tools to tackle the complexity created through systems driven by Big Data. However the data or causal relations of information must be associated with physical and social meaning, so that data could be relevant to governance.

As an emerging field of science[11] ***SoG*** needs to be grounded and validated in the physical world and must be socially meaningful to people willing to use this theory. Data may be associated with physically observable parameters, such as timestamps[12] and spatial markings, such as addresses and relative locations. To associate social meaning to data, one must engage with many socially relevant participants to agree on certain pieces of data. These are often called signed contracts. A signed contract often is dated and the integral date value is a timestamp. These increase the trustworthiness of the contract.



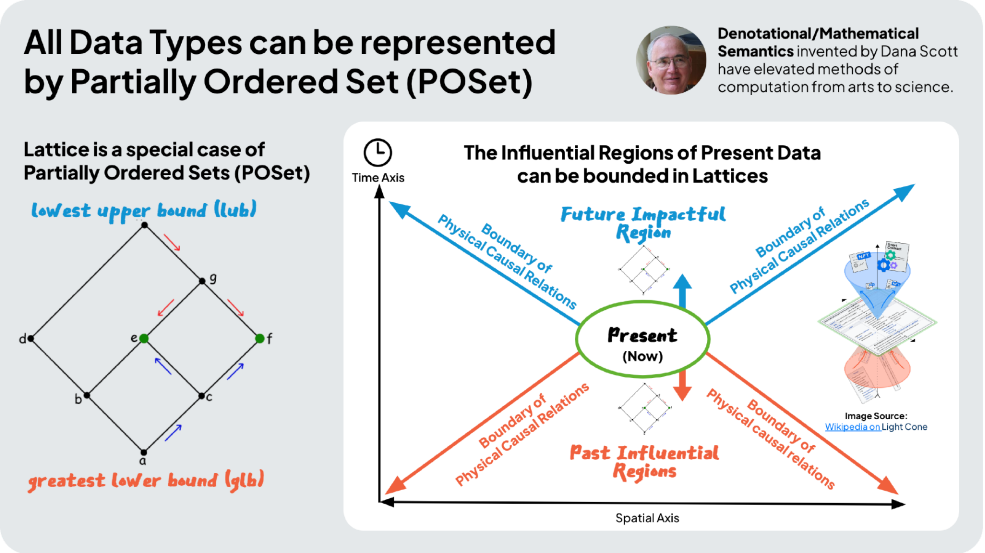
[11] See Bruno Latour's Science in Action in Works Cited

[12] Associating time value with a piece of data is called time stamping.

Symmetry breaking: Time flies like an arrow

It is ***time***,[13] the phenomenon that captures the unifying direction of causal relations, which breaks symmetry in our physical world. Symmetry occurs from as small as the electron level, as indicated by Paul Dirac.[14] But time erodes everything: consistency, flexibility, balance, order, etc. It breaks directional symmetry by forcing us into the future, never the past.

Governance is about capturing opportunities in time, and it must use past data to inform actions into the future. It is defined in the field of theoretical computing science as all data is represented as ordered pairs of data (Hoare Triples). Even "faulty" data or "failed experiments" are useful to governance due to innovation. According to Luo, the more diverse data innovators look at, the more novel and useful their design.[15] Governments should innovate to initiate policy to benefit the people, and the efficacy of the policy should be judged by CbD composed of Hoare Triples.



[13] In logic, a bounded period of time is called a Lattice. It is a collection of ordering pairs of relations that has a unique bottom and a unique top. In the description of a program, it specifies the initial state and the ending state of a program whether the program succeeds or not. The evaluation of success is done by Pre and Post conditions attached to bottom and top in a Lattice.

[14] See *The Principles of Quantum Mechanics* by Paul Dirac in Works Cited.

[15] See "Data-Driven Innovation: What is it?" by Luo Jianxi in Works Cited.

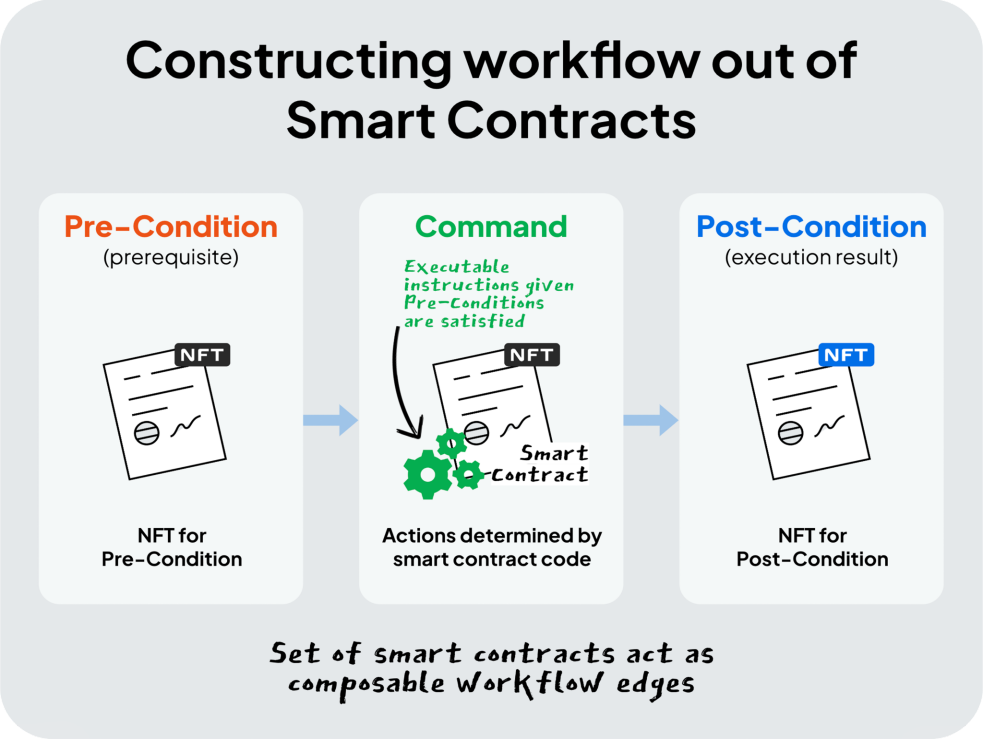
For governmental purposes, one can see these basic data types as Logic Models that keep policy execution on track. Framing correct governance practices needs only one data type: the "ordered" relations. This singular data structure, graphically represented as ***arrows***, an ordered pair of key-value data points, is a way to use discrete symbols to denote causal relations, a fundamental reason for the inevitable Digital Transformation. Arrows, ordered relations, and Hoare Triples are all representational data structures that help humans and machines perceive time[16] in logically computable terms. Only after causal hypotheses are given finite symbolic names in these logically represented formats, ***correctness*** of prescribed policies becomes accountable, observable, and terminable in finite time.

Governance is an intentional act, it must be encoded in data. There is an often ignored universal truth: all data encoding schemes can be absorbed into a set of ordering relations, as shown in diagrams composed of connected arrows. Executable programs of any kind, especially programs designed for intended activities in public affairs, are all made of nothing but arrows, because they are just bounded events in ***time***.

Timestamping Hoare Triples with Blockchain

Time penetrates everywhere. Once a reliable time source is approved by many participants, complex workflow amongst these parties carries them across vast space. Blockchain should be used as the medium because it is an immutable ledger, being a permanent, indelible, and unalterable history of transactions. Since all blockchains must regularly package a "block" of mutual agreements in a fixed time interval, the process of packaging agreements makes blockchain both socially (many social agreements) and physically meaningful (each block denotes an increment of time).

[16] Hoare Triple, key-value pairs, and data types in general are all considered to be representable as Partially Ordered Sets, or POSet.



Using Blockchain as a common ledger to share actionable code, often called a Smart Contract, both pre- and postconditions of a Hoare Triple can be bound to socially agreeable physical time. In other words, a trusted timestamp system defines the temporal ordering of events. It allows “commands” or “contractualized action ” to be executed in a sequence that fulfills the functions of an arbitrary and complex workflow that must be met for agreements, all denoted by Blockchain.

