

Introduction to Decentralization

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Abstract

This is an introduction to decentralization. The authors distinguish centralized from decentralized organizations and show their respective uses and limitations in different contexts.

A centralized hierarchy is the most efficient architecture for solving the particular limited problem it was designed to address. But centralization is not the optimal organizational structure under highly dynamic conditions. Rigid power allocation means the organization can't easily reorganize to adapt to unanticipated challenges from the outside. Clear rules lead to internal corruption when the letter of the law overrides the spirit of the law and members compete for power. New sources of information are ignored since they don't have existing lines to the decision-making authorities. Information at the edge is lost.

The authors show that advances in technology have given decentralized systems the efficiency they have lacked in previous eras and that allowed them to be outcompeted by centralized systems. Decentralized organizations thrive under the types of changing circumstances that break centralized organizations. Information at the edge is naturally incorporated and communicated so the system can adapt to external threats. Decentralized organizations are more stable. Decentralized organizations do not crash in response to new external problems like crystalline hierarchies do. Decentralizing allows an organization to adapt to change and chaos. Decentralization, while it may be seen as wastefully redundant, gives every member greater autonomous power.

The book can be accessed here:

<https://www.amazon.com/Decentralization-Technologies-Organizational-Societal-Structure/dp/3110673924/>

and here:

<https://www.degruyter.com/view/title/569051>

Overview & Introduction

The process of organizational development

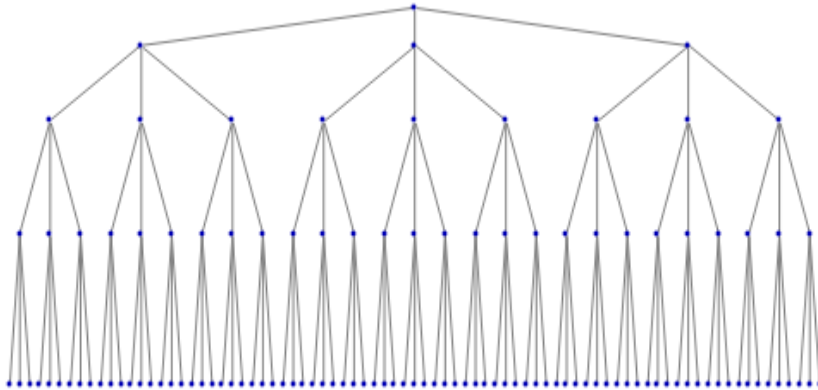
Human group coordination naturally progresses from the first stage, chaos (barbarians ravaging the landscape, “Raahr!”), to decentralized organization (“Let’s all agree to band together to defend ourselves from the barbarians”), to centralized organization (“Long live the king”).

Abstractly, the first stage is chaos, completely disorganized individualized power centers, or nodes in the network. We imagine chaos as random uncoordinated actions, the first moments after the Big Bang, the static of your television screen flooded with turbulent Brownian motion.

These individualized power centers proceed to decentralized organization when the powers become more correlated, aligned by a common principle, a transcendental goal, an ideal. The individuals may begin to partially imitate each other as they seek to progress toward this common goal. The individual nodes remain autonomous; the network does not have fixed roles for each member. But they are all responding to a higher calling as they unite in purpose. This newfound harmony makes the group more efficient than before, as they find varying ways to collaborate in more complex cooperative behaviors. “The values are the organization.”

The final stage is a centralized hierarchy. The harmony and cooperation of the decentralized organization filters the group into an ever tighter and more complex hierarchical structure, raising some individuals into positions of power over others. If successfully completed, a tree structure emerges, a hierarchy, and the organization becomes fully centralized with a single member on top. This filtering process is usually the result of competition. Money is especially efficient in focusing the competition. Rarely, instead, a hierarchy may form from the conscious allocation of power, matching the position to the appropriate individual’s talents.

If the hierarchy is successfully completed, all individuals find their positions of power statically fixed and the levers of power clear. Each member has a very limited number of formal connections to the other members of the centralized organization, instead of interacting on a relatively equal basis with all other members like they did when it was decentralized. This end stage is a completely centralized organization, with the top of the hierarchy (or the root of the tree) being the center of power.



(5 levels)

Until there is a single central power at the top of the hierarchy, there is still room for more efficiency, and the organization is incomplete and in flux. Ideally, once a single central power emerges, the organization is optimally efficient and effective in addressing the challenge it was formed under. A centralized organization can rapidly change course, following the single leader at the head of the chain of command. Assumedly, the very best decision maker is the leader who has the power to move everyone in the organization in unison to respond to those difficulties.

