Designing for Multiple Centers of Power: A Taxonomy of Multi-level Governance in Online Social Platforms

SHAGUN JHAVER, Rutgers University, USA
SETH FREY, University of California, Davis, USA
AMY ZHANG, University of Washington, USA

As online social platforms increasingly impact society, scholars and activists have criticized the centralized and unaccountable nature of many of their governance structures. In response, some have proposed governance that can represent a broader range of stakeholders through the creation of multiple centers of power, with nested communities governed by customized rules set by local community managers. However, this multi-level governance structure, where inputs can come from both a centralized and a decentralized governance system, already has implementations on many platforms, including Reddit, YouTube, and Twitter, albeit in very different forms. In this work, we characterize the landscape of different multi-level governance structures in online social platforms, drawing from extensive literature on taxonomies of multi-level offline institutions, including administrative hierarchy, federalism, and polycentricity. Focusing on the middle levels that sit between end users and a centralized governance system, we describe how middle level units, such as subreddits, YouTube channels, and Twitter blocklists, interact with one another and with levels above and below. As not all aspects of offline institutions translate directly to the online realm, we discuss challenges unique to online governance and lay out a research agenda for the future study of multi-level governance design in online social platforms.

Additional Key Words and Phrases: online social platforms, governance, multi-level governance, decentralization, polycentricity, social media, content moderation

1 INTRODUCTION

Governance decisions over social activity and speech in online social platforms are increasingly consequential [19, 87, 88]. In recent decades, technology for interacting with others online has shifted from a proliferation of self-hosted software for different communities to the rise of a small number of digital platforms that provide hosting to millions or even billions of people [36]. Choices made by these platforms regarding what is permissible content and activity have great ramifications, impacting everything from the lives of individuals suffering from targeted online harassment [63, 73] to the stability of public social and civic institutions [118, 127].

In recent years, scholars and regulators have expressed alarm about how governance is enacted on major platforms, in particular calling out their oftentimes centralized and opaque nature. Some criticize platforms’ lack of procedural fairness and accountability to the public and to their users [27, 30, 41, 118]. Without sufficient checks and balances, critics point out that platform owners can abuse their power and act to the detriment of their users [116, 123]. Others argue that a unitary governance structure creates greater distance between decision makers and user communities, making it challenging for a centralized platform to understand the needs of different end user cohorts [27]. Indeed, some go farther to assert the futility of crafting a single set of policies that can be consistently applied over such large and diverse user populations and that invariably harms marginalized groups without well-placed advocates [28, 61, 111].
In reaction to concerns over monopolistic governance by platforms, many have called for greater decentralization of the powers that platforms wield. Some have proposed that centralized platforms enable APIs, plugins, or protocols to create a marketplace of governance services [40, 78, 108, 132]. This would allow end users to plug into a governance service that operates in line with their own tolerances for different types of speech. Twitter blocklists are an example of a third-party governance service allowing users to subscribe to the blocklist of their choice. Other proposals call for decentralization enforced by technology and without any centrally hosted platform, via cryptocurrencies, decentralized autonomous organizations (DAOs), other blockchain technologies, or federated protocols [14, 133]. For instance, Mastodon uses the ActivityPub protocol as a technical standard so that self-hosted Mastodon communities or ‘nodes’ can communicate with each other. Still others point to existing social platforms that incorporate some amount of decentralized governance by design [100]. For example, the Reddit platform offers semi-autonomous online communities called subreddits that are governed by volunteer end users, and Wikipedia offers multiple independently governed language editions.

In cases where we have seen decentralization of governance power carried out, challenges still emerge. For example, the different centers of power sometimes operate opaquely and in isolation to one another [22, 61], resulting in redundant problem solving and wasted effort. In addition, local governance centers sometimes fall into intractable conflicts with one another or with global platform operators, with little formal avenue for resolution or recourse [22, 79]. The presence (or absence) of a central government that is coordinating or overseeing local governance centers can present questions regarding the bounds of local autonomy and the delegation of responsibilities. For instance, without a central authority, local governance units have a harder time addressing networked harassment like non-consensual sexual imagery [54, 77, 78].