In the physical world, the sequential order to contract execution can be easily encoded in logical assertions bound in Pre-Conditions of other Commands. The required time to fulfill the command execution, such as payment due dates after product delivery, can be encoded in Post-Conditions. These time-bound logical statements are the essential programming constructs that make up the composition of modern workflow systems, often called the Enterprise Resource Planning (ERP) system. ERP’s most essential function is to ensure all enterprise actions across highly dispersed geographical locations follow programmatically-defined temporal ordering sequences. With Blockchains and Smart Contracts providing a trustworthy global clock (via timestamps and hashes) and custom-defined action triggering conditions, many expensive ERP software solutions could be replaced

by public computing services, sometimes referred to as the Web3 movement.[17]

Hoare Triple as the Open Format

Governmental policies are codes, and codes should be represented in domain-independent and scale-free data structures such as ***Hoare Triples***.[18] The ***domain-independent*** and ***scale-free*** nature of the Hoare Triple provides a unifying data primitive to express and examine the process of policy construction and deconstruction without being fixated with a narrow field of domain knowledge or a particular physical scale. The same reasoning applies to business operations and even personal event management. Coupled with a trustworthy timestamping system, a time-bound Hoare Triple can be the Open Format to construct workflow for any application domain and any scales of applications.

Open Format is an important assumption in the global pursuance of Digital Transformation. The integrity of digitized governmental policies must be united in a logically invariant data type, allowing any policy to be computationally examined with computable correctness. ***Correct by Design*** provides a logical framework to connect causal structures and policy statements in a common data type that is not tied to any specific interest parties. This openness in format enables a unifying semantic realm to reason about policy consequences in one logical universe.

We also encourage governmental agencies to contribute their practice in a scientific community by promoting the creation of an ***Open Format Repository*** across many government agencies, so that their governance experience can be shared and reused. This repository will catalog existing security-aware communication formats, curate these designed artifacts as Ricardian Contracts, and manage the evolutionary history of the curated content as Non-Fungible Tokens (NFT). This blockchain-validated (timestamped) repository of data content composed of executable source code with textual descriptions would elevate public accessibility to the highest level possible, making ***Open Format*** knowledge reusable across application domains and shareable by various sovereignties and cultures.

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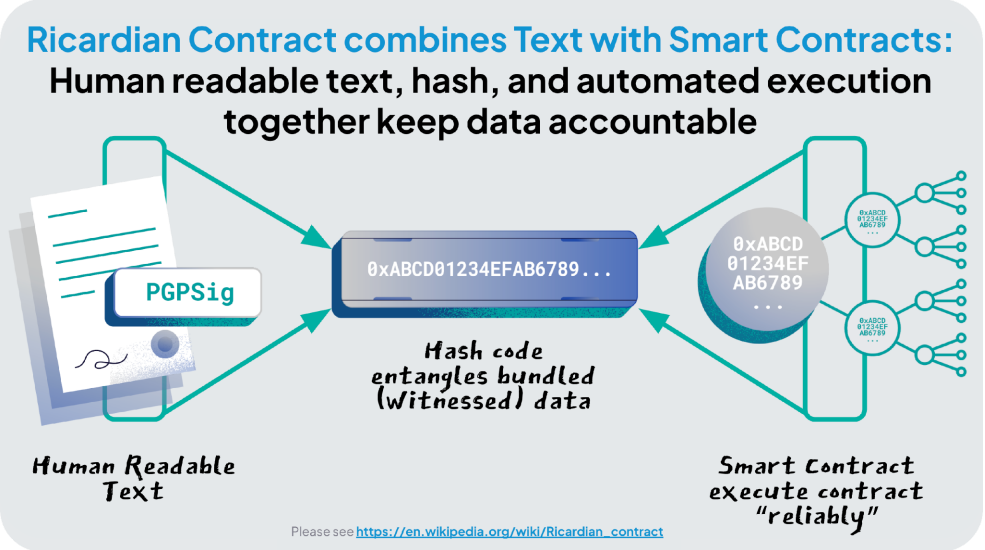
[17] See "Decentralized Society: Finding Web3's Soul." by E. Glen Weyl, et al.

[18] There are many other models to express domain-independent data structures, see Principles of Abstract Interpretation by Cousot in Works Cited.

Open Format for Everyone

The foundational assumption about ***Correct by Design*** is to enable the broadest and deepest possible interpretation in a common data format that synthesizes abstract rules with concrete results in world events administered by digitized government policies. This data format cannot be only accessible to highly trained programmers. The format must be accessible to people who can read and write languages. The combination of human readable text with a specific set of executable contracts needs to have some form of technical certainty. The Ricardian Contract was invented by Ian Grigg in 1996, which proposed the generation of one fixed-length number, called a hash code, to represent the unique composition of human readable text and machine executable contract by passing this contractual package with a secure hash code generating algorithm. Bitcoin uses hash codes to secure money transfer between users.[19] Due to the uniqueness of the cryptographic key, hashes have multiple resistances to hacking,[20] increasing the safety of the data format. The Ricardian Contract is also known as the Bowtie model, because the diagram of the proposed data format looks like a bowtie.

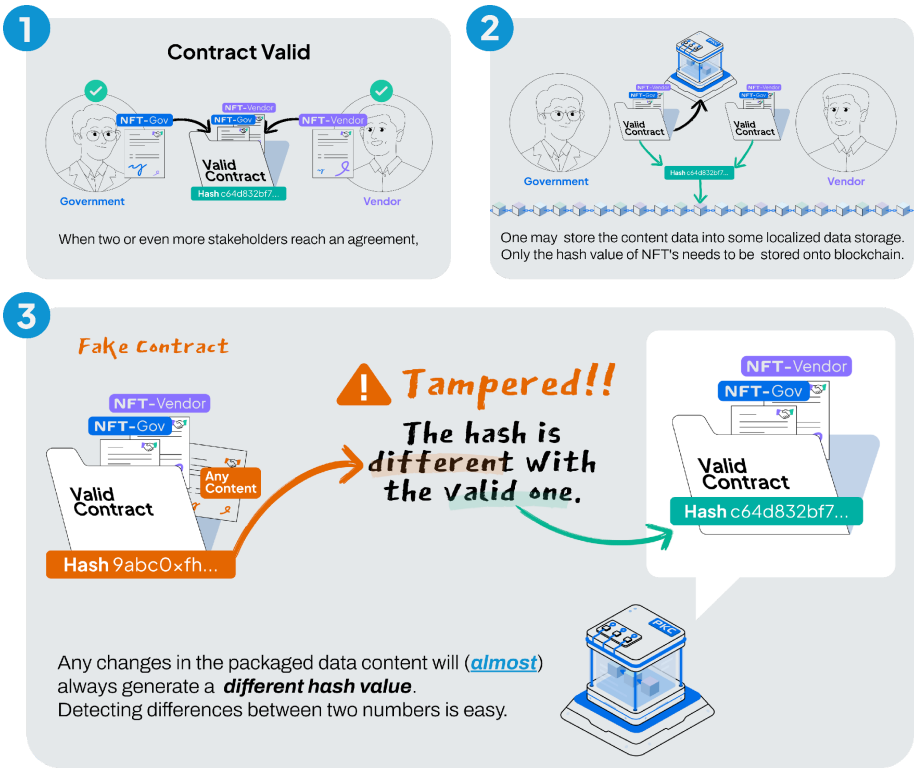


[19] See "Bitcoin: A Peer-to-Peer Electronic Cash System," by Satoshi Nakamoto.

[20] See *Communication in a World of Pervasive Surveillance: Sources and Methods: Counter-strategies Against Pervasive Surveillance Architecture* by J.R. Appelbaum.

Trustworthy and Economical Data Storage

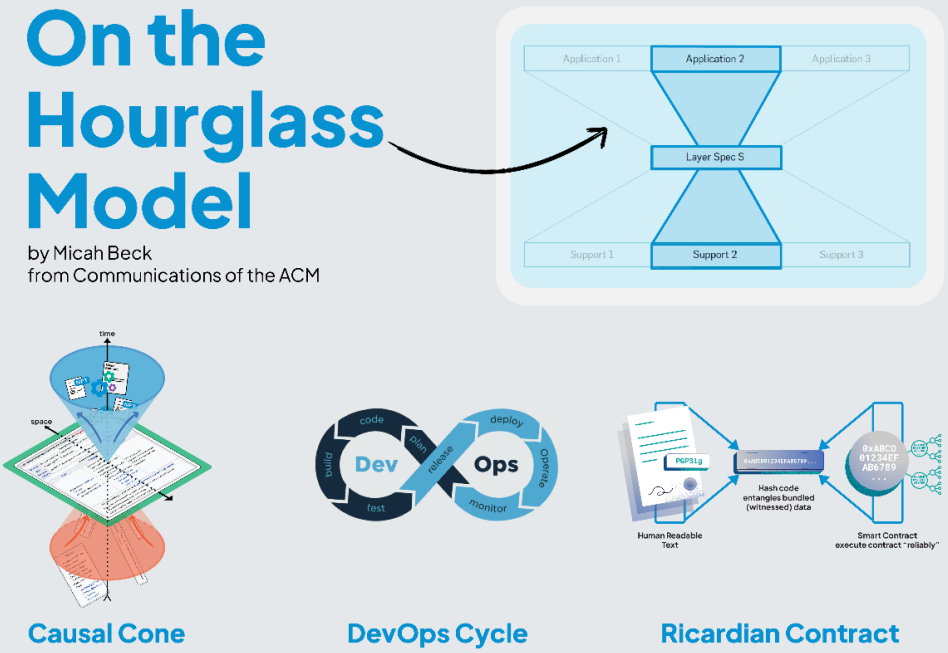
Blockchain, as an immutable database, can be expensive to operate. It is particularly expensive to store amd synchronize a large amount of data across many computers. It can serve as an economically viable notary service if it is coupled with some local storage systems. As proposed in the following diagram, blockchain only needs to store the hash code of a Valid Contract, while the detailed data content of the Valid Contract can be stored in local file systems of participating parties. As long as the presented data content generates the same hash code, it can be considered valid. If any modification is made to the contact package, running through the same secure hash generating algorithm again, it will guarantee to generate a different number, and then we may know that the data package has been tampered.