What comes after the hierarchy is complete? If the hierarchy is too rigid, the organization inevitably fails, and the result is a return to chaos. That's why it's called a revolution—because governmental structures have followed this cyclic pattern throughout history. The written traditions of every civilized culture include stories of how the rigid hierarchy rises from chaos, but inevitably shatters and falls back to the chaotic void.

The threats to a centralized organization can be both external or internal. External challenges that can destroy a centralized organization are novel and unexpected changes. Internally, a centralized organization can fail from corruption or friction, from ineptitude at the top or from the discontent of those at the bottom.

The organizational clarity of a centralized hierarchy makes it extremely efficient at the task for which it was originally constituted. However, any new outside challenge to the group may reveal the weakness of the structure. Tree structures of a centralized organization are optimally efficient for communicating orders from a single member. However, if too much power is held in any single office in the hierarchy, decision making finds a bottleneck that can cripple the organization. A strongly centralized organization leaves no power of decision making in the outer edges of the organization. "Information at the edge" is not likely to make its way from the bottom echelon (the leaves of the tree) to the highest echelon of power (the trunk of the tree). The central authority makes decisions without full information, so a centralized organization is not well designed to respond to any crisis it hasn't anticipated. If

the power structure is particularly crystalline and cannot bend and rearrange its order, it cannot survive the inevitable novel challenges that arise in time when it faces a new organization that has been better formed in the crucible of the novel challenge.

The internal threat to an organization is friction. Friction is simply the inefficient allocation of power, which is an ever-present feature in any hierarchy. By inefficient allocation of power, we mean that if the distribution of power were changed, the goals of the organization could be achieved more easily. Left unchecked, friction can grind a centralized system to a halt. Typical sources of friction are communication bottlenecks, corruption, and concentration of power.

The most common type of friction comes from the natural tendency of a hierarchy to concentrate power at the top. The basic mechanism is “the rich get richer”. A more powerful member is able to use their greater power to gain more power, in any stage, than a weaker member can. Any differentiation between members tends to separate them further as time goes on. This is why hierarchies tend to become centralized with a single leader on top if the process of differentiation continues long enough. This also leads to concentration of power. In the limit, if left unchecked, the most powerful member would have 100% of the resources and the others would have 0%. Clearly, getting anywhere close to this distribution is inefficient for the goals of the group. The resulting discontent is the main historical reason for revolt. Corruption happens when a minority subgroup collects the power or wealth of an organization for its own benefit at the expense of the larger group.¹ Corruption is the type of friction that provokes our greatest moral indignation, as it offends our fundamental sense of fairness.

The more rigid the structure, the more susceptible the organization is to corruption. There is no protocol rigidity at the chaos stage, so there is no opportunity for corruption—since there is no group goal there is no opportunity to subvert it. At the decentralized organizational stage, the group is unified by vague goals and vague protocols that roughly follow the ideals that unite the group. In this case, the notion of corruption itself is vague and impermanent, open to interpretation and reevaluation. As a hierarchy begins to emerge, the original occupiers of the varied roles remember their initial motivations for organizing and remain cooperative without relying on formal rules. Their founders’ zeal maintains their collaboration. At the final stage of a centralized organization, success of the group serves to fix the hierarchy. The ideals become mundane secular rules. As the hierarchy becomes stronger, the power relationships ossify and inviolable rules naturally emerge. Once these rules are formalized, they become more important for every internal decision than the previous ideals which held the group together at the decentralized stage.



¹ Compare this with the definition of rent-seeking, which is the attempt to gain wealth without reciprocally adding wealth or productivity to the group you are participating with.

Corruption is technically inevitable in any hierarchy, since it is impossible to create a perfectly efficient organization in practice—there is friction in every real system. Further, once the rules are set, the natural competitive impulse means its members will act creatively to intentionally corrupt the system, using the rules and protocols of the organization to one's personal advantage instead of advancing the shared goals of the organization, especially in secular institutions.

Formal secular rules are valuable for ensuring unity in a group with diverse values. Universal rules can ensure equal application to all members, which satisfies our sense of fairness. The primary problem with corruption arises with policing the rules. When the letter of the law is more important than the spirit of the law, then internal competition for power within the hierarchy reveals the best strategy is to push your behavior to the limit of what is acceptable. The easiest rules to police are clear infractions of the letter of the law, but these infractions are not the most damaging to organizational unity. As members constantly probe the edge of acceptable behavior, policing the rules becomes more expensive. The rules become divorced from the shared goals. Relationships become brittle and formal instead of warm and loose. People bristle when violators “getting away with it”. The centralized organization is destabilized.