This public infrastructure, coupled with data and computing service packaging tools like microservice and microservice orchestration, provides a new breed of data services that allow citizens to own and operate data centers like large organizations. This creates a form of scale-free data sovereignty that was not possible before. Tools such as the Personal Knowledge Container created in Indonesia were designed to demonstrate the feasibility of such an egalitarian data instrument.

Summary: An End-to-End Argument on SoG

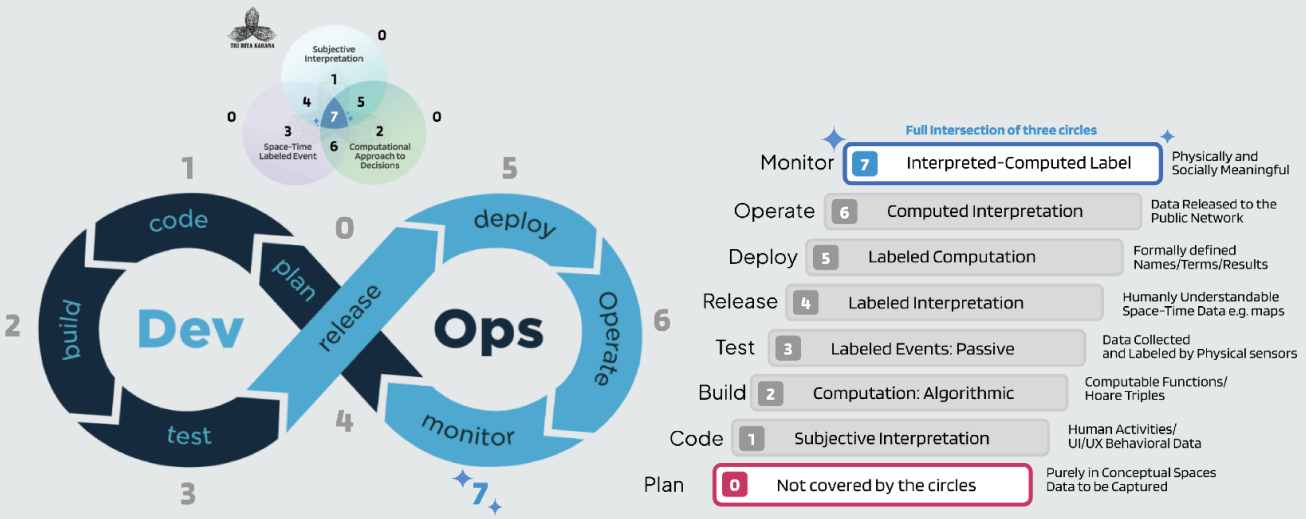
It is popularly known that large-scale Internet engineering follows a so-called Hourglass model[21]. To allow any organizations to conduct self-governance in the era of Internet of Everything, it is inevitable to ask what would be an End-to-End argument[22] that would reliably scale to cover everything. This is reflected in multiple concepts, workflow cycles, and operational models. The causal cone of ***Past→Present→Future*** and the Ricardian Contract, being visually presented as a so-called Bowtie Model, both are presented in diagrams shaped like hourglasses. Also, the DevOps cycle is often drawn in the shape of a Möbius Strip, which also looks like an Hourglass shape. These recurrences of hourglass shape are not coincidences.



[21] See Beck's On The Hourglass Model, referenced in Works Cited.

[22] See Saltzer's End-to-End Arguments in System Design, also referenced in Works Cited.

DevOps Cycle: Iteratively Refines Learnable Data



There is a reason that all these concepts, cycles, and models must have a common point of control. The action of control may only happen at "the present (time)." One does not "live in the past," after all. "The present" is often short and locally small, dealing with a very large world of possibilities. Therefore, all decisions that have big impacts must condense from a significant amount of past events and expand to a wide range of future possibilities. That is why all system design patterns are eventually shaped like hourglasses. Some of them are oriented in different directions (horizontal vs. vertical), the general shape being wide on both ends and skinny in the middle. The widening and narrowing structure of an hourglass shows that data can be compressed and shaped asymmetrically. It is this asymmetry that gives utility to practical applications, and the practicality of data manipulation introduces accountable ways to deal with governance issues. It is also why the hourglass has been recognized as a geometrical pattern to show controllability in various literature. Interestingly enough, an hourglass happens to be a device that is used to measure time.

Leverage Information Asymmetry for Self-Governance

We argue that information asymmetry exists in nature and cannot be avoided. But, they can be technologically distributed by allowing more people a monopoly on their own information. By utilizing computing resources that many people of the world already own privately, individuals can obtain information in timely, accountable, and observable manners according to their personal interests. Alternatively, people could create information asymmetry based on their private data assets, therefore creating a form of mutual dependency that reduces systems favoring people with more money or more computational knowledge. The people who can make use of the ***SoG*** are not just the ones who have powerful computers or high bandwidth network connections. ***SoG*** changes the power structure by helping more people know how data and causal structures can be used to create information asymmetry in their subjects of interest. Moreover, the successful ones must have timely, accountable, and observable instruments to process application specific data to adequately govern their own organizations. This is where a free and unbiased technical instrument must be created and adopted to enable correctness in governance. The creation of such a technical instrument is about pragmatic data engineering, not just theoretical science, which will not be discussed here[23].

SoG evolves with the technology of data manipulation

An automated process to identify causal entanglement of data over spacetime would be the ultimate crystal ball for governed outcomes. According to Han Feng[24], physicsts such as Kofler and Zeilinger[25] already explained the boundary of predictive powers in quantum physical terms. With new waves of the Internet of Things technologies and higher bandwidth communication infrastructures, the casual entanglement of data over spacetime still has many surprises in store for this cycle of civilization. Because the Science of Governance is scale-free and domain-independent, abstract structures like the Logic Model, Ricardian Contract, and the Hoare Triple will continue to enjoy

[23] SoG can guide its design and implementation, but not specify the detailed engineering decisions.

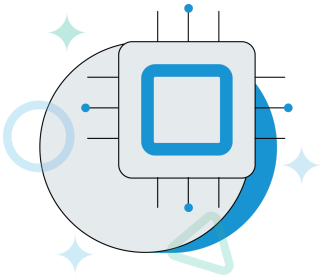
[24] Han Feng is a Physics Research Fellow at the Advanced Institute of Studies at Tsinghua University.

[25] See "Quantum information and randomness," by Johannes Kofler and Anton Zeilinger.

their inevitable existence in future scientific endeavors. Independent of the size of organization, arranged and ordered pairs of instructions (Logic Model/Hoare Triple) are the necessary knowledge to enable a form of self-governance that should be treasured by anyone who possesses private valuable data.

Tools:

Personal Knowledge Container



I. Tech for Trust:
A Data Infrastructure for Trust Building

The Personal Knowledge Container (PKC) is both a scalable personal library and a data wallet,[26] a self-administered knowledge management solution that addresses the problems caused by information asymmetry as diagnosed by the Science of Governance (*SoG*). PKC is a Domain-Driven Microservice to avoid a monolith application, reducing unnecessary entanglement of functionality in a modular way.[27] PKC is created to show how technically feasible and economically viable it is to enable individuals and small organizations to process data in a timely, accountable, and observable manner in ways that are similar or equivalent to systems only affordable by large-scale organizations. This means that individuals can process a potentially infinite amount of data. Large-scale organizations would also benefit from PKC as they would save large costs of transferring terabytes of data by simply using the tool. It can be trusted as it is open, transparent, and most importantly, operated and owned by people who generated the data from the source. PKC chooses currently known technologies that allow data providers to contain the right to govern at the origin of data, so that its technical architecture is trustworthy.

PKC is a technical solution that addresses the political problem of data ownership. By making data processing technologies available to the

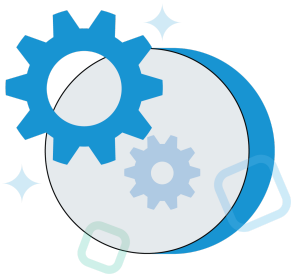
[26] "data wallet" being a term Marten Kaevats, member of the IEEE SA OPEN, suggested for PKC.

[27] As summarized by Marten Kaevats.

masses through Open-sourced and freely distributed PKCs, this technical instrumentation should help reduce technologically or economically induced information asymmetry, and therefore build trust amongst society participants.

As Blockchain and Smart Contract related data infrastructures become increasingly mature, the features of geographically-dispersed collaborative workflow as promised by the "Web3.0" programming model has already been incorporated into PKC.

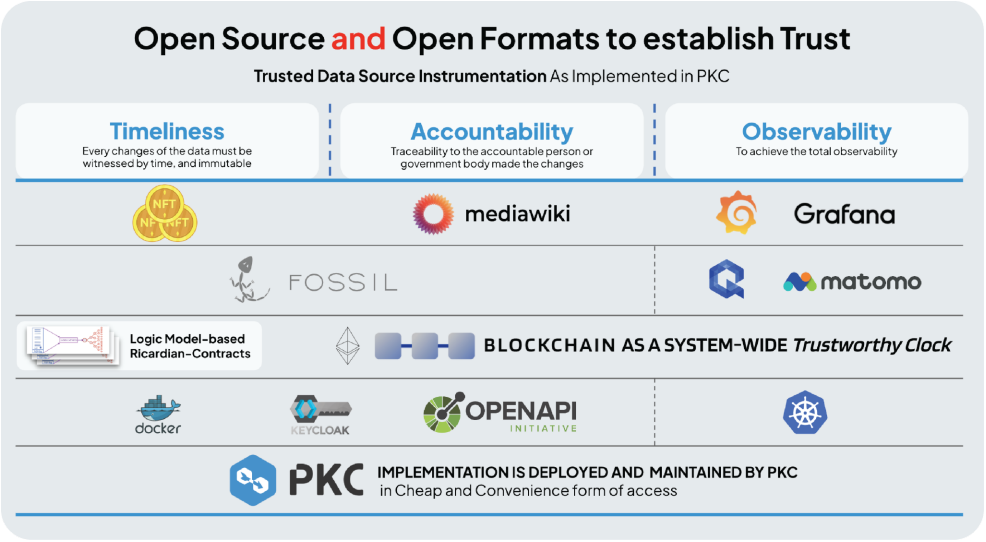
The increasing adoption of digital payment systems and publicly registered Data Assets, commonly known as Non-Fungible Tokens (NFTs), shows that Internet-scaled marketplaces could be designed and deployed by grassroot startups. Since the public deployment of Ethereum in 2015 as a "programmable blockchain", many of the highly publicized online economic events have been conducted by rules encoded in machine executable contracts. This also gave birth to the field of Cryptoeconomics, an area of digitally transformed economic activities that are usually associated with Decentralized Finance (DeFi) applications. The lack of an Internet-scale regulatory framework to govern these economic activities is another kind of information asymmetry that favors communities with better access to data processing technologies. By bundling Blockchain-compatible services and Smart Contract deployment capabilities in PKCs, the container reduces this unfair advantage. PKC as a general-purpose data and computing service container also allows more people to participate in these online marketplaces with a wider range of asset classes. To contextualize the design intent, PKC is not just a specific data manipulation tool designed for Information Technology professionals, it is a stack of governance technologies that addresses the evolving needs of large-scale online interactions.



II. Processes and Resources:

Manipulate data assets in Open Formats

To ensure trustworthiness, the source code of PKC should not only be Open-sourced; it is even more important to be compliant to open and exchangeable formats. Open-source technology is usually created by other entities, so when mistakes in the software happen, the person would have a harder time identifying what exactly to fix. Open-format solves this issue as one can directly see the codes themselves. The following diagram shows the Open-source solutions adopted as the key functional elements of PKC.

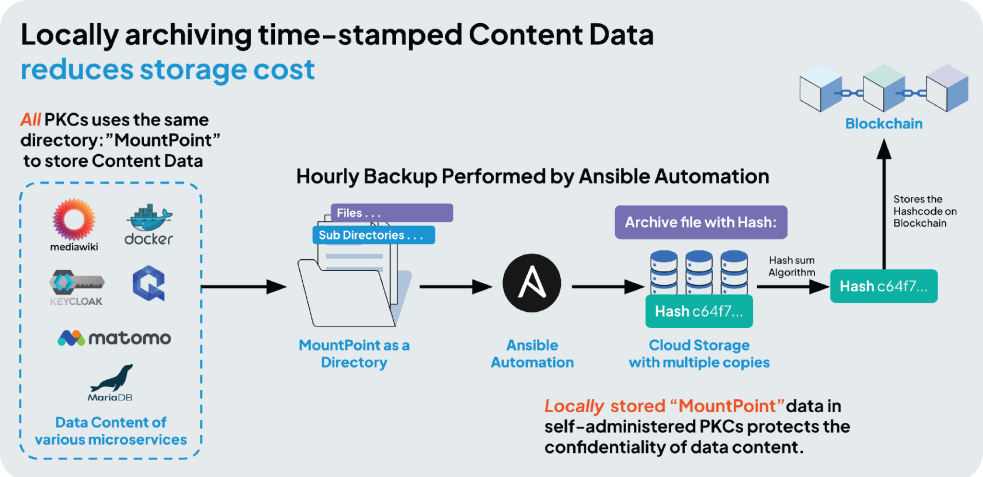


A format is open if the encoding structure and the metadata regarding the structure is transparent and well-documented. One such technical effort to ensure openness is called Open API, originally the Swagger API project. It forces all computing services to produce results in JSON formats (human readable), offering a set of web-based graphical user interfaces to expose the metadata and allow data extraction and data submission to be operable through standard network requests. PKC

adopts Open API protocol by exposing data content in the MediaWiki database. The other services such as Keycloak and QuantUX already have native implementations of Open API.

Connect Web3 into the Cloud Native Industry

Distributing these technology building blocks is not a new idea. It has been a massive social and economic movement in the making for at least 30+ years. The most relevant technologies include software container technologies such as Docker, container orchestration technologies such as Kubernetes, and OpenShift Framework for a standardized Continuous Integration and Continuous Delivery (CI/CD) tool chain. These software integration efforts are not only free, but they have abundant tutorials and community practitioners that can help create fully functional distributed data centers with near-zero software development cost. In terms of hardware infrastructure, PKC is designed to reduce the cost of data ownership by using commodity hardware solutions to enable remote and low-cost communication services, such as Wifi Mesh, and 3~5G access points. By localizing personal data storage, one may choose to only store the hash code of a large data set to Blockchain. This “layered” solution of data storage would retain a mechanism to verify data content that must be tamper-free, while not having to incur massive costs of data storage on public blockchain.



PKC can also locally serve computing services with containerized microservices, therefore reducing large amounts of unnecessary network traffic across the Internet and network operations costs.

Docker containerization technology and virtualization enable us to see software package functionality as an instrument, rather than a bunch of code, thus enabling us to achieve our goals more concisely and consistently, allowing us to see the full scalability of the instrument.[28]

It is the collection of all these existing Open-source technologies and commoditized hardware solutions that enabled the possible mass adoption of PKC. In other words, PKC is a technology stack for trust-building that empowers individuals and agencies to exercise data sovereignty in affordable ways. For example, when one needs to share a file with many potential downloaders, a solution is to store it in the IPFS format and naming scheme, so that it can be addressed across the Internet based on its digital content. PKC can include an IPFS service node as one of its Dockerized services.

NFT: Transferring Governance Rights

Data formats also need to support exchangeability. A piece of data asset should be exchangeable in the marketplace by having a common set of annotation to denote its ownership and protect its content to be only editable by its owner. This can be accomplished by publishing/minting data assets as Non-Fungible Tokens (NFTs). Without going into the technical details of minting NFTs, the main obstacle of minting NFTs is that public NFT minting services all require upfront crypto currency payments. The good news is that there are public NFT minting and publishing services that require extremely low fees. NFT as a special kind of securely protected data content allows for many kinds of workflow security programming that was not feasible before. For example, one may transfer the ownership of certain rights, which serves as the condition to modify or authorize information in a workflow. So that decision-making accountability can be programmatically controlled using NFT ownership transfer. This is a critical feature in managing the governance practice in many organizations.