The ultimate problem with relying on letter-of-the-law governance over spirit-of-the-law governance is that no static set of logical rules can ever succeed in preventing corruption. The Folk Theorems of Game Theory (explained in Chapter 4) prove the point that any rules that can be formally set down can be subverted. Strategies always exist which follow the rules and yet allow a minority player to profit at the expense of the majority.

The fact that any set of rules can be corrupted illustrates two necessities for the long-term stability of any organization, but especially for decentralized organizations. First, a dynamic governance system must be designed that can adapt the rules to the circumstances. Second, the organization needs to hold to its ideals, its transcendental values. The spirit of the law must override the letter of the law. If the organization is governed by transcendental values—ideals that everyone understands yet they can never practically attain or properly instantiate concretely—then people have less motivation to probe the limits of acceptable behavior. Less policing is then required, making the organization more efficient, as time, attention, and resources can be rightfully directed toward the shared goals of the organization.

Basic idea

Decentralized organization is a natural stage in the evolution of human cooperation. It is the step between chaos (no organization) and a completed hierarchy (a centralized organization).

A centralized hierarchy is the most efficient architecture for solving the particular limited problem it was designed to address. Centralized organizations have clear

lines of power and clear membership rules, which leads to formalized rules of behavior. Power is organized rigidly and clearly, so there is little wasted effort deciding who is in charge of which task while attempting to cooperate. There is also no wasted effort from redundant actions in a perfectly centralized organization—each member would have a unique job that doesn't overlap with any other member's duties. Centralization is an optimal and natural evolutionary solution to most specific organizational problems, under static conditions. Competition is the most common driving force that leads to a centralized structure.

But centralization is not the optimal organizational structure under highly dynamic conditions. The usual strengths of centralized hierarchies become their greatest weaknesses.

Ossification. Rigid power allocation means the organization can't easily reorganize to adapt to unanticipated challenges from the outside.

Corruption. Clear rules lead to internal corruption when the letter of the law overrides the spirit of the law and members compete for power.

Blindness. New sources of information are ignored since they don't have existing lines to the decision-making authorities. Information at the edge is lost.

These three weaknesses play off and intensify each other. In the face of a changing environment, a rigid organization is blind to and ignores new information that is incompatible to the preexisting structure. But, this new information remains highly valuable. And so, an opportunity is born for an individual to exploit this opportunity for personal advantage since the organization was too rigid to take advantage of the opportunity collectively in pursuit of their shared goals. Even if corruption can be avoided in the beginning, the rigidity still leads centralized organizations to catastrophic ends, as failures naturally push members to cling ever more faithfully to the rules that have saved them in the past, making the system even more rigid and brittle.²

Decentralized organizations, on the other hand, thrive under the types of changing circumstances that break centralized organizations. Information at the edge is naturally incorporated and communicated so the system can adapt to external threats. Decentralized organizations are more stable. They don't crash in response to new external problems like crystalline hierarchies do. Decentralizing allows an organization to adapt to change and chaos. Decentralization, while it may be seen as wastefully redundant, gives every member greater autonomous power. Centralization limits its members' powers, reducing them to mere cogs in the machine. To contrast with our previous example, if new information or a new situation arises, it is more likely to be recognized by someone at the edges (i.e. not blind), who is empowered to act on this information and take advantage of the opportunity (i.e. not rigid). But, because individuals within the organization are motivated by the spirit of the shared goals of the organization (and not by complying with the mundane rules of the organization),

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² https://en.wikipedia.org/wiki/List_of_last_stands (Retrieved 8/11/20).

they seize the opportunity not for mere personal benefit, but for the collective benefit of the organization (i.e. not corrupt).

The goal of this book is to show that advances in technology have given decentralized systems the efficiency they have lacked in previous eras and that allowed them to be outcompeted by centralized systems. And, along with the virtues of responsiveness and resiliency, the newly realized efficiency makes decentralized systems the model for our times. But, we also want to understand whether there is anything that can destroy them? What threatens decentralized systems? And how might decentralized systems ward off these threats?