[28] As summarized by Muhammad Haviz, Chief Engineer of PKC.

Content filtering independent of outside influence

An important feature of PKC is the ability to filter data content based on self-operated content filters. Controlling the filters is not only useful for preventing children from seeing age-inappropriate content, it can also be used to actively filter and prioritize content beneficial to social, intellectual, and economic activities. Running a privately owned knowledge container such as PKC will enable individuals to search, organize, and store data content in ways that can be isolated from data surveillance technologies. Without a self-administered knowledge container, online content consumption is inevitably influenced by external parties, which is not desirable: the ability to independently configure data filtering options with minimal external influence is an aspect of freedom to modern citizens. PKC serving the data filtering functions based on privately controlled computing services also enables a type of law enforcement possibility that does not intrude on individual privacy.

III. Desirable Outcome:

Egalitarian access to Data Processing Technologies

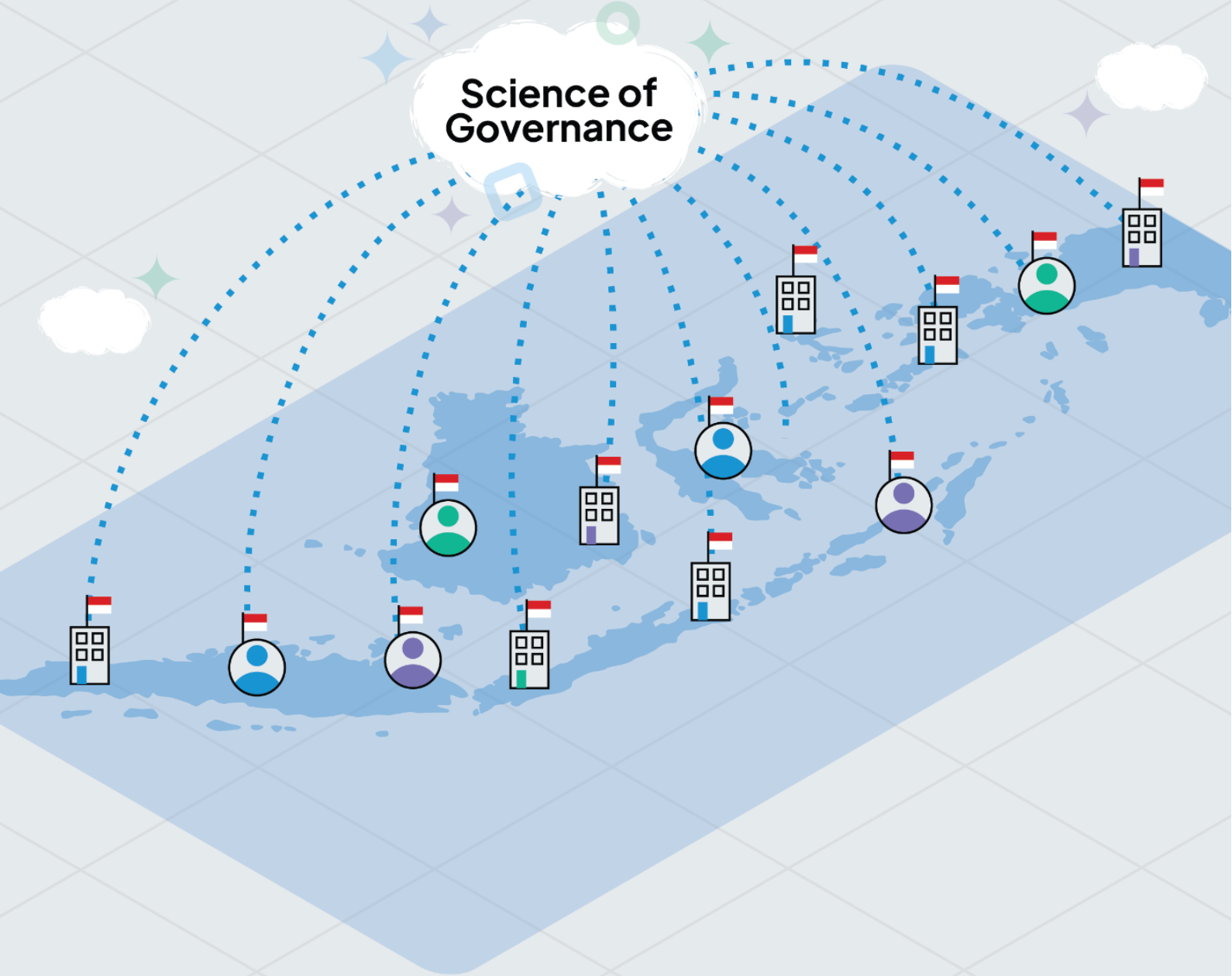
PKC implementation can be successful when it satisfies the following conditions:

1. It enables owners of PKC to collect, catalog, navigate, search, and process data assets using computing technologies that have been released to the general public as Open-source and Open Format solutions. All chosen technical solutions should be affordable to everyone.

2. It must store the change history of data assets by registering changes using various levels of technically secured (cryptographically verifiable) procedures, so that data assets can be traced to know at what time and by whom did the collection of data change. Therefore, it becomes technically possible to assign accountability, observe, and change outcomes with timely remedies.

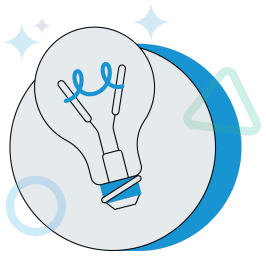
3. It must encode knowledge in a ***Correct by Design*** (CbD) format, which should fit in logic models composed of human-readable text and relevant executable code. The operational experience accumulated from the execution of each logic model should also be recorded by PKC to provide feedback for future refinement of the logic model.

It is only after a wide enough population started to have egalitarian access to data processing technology similar to large tech companies can the societal issue of information asymmetry be systematically addressed. PKC is a technical solution to address this concern as prescribed by the Science of Governance.



Applications:

Concrete SoG Examples



I. Applications:

Concrete SoG Examples

SoG provides a scientific basis for policy correctness, so that tedious and complex entanglement of interacting policies[29] and anecdotal events can be verified with the help of automatically executed algorithms[30] and pre/post condition verifiable data. In other words, making policy changes learnable and accountable requires the realization of a PKC-based version control and content comparison/verification framework that analyzes government policies against a significant amount of real world events.

However, keeping event data in ways that both uphold the sovereignty of a government, while protecting privacy concerns of individuals, is a technical dilemma. For instance, health data can still be accessed by savvy tech specialists if the raw data is stored in blockchain alone. This dilemma can be incrementally resolved with improved and well-engineered data security solutions, such as creating a unique hash code for the data and assigning them a Smart Contract. Operationally effective and legally accountable data management systems require continuous improvements in the technological infrastructure of the governed geographical regions, as well as the technical literacy of local citizens. To ensure educational equality, data-intensive literacy and technical knowledge, such as skills and awareness of Continuous Integration and Continuous Deployment (CI/CD), should be embedded in the educational curriculum for all citizens under the movement of Digital Transformation. Based on this observation, we have the following propositions:

[29] See C.A.R. Hoare's *Communicating sequential processes* in Works Cited.

[30] See Koo et al. "Algebra of Systems as a Meta Language for Model Synthesis and Analysis" in Works Cited.

Disseminating SoG-based Body of Knowledge

Pre-Condition(s):

To create public awareness of *SoG*, the professional user needs both the body of knowledge (the curriculum) and a publicly accessible data infrastructure. PKC is to be adopted by individuals and/or organizations. In parallel, educational institutions must have evolving pedagogic approaches to operationalize the learning of self-governance, particularly in multiliteracy. The GASING method is a pedagogical approach, compounded of three words in Bahasa Indonesian, roughly translated to "gampang" (timely knowledge acquisition), "asyik" (observably attractive to potential participants), and "menyenangkan" (accountability for individual and group-wise experiential encouragement). These approaches using both physically meaningful and social data, like representing numbers in different forms using fingers and asking students to exchange content knowledge in symmetric formats.[31] It employs multiliteracy methods including singing and dancing that prioritizes a computation approach instead of calculation. This method is very easy for anyone to learn and replicate. It is not only applicable to arithmetic, but also to high-level mathematics, physics, and other subjects.

[31] The GASING method is an educational framework originally created by Prof. Surya that has proven to work at scale and with a wide range of student capacities. See references on GASING Method in Works Cited, GASING Method is being practiced with Indonesia's Beasiswa Indonesia Maju Science Park (BIMTS) Scholarship Program and training camp being supported by Yuan Xun's work on the concept of Nucleus of Computing.

3/2/2022 - President of Indonesia, Joko Widodo, visited children in Humbang Hasundutan Regent's Office area (North Sumatra Province), who were studying mathematics with Professor Yohanes Surya using the GASING method.
Source: Liputan6 News.

Command(s):
To spread the knowledge of ***SoG***, relevant books, papers, and online articles will be continuously refined, compiled, and annotated under the direction of the G20 Professorship Program. The data infrastructure allows for scalable distribution of content through network channels using the most widely accessible data formats and data presentation terminals, such as HTML5, Web3D and Smart/Ricardian Contracts.[32] The interactive data content should be displayable on portable computing devices. Student's learning performance should also be recorded, analyzed, and protected[33] for their personal growth purposes.

A collection of interactive models and executable specifications should be assembled in order to facilitate the learning of Open Formats. Online virtual 3D laboratories connected with remote laboratories and data from physical laboratories can play a big role in federated online research[11]. That way it will be a domain independent research center for anyone who wants to contribute. The data will be secured through the blockchain. Pedagogically, the GASING method has been applied to experiment, summarize, and integrate ***SoG*** body of knowledge and data infrastructure, so that it can be orchestrated within school environments and create a self-reflexive (CI/CD aware) curriculum based on data-intensive evolving evidence from the real world.

Post-Condition(s):
Successful execution will lead to the reduction of public data entry barriers to all of society. By creating a strong, symmetrical, educational pedagogy, student learning will increase. Because more resources are opened up due to a strong educational infrastructure, more resources can be devoted into alternative learning for students with alternative literacies. Using novel approaches like the GASING method leads to students enjoying learning, so that within two weeks those who previously could not count would be able to master addition, multiplication, subtraction and division quickly. The purpose of GASING is helping students understand and practice self-governance through the most basic/fundamental primitives that can be

[32] See *Code is Law* by Lawrence Lessig in Works Cited.

[33] This is the idea of the SoulBound Token, as Vitalik Buterin articulated in Works Cited.

composed as logically consistent arithmetic expressions, so they can experience meaningful correctness in their lives. The end goal is to practice the use of individually-operable data instruments[34] and self-administered knowledge content to enable everyone to own their personal data assets.[35]

Gloria, a 5th grader, felt the effectiveness of the GASING method to learn mathematics. For her, the GASING method makes mathematics fun instead of complex formulas.
Source: *Indotren.com*

[34] A proof of concept of such a data instrument has been built by Sir Tim Berners-Lee, see Works Cited, and one other implementation is available here.

[35] See reference programs by Mizanul Chowdhury's Proposals in Works Cited.

Social Governance Applications

Pre-Condition(s):

Government agencies should systematically identify areas of applications to apply *SoG* by enhancing data transparency while protecting natural security and privacy rights of its citizens.

Command(s):

Currently, Indonesia's LKPP (National Procurement Agency) and Digital Nomad Visa Programs[36] are just two examples. The Sovereign Union is establishing E-Identities to secure individual privacy.[37] Fab City is attempting a revolutionary paradigm shift to incorporate digital infrastructure solutions around the world. Fab City's values of open source, data self-sovereignty and trustworthy data exchange signify a paradigm shift not only for increased regional supply chain resilience and independence, but also for an in-depth global transition to a greener, more circular economy. The Fab City Operating System is one such set of standards-based, networked tools that enshrine these principles in code.[38]

In a neighboring country, the Australian Digital Transformation Agency (DTA[39]) is trying to deliver the strategic outcomes with more human centric, sustainable, and easily accessible digital government services for the people, businesses, and the government addressing the issues of data security, privacy, trust, transparency, and governance. A cross-ministerial platform such as myGov is an excellent example of similar efforts. Indonesia will seek to collaborate with the Australian government to refine the practice of *SoG*.

[36] See Bali Digital Nomad Visa in Works Cited.

[37] See Sovereign Union in Works Cited.

[38]The information on Fab City came from Adam Burns, Chief Information Security Officer of MICT (Media in Cooperation and Transition.)

[39] See Digital Government Strategy in Works Cited.

25/5/2022 - Indonesian National Public Procurement Agency (LKPP) will utilize blockchain technology to create a transparent and accountable government spending system. LKPP Head, Abdullah Azwar Anas said the use of this technology would be the first in government procurement of goods or services.
Source: *CNN Indonesia*

Post-Condition(s):

Changes to LKPP hosted price listings and immigration offices will be tracked using immutable and transparent databases. This will assign timestamps, track user accounts that changed relevant public/policy related information, and make the effects of changes observable. The initial Proof of Concept is already demonstrated to function as a replacement of LKPP's existing e-Catalog using PKC with Ethereum-compatible blockchain's Smart Contracts' infrastructures. Inter-departmental authorization of product specification changes are encoded as Non-Fungible Tokens (NFTs) to ensure future transfer of administrative rights are controlled by a public defined Open Data Format. New features of e-Catalog will also be Continuously Integrated and Continuously Deployed (CI/CD) using web-based interfaces that are compatible with Hoare Triples as an Open Format to control the stage gate of integration and deployment actions. This Hoare Triple-based format will standardize the data formats to document and encode conditional statements, reducing entry barriers for involving new vendors and new government agencies that do not have the budget to hire professional software development teams to integrate their subsystems to this national-scale governmental workflow.

Educational Governance Applications

Pre-Condition(s):

Educators and school administrators need to learn *SoG* as a new leadership skill. This means traditional disciplinary-based departmental administration boundaries must be adjusted to accommodate the intellectual revelation since the explosion of connected data.[40] Education administrators and school teachers must refresh their mindsets about what teaching and learning should be in this modern age. A new kind of school and schools that train educational governance practice must be created.

Command(s):

We propose to create such a pioneering institution in Bali, Indonesia, to train educational institution leaders around the world on the subject of *SoG*. In the process they will experience the ubiquitous data delivery mechanisms of web-based data collection and analysis interfaces provided by PKC.

Post-Condition(s):

Modern educational institution leaders will continuously integrate new methods and Continuously Deploy supporting evidence (CI/CD) to repeatedly improve learning practices. To reduce the cost of developing tools for collecting learning efficacy data, institutions will use Open-sourced and Open Format solutions of learning data collection, namely PKC, to systematically improve their understanding of how their respective institutions can be more effective in delivering or creating knowledge. The cost of collecting and storing organizational learning activity records can be significantly reduced if these institutions adopt PKC. Moreover, they can participate in the continuous improvement of PKC as active contributors.

[40] See dev4x.com Website as shown in Works Cited.

Age-Appropriate Design Code

Pre-Condition(s):

Children are vulnerable to threats to their privacy, safety, and security, which can lead to negative impacts on their safety, including their mental and physical well-being, as well as lowering their agency over their lives, disrespecting their childhood. Major internet platforms, meanwhile, have allegedly violated children's privacy laws and boasted to advertising customers about their algorithmic systems' capabilities to manipulate and target children to maximize their time spent on-screen where said threats exist. Children are suffering due to these platforms. The United Nations' (UN) 1989 Convention on the Rights of the Child laid the groundwork for protecting the rights of children. The UN's 2021 General comment No. 25 on children's rights in relation to the digital environment "emphasized" or "reinforced the fact" that children's rights apply to the digital world.

The United Kingdom provides an example on protecting children's rights in digital spaces. After the 2018 Data Protection Act was passed, the UK's Information Commissioner Office (ICO) developed guidance that provides "age-appropriate design of relevant information society services which are likely to be accessed by children." This resulted in the Age-Appropriate Design Code (AADC; also known as the Children's Code), which came into effect in September 2021. In California, legislators passed the California Age-Appropriate Design Code Act (AB 2273), which contains provisions inspired by the UK's AADC, including the age threshold defining childhood.

The Indonesian government has been considering similar policies like AADC, and is currently planning to engage with AADC creators to learn more from its operational experience and policy design wisdom to create a system to protect Indonesian citizens. The key contributing element of the Indonesian government is using personalized content filtering technologies similar to PKC that allows for individuals to subscribe to published content filter algorithms as Smart Contracts (which guarantee their transparency and accountability) to best protect the safety and liveness of online data consumption experience.

Command(s):

Creation of an Age-Appropriate Design Code in Indonesia through PKC. PKC practices a content distribution model based on content-filtering Smart Contracts. It is Open-source and allows individuals and nations to practice data sovereignty. This scale-free "personal data store" allows children's

guardians, school administrators, and regional education ministries to have the same technology and data governance capabilities that were only available to large tech companies. It filters out content and helps ensure the safety and agency of children.