What can destroy a decentralized organization? Nothing. Decentralized organizations are invincible unless every single member loses their adherence to the values that organized it in the first place, which may happen if they transform and centralize under a different value which takes precedent. Centralization is a natural state that evolves from decentralization under competition if it is not consciously prevented by guarding members' power. It is clear how a centralized organization can be conquered—the single point of failure at the top. How can we prevent an organization from centralizing? How do we protect individual autonomy in a decentralized organization? How do we make our institutions more resilient with decentralization? Different organizations throughout history have struck upon a variety of answers. The goal of this book is to revisit these historical strategies and explain how recent advances in information technology give us new solutions to these problems.

History

The cycle from chaos, to decentralized organization, to centralized organization is natural and attends human institutions throughout history.

Advances in information technology explain each historical leap in organizational efficiency and reach. The evolution of ever more complex human societies moves from kinship tribes to regional clans to kingdoms to corporations (religious and secular) to nation-states to empires to the emerging global society. This evolution is enabled at each stage by advances in information technology. Information storage, processing, and transmission allows larger groups of people to effectively connect and cooperate. Information technology has advanced from the spoken word (communication and storage), to complex ideas (processing and storage), to written word (communication and storage), to schools and bureaucracies (processing), to printing presses (communication and storage), to telegraphs and telephones (communication), to digital computers (processing and storage), to the internet (communication, storage, processing).

In Chapter 1 we examine the history and evolution of religion and law, politics and business, from the lens of centralization versus decentralization. We use the examples of history to illustrate how decentralization stabilizes organizations, by ensuring their members' autonomy, which makes the group more adaptable. These historical sketches show how to build decentralization into an organization, detail the natural

threats to a decentralized organization, and explain how to defend against them. Ancient Egypt and China were remarkably stable for thousands of years due to the protocol decentralization fostered by their Rule of Virtue legal system. The Apache tribe used political decentralization to survive for hundreds of years against vastly better-equipped centralized empires whose goal was to eliminate their way of life. The Maghribis built a sophisticated decentralized trade network using 11th century information technology, and reputation. 18th century farmers used dynamic governance designs to create the most powerful decentralized organization in history.

Present

Today, many centralized institutions are experiencing the senescence that naturally attends their rigidity, their internal corruption, and their predictable failure to respond to novel external challenges. This is provoked in obvious fashion from the massive cultural and social changes due to rapid technological advancement. New technology for data storage (cheap hard drives), processing (computers), and communication (telephone and internet) give new tools for enabling centralized and decentralized structures of organization. These new tools make people much more powerful than ever before.

Western democracies are still using the structures developed decades or centuries ago, and lack any formal interaction with this new data stream. Private, centralized companies are adapting much faster than our aging centralized legal and governmental institutions to leverage the power of the latest leaps in information technology. The most obvious ways to adapt our supposedly decentralized democracies to these new technologies of information storage, processing and transmission would be:

- Polling constituents—on past, present, and future issues. Put polls in context—reveal how many constituents from which districts voted in which way—how many didn't vote. Mandate the goal of providing intuitive user interfaces for accessing statistical knowledge, so people can parse the data easily.
(information processing)
- Stack Exchange-like websites (or Reddit or Facebook) for people to broadcast their opinions and upvote/downvote other people's posts. Require open source algorithms for how information is filtered, so analyses can be made, and everyone can understand if and how the system is being gamed by special interests.
(information transmission)

- Bureaucratic transparency—Build open source websites detailing executive expenditures. Make it easy to access your representatives. Use a uniform accounting scheme of the official work all legislative representatives have done (speeches they've made, votes, meetings with lobbyists, constituents, transcripts of those meetings). A radical proposal would make it illegal to speak about public matters while a politician is in office unless they are on the record, holding politicians to the professional standards of lawyers and equity investors. Mandate the goal of making public data on justice easier to access, to expose more information on our institutions' integrity or corruption.
(information storage)

These first simple steps provide some examples as to what could potentially lead to more formal interactions with decentralized democracy, such as binding referenda on basic expenditures, which could revitalize our institutions. 19th century technology naturally limited our formal democratic interactions with government to biannual elections of representatives. 21st century technology is completely different; society is different. And our governmental structures need to change. How do we save democracy? Simple. Make our societies more democratic.

These changes would be technologically trivial to implement, cutting and pasting existing open source projects. This is quite unlikely to happen naturally, however, without a powerful catalyst—coherent social demand. Large decentralized networks, like national democracies, don't make fundamental changes easily. Stability is their primary quality.