Post-Condition(s):
In countries that do not have AADC protection, children will be exposed to data exploitation by various means.

In countries that have AADC laws passed, childrens' data access will be based on the compliance of data vendors. The law enforcement will have to be done passively, after the laws are broken.

Indonesia, with the intent to implement AADC to protect children, will use self-administered data filtering technologies, such as PKC, to actively protect data exposure online and configure an individual person's desire and need according to transparent Smart Contracts and NFTs that is legible, allowing for comments by anyone with or without information technology skills.

Actions in progress before G20 in 2022

To launch the *SoG* as a governance policy initiative during the 2022 G20 meeting, we must:

1. Engage global opinion leaders in creating an *SoG* **Proclamation**, which will define the goals and direction of the initiative. This document will be minted as an NFT and will allow programmable transfer of governance ownership.
2. Work with the **next G20 host country**, India, to announce an ongoing G20 Professorship office, which will serve as the office to provide the stewardship of the Intellectual and operational efforts.
3. Create a sample **knowledge sharing website** to share data and content knowledge with all interested parties of *SoG*. It should also provide reference material to existing and similar efforts that have been created in related fields.

II. Proposed Actions after G20 in 2022

To operationalize the *SoG*, we need to enable the following actions and associated resources:

1. Creating an institution, initially called the ***G20 Professorship Program***, which will invite world leading experts in various fields to collaborate and formulate the foundational scientific questions and solutions of *SoG*.
2. Working with educational institutions (universities, educational ministries), to develop strategies and programs in **disseminating knowledge of *SoG***. This would include political and scientific literacy for the young. It would also provide a trans-disciplinary body of knowledge for transfer agencies to educate government officers and educational institution administrators.
3. Working with regulatory bodies, global technology standard institutions and data instrument (semiconductor) manufacturers, to organize **standards/formats setting consortiums**, and set up ethically aware and interest-neutral standards.
4. Assembling early technology contributors, to build ***Proof of Concept*** prototypes to demonstrate the feasibility of *SoG* solutions.
5. Mobilizing Indonesian government agencies (e.g. ***LKPP* and *Immigration Office***) to plan for their internal digital transformation activities. Provide training courses and present data-intensive solutions to leaders of these agencies to become aware of possible options in improving their internal operational and governance efficiency.
6. Work with talented people (including digital nomads) and opinion leaders to create ***broadcast quality media*** content (video and websites), endorsed and spoken by leading government officers (ideally, the President and the Coordinating Minister) to articulate the strategic value and long term impact of *SoG* to Indonesia and to the world.

III. Scientific Governance in Action

The success criteria must make ***SoG*** not only scientifically sound[41], but also practically operable. To satisfy these two potentially contentious criteria, we need to inclusively consider competing scientific methodologies[42], identify the ***converging*** ideas and rules and compile them into shared knowledge bases (PKCs) as symmetrical data content. It is also necessary to identify ***diverging*** ideas and rules, and make sure different opinions can easily branch out to isolated knowledge bases to avoid unnecessary entanglement of operational data. This is often known as the practice of version control, but the adequate adoption of version control data in different application domains can be costly and requires a lot of Information Technology support in an organization. That is why a general purpose data management platform that is not designed to maximize commercial interest is a precondition of data ownership/data sovereignty. Most of the organizations are still debating their internal differences using traditional means of verbal interactions. In many cases, a well-managed set of historical records, such as a transparent, accountable action log will resolve a lot of managerial issues. In other words, Scientific Governance requires a scientific instrument, and that instrument is PKC.

As mentioned earlier, data becomes more trustworthy if the ordering sequences of potentially interactive events do not violate the temporal logic in the physical world. It is time and pre/post conditions that helps organizations to filter operational data to an actionable body of knowledge. That is why the Science of Governance can only be exercised operationally with a symmetrical format represented in Hoare Triples.

[41] The notion of Soundness, Precision and Terminability is articulated by Patrick Cousot in his work on Abstract Interpretation in Works Cited.

[42] See “Einstein and Chomsky on Scientific Methodology” by Raymond Dougherty in Works Cited.

Conclusion

The Science of Governance (*SoG*) is our answer to the growing problems of information asymmetry and technological complexity caused by the accelerating Digital Transformation. These problems plague social justice and destabilize political structures. Due to its abstract nature, *SoG* is a neutral theoretical foundation to help innovate and improve global governance while employing Tech for Trust (TfT) to solve the world's problems and serving as a concrete global "clock." The success of *SoG* depends on the following aspects: assessing governmental practice via time-stamped data, using an open-format, domain-independent, and scale-free methodology, providing a trustworthy and inclusive data infrastructure, as well as ensuring and utilizing secure data protection protocols to protect privacy. Key to *SoG* is the wide distribution of the Personal Knowledge Container (PKC).

PKC is a tool that gives agency to every agent to create and store knowledge and values with little entanglement. Through adopting the Correct by Design (*CbD*) notion using Hoare Logic, PKC can facilitate secure knowledge storing through treating all data as NFTs and through the execution of Smart Contracts, which are transparent by their technical nature. PKC is designed to make high-powered data security instruments free to independent agencies; it can be independently configured to filter data and security breaches, reducing potential safety hazards. It can utilize publicized knowledge through Smart Contracts or NFT exchanges. It will provide feedback and operational experience to improve Smart Contracts, cataloging data assets, implement software, and instill CbD knowledge content through hyperlinked Logic Models.

SoG needs to be applied through creating a *SoG*-based curriculum and dissemination, applying *SoG* through social governance and educational governance, and must be created as a governance policy initiative during the 2022 G20 meeting. To operationalize the *SoG*, a G20 Professorship Program has been created, and this document is its first public offering. Education bodies should also develop strategies

and programs in disseminating knowledge of ***SoG***. Training courses and data-intensive solutions on the subject are given to leaders of government agencies to improve their operational and governance efficiency. Policies like an Age-Appropriate Design Code should also rely on SoG's PKC to ensure its successful implementation. ***SoG*** shall also work with regulatory bodies, global technology standard institutions and data instrument (semiconductor) manufacturers to organize ethically aware and interest-neutral standards. ***SoG*** also needs to assemble early technology contributors to build ***Proof of Concept*** prototypes to demonstrate the feasibility of ***SoG*** solutions. Finally, ***SoG*** should be articulated through widespread websites and videos around the world.

As shown in Sanskrit on page 3, the notion of time is embedded in changes or differences. The differences can be captured as chained or partially ordered Hoare Triples. These triplets capture the rules and sometimes the actual content of changes, so that they form an immutable historical thread that can be used to make decisions across space and time. One could say that data is a scale-free medium to encode knowledge, therefore knowledge is just a special kind of data: a casually related set of data. It is such a universal pattern that breaking symmetries using causal relations (Hoare Triples) gives the sound and complete foundation to reason and assign correctness to governing actions. When science evolves, innovations in instrumentation break the paradigm of existing scientific theories.[43] As Albert Einstein said, "technology [...] has confronted mankind with problems of profound gravity. The very survival of mankind depends on a satisfactory solution of these problems."[44] It is time for us to share freely available data processing technologies to reduce technology-induced information asymmetry, so that ***SoG*** and self-administered data can serve as containers of knowledge to liberate willful souls around the universe.

[43] See *The Structure of Scientific Revolutions: 50th Anniversary Edition* by Thomas Kuhn.

[44] As quoted from *The Cosmic View of Albert Einstein: Writings on Art, Science, and Peace* by Albert Einstein in the Works Cited.

Acknowledgements

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Appendix

Logic Models as Multi-Level Hoare Triples

Logic models describe the chains of causes and effects leading to an outcome. While many logic models use a four-step process (Input, Activities, Output, and Outcomes/Impacts), logic models can be turned into concise (one page) document, listing the abstract goal statements in a triple, called: Context -> Actionable Goal -> Success Criteria, and another triple called Input -> Process -> Output. This is structurally identical to a Hoare Triple, which consists of three things:

Pre-Condition → ***Command*** → ***Post-Condition***

A logic model is shown in the following example:

Logic Model (eCatalogue Smart Contract Logic Model) Template:LogicModel 11 2, 2022

Abstract Specification

Context	Smart contract that enable creation of one Product Catalogue.
Goal	Create one NFT of eCatalogue
Success Criteria	one NFT of eCatalogue is created with the transaction hash calculated

Concrete Implementation

Input	Process	Output

• Hyperlink to eCatalogue Product
• Wallet Address of the product owner:0xdd8...
	• Created one NFT with token number
	• Calculate the hash of the product page
	• Return transaction hash code of the NFT
	• Executable Source Code
	  • Berkas:MyNFT.sol
	  • Berkas:Bytecode.txt
	  • Inspect on Etherscan
		NFT's hash code transaction, with the owner of the NFT recorded into blockchain

Boundary/Safety Conditions of eCatalogue Smart Contract Logic Model

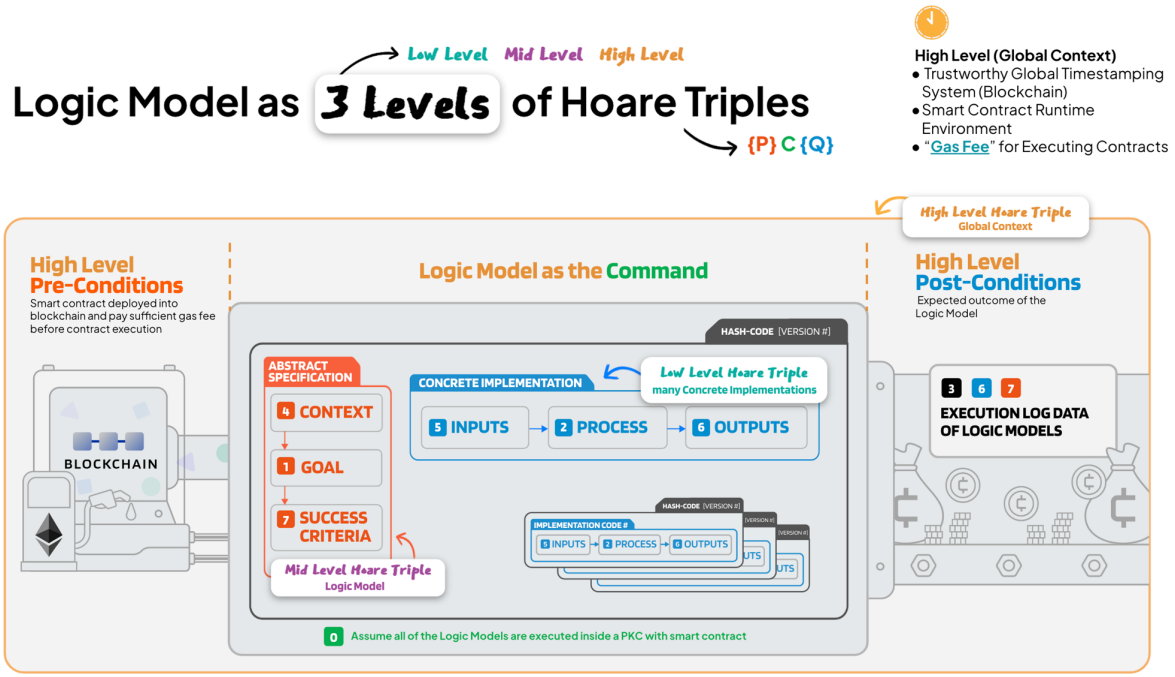
- Transaction will be failed if the wallet owner does not have sufficient gas fee
- URL must be reachable and have content
- Content must be validated with correct officials

A logic model can also be considered as a macro-structure, which can be condensed into a higher order triple:

Abstract Specification → ***Execution Plan*** → ***Boundary Conditions***

From a ***Correct by Design*** viewpoint, it is necessary to convert all structures into a Hoare Triple. Therefore, one can use the same data structure to organize all causal relations into temporally-ordered data elements. The consistent format allows convenient verification and version control of these three types of information containers, and can be executed and validated using humans or machines.

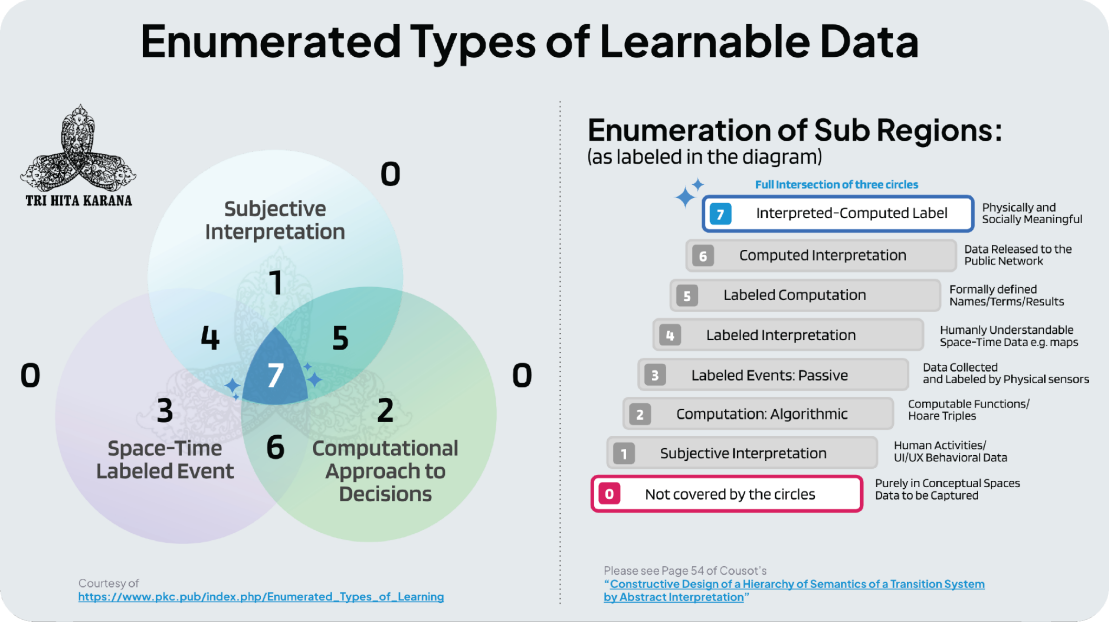
The idea of a logic model being composed of a multi-level Hoare Triple can be illustrated as follows:



The box marked Hash-Code contains two Hoare Triples. The left one is the ***Context→Goal→Success Criteria*** triple. The right one is the ***Inputs→Process→Outputs*** triple. It is the intention in the diagram to show that there could be many implementation approaches to satisfy abstract specification. Therefore, the diagram has many other entries for ***Inputs→Process→Outputs*** Hoare Triples. The overall logic model as a "Ricardian Contract" is shown on the top of the above diagram as a collection of Human Readable Text. Hash-Code entables bundled data and a piece of Smart Contract code that can be executed by machines "reliably." The operation of such a "Ricardian Contract" would generate execution logs, and its anomaly or conditions that might break in any known or unknown cause can be captured as a "Boundary Condition of Logic Model" and stored in a common data structure, similar to the notion of exception capture in modern programming languages. The three kinds of Hoare Triple, including the last one that is the "higher level" Hoare Triple, treating "Boundary Conditions" as a Postcondition, is a nested data structure that allows many different pieces of content knowledge to be composed of different instances of textual descriptions, executable code, and data type descriptions. This provides a mechanism to store and capture all kinds of enforcement mechanisms, which therefore can serve as a generic data container for information.

The numbers that marks these boxes, 4, 1, 7 for ***Context→Goal→Success Criteria***,

and 5, 2, 6 for ***Inputs→Process→Outputs***, can be found in the following Venn diagram:



Each of the numbers represents a "Namespace" that covers a different area of interpretive interest. The goal of this Venn Diagram is to help classify content knowledge in categorized namespaces that each lead to appropriate interpretive actions, so that knowledge content can be managed in a consistent manner, using appropriate computational or human interpretation approaches.

Also important to note is that a logic model/logic frame is a tool that is being used by many government agencies to express the intent and expected outcomes of government-sponsored programs. This short explanatory text and diagrams hope to present a path to organize traditional pen/paper content of the model to a computable medium that can be captured directly in tools such as MediaWiki. In fact, the first screenshot of the logic model is an implementation of a logic model template in MediaWiki. In other words, the notion of using a logic model in a relational/hypertext oriented data storage is already feasible. With a proper set of tools, such as using Blockchain and Smart Contract to assign trustworthy timestamps and unique hash code to a Smart Contract, one can make information and contract execution

globally transparent in ways that traditional logic models cannot do. It will be a very pragmatic and powerful tool for governmental project management and control, since it will help easily track all kinds of changes in the logic model with access and links to many other kinds of digitized data content. In other words, logic models can serve as a human-machine front end to the full stack of Technology Stack for Building Trust (Tech for Trust[45]).

[45] The term Tech for Trust was proposed by Konstantinos Karachalios in multiple personal conversations and digitized mediums.

Appendix

Initiated by the heart and mind
of Luhut Binsar Pandjaitan,
for Indonesia.