Meanwhile, in a testament to the power and effectiveness of centralization, capitalist companies are rapidly innovating new uses for this torrent of decentralized information from traffic (virtual and IRL, such as Google and Baidu, and Google Maps), marketplace transactions (Amazon, Alibaba, and Airbnb), social networks (Facebook and Tencent), and economic talent (gig economy industries like Uber and UpWork). Web2.0 has built the user interfaces (UIs) necessary to leverage the talent of the masses with these tools.

Before advances in blockchain tech and cryptographic security, such companies needed a centralized authority for several reasons. A dictatorship was necessary for governance of the network, because more sophisticated governance architectures, such as democracies, lacked the ability to govern efficiently. With 19th century technology, millions of members could only be practically polled on a yearly basis. In that case, centralized institutions were necessary, since they are far more efficient in communicating with members, storing the relevant information and history of the

company, and filtering and curating the information to reward members appropriately. But information technology has changed, giving us new options for the governance of large networks of participants.

The technologies and technological trends that enabled the advances in telecommunications, internet proliferation, e-commerce, the digital transformation of society, social media, and the Internet of Things have inaugurated unprecedented societal network capability. These advances are gateways for the deeper structural reform of society.

Decentralization tools in social media demonstrate how networked communication structures allow social groups to cooperate and co-create at an unprecedented level, transcending previous barriers due to nationality and socio-economic status. Web3 is the vision of building tools for decentralizing our economy in a similar way.

Web3 initiatives such as Bitcoin, Ethereum, IPFS, and many others are building some of the tools necessary to allow decentralized organizations devoted to business goals. The technology is advancing to the point that fully decentralized organizations are beginning to compete with centralized organizations in profitable enterprises. And decentralized organizations have fundamentals which are superior in our rapidly changing global society. Unlike centralized organizations, decentralized organizations can give members individual autonomy and privacy, they maintain network stability under changing conditions, and they thrive under information transparency.

Future

The stated purpose of Web3 is to build the tools to empower decentralized networks to compete with traditional centralized networks, using blockchains, distributed hash tables, and more complex peer-to-peer (P2P) architectures.

Bitcoin and Ethereum are building decentralized money and decentralized automated business contracts (smart contracts). These networks are worth hundreds of billions of dollars, not because people are using them, but almost entirely because of speculation. People see the future value of these tools. Their future value is the dream that people will use them to build DAOs.

DAO is the Web3 acronym for decentralized autonomous organization. “Autonomous” is to distinguish DAOs from less decentralized organizations (like Wikipedia) which still have ultimate centralized control in an owner (like Jimmy Wales, co-founder of Wikipedia) who can finalize contentious decisions among its members. The autonomous aspect of a DAO stems from its programmed governance system through smart contracts. A DAO is ultimately democratic, instead of having a benevolent dictator behind the scenes to efficiently correct course during black swan events.³



³ Everyone knows there are only white swans. There is no such thing as a black swan, and there is no reason to look for one—until somebody sees one. Then everyone says their existence was obvious. A

Marketplace DAOs can now supply level playing fields where nobody is in charge (unlike Amazon). Decentralized finance (deFi) uses blockchain technology to provide financial tools such as banking, equity investment, and derivatives trading. DeFi promises to empower people with broader financial inclusion with new financial tools with lower transaction costs and open access across borders.

Social network DAOs and web traffic can be organized on a peer-to-peer architecture, where members opt in or out of participating in data filtering and curating. Individuals can completely control their information and share it precisely with whom ever they wish (unlike Facebook or Google) and can be remunerated fairly for the effort.

Ridesharing applications and other gig economy industries can be completely managed and governed with peer-to-peer reputational systems (unlike Uber), so membership in a network gives appropriate ownership of the network, as opposed to the asymmetry of merely being a user.

The Web3 dream of the future is for DAOs to replace centralized structures with more efficient and adaptable groups throughout our society and economy.

Two important tools have been built, decentralized money (Bitcoin) and decentralized contracts (Ethereum). But it won't work until eight more decentralized institutions are built that people use to do business. Money and contracts are worthless in business with barbarians who can't be trusted to keep a bargain. To do business, we need a system where reputation means something. We have the bones of such structures, but we need to put the flesh on the animal. Then it can dance.

Let's begin.

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black swan event is a unique and unpredictable event which has a major effect on the economy. The theory was developed by Nassim Taleb, who argued these events have a dominant role in human history, but that fact is not properly recognized, because humans naturally rationalize the effects afterwards as predictable. Examples include the effects of World War I, the internet, or the 2020 Covid-19 Pandemic in changing global economies.

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