Clearly, decentralization on its own is not a panacea, and the details of how decentralization of governance is carried out are vital to achieve success in the eyes of users and society at large, as well as sustainability for governance operators at every level. For instance—How can decentralized governance centers cooperate and learn from one another? How can different centers be held accountable for their poor performance or rewarded for good performance? How can conflicts between different centers be resolved? In this work, we provide first steps towards answering these questions by laying out what we can already learn from existing literature and practice and noting what remains to be explored. Luckily, we need not start from scratch—there is already extensive empirical and theoretical research examining decentralized governance in institutional contexts outside of online social platforms, including in nations and formal organizations. In addition, we can learn from the many examples of online platforms that already incorporate some amount of decentralization, albeit in different forms. By examining and characterizing these existing platforms in light of the existing literature in offline contexts, we can chart a path forward for additional research in the online context, toward designing new and better decentralized online governance structures.

1.1 Contribution

In this work, we contribute a taxonomy of attributes to characterize the design landscape of multi-level governance on existing online social platforms. To conduct this work, we borrow primarily from the political science and public administration literature [7, 9, 59] to define multi-level governance systems in the online social context as platforms in which authoritative decision making is dispersed vertically across multiple levels of jurisdiction, and horizontally over many centers of power. In cases where they exist, platform administrators at the highest level remain central actors but do not monopolize the policy making and decision making competencies—instead, these powers are shared and contested by actors organized at different administrative levels.
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| Multi-level Governance | Examples |
|------------------------|----------|
| Top levels             | Reddit platform | Twitter platform | Wikimedia Foundation | Mastodon standard | YouTube platform |
| Middle levels          | Subreddits | Twitter blocklists | Wikipedia language editions | Mastodon nodes | YouTube channels |
| Bottom levels          | Subreddit participants | Blocklist subscribers | [language] Wikipedians | Node members | Channel subscribers |

Fig. 1. A depiction of multi-level governance in online platforms, describing top, middle, and bottom levels and typical actors within each level, alongside a few examples from online platforms. In a multi-level structure, end users at the bottom levels are governed by one or more centers in the middle levels as well as governed by the top levels. Top levels can be concentrated and relatively powerful (as in the cases of YouTube and Twitter) or offer a looser, ‘thinner’ set of constraints (as in the cases of the Wikimedia Foundation and Mastodon standard). In our work, we characterize middle levels according to both horizontal governance attributes, which describe intra-level interactions between centers in the middle levels, and vertical governance attributes, which describe inter-level interactions between the middle levels and the top and bottom levels.

In our characterization of multi-level governance, we focus our attributes primarily on the ‘middle levels’ of governance, where many kinds of interactions play out between individual agents at the lowest level of a platform and the centers of power, authority, or ownership that comprise the top-most levels. We focus on middle levels because they are the principal arena for low-level agents to collectively organize with or against each other, with or against top-level agents, and even to interact with other kinds of middle levels. As it turns out, middle levels are ubiquitous in online social platforms. We draw upon contemporary examples in this work, including Facebook Groups, Twitter blocklists, Reddit communities (subreddits), YouTube and Twitch channels, Mastodon and Minecraft servers, WhatsApp groups, and Wikipedia language editions (Figure 1). Despite their prevalence, the reason they emerge so consistently remains puzzling, especially considering the additional complexity they impose on a platform. Prior scholarship on platform governance has largely focused on either decision making within the central governance units [26, 51, 62] or work done by local moderators within their communities [61, 80, 81], but the relationships and interactions between different centers of power have received little attention. In particular, we distinguish horizontal attributes that characterize the middle levels and interactions between units within those levels from vertical attributes that are concerned with interactions across different levels (see Figure 1).

We conclude with a discussion of how our taxonomy can be used. We note the ways in which insights from offline institutions such as nations and formal organizations do not translate well into an online context. These differences point to additional research towards developing new theory on multi-level governance specific to the online platform space. Beyond theoretical insights about governance, we describe practical design implications for platforms and online communities drawing on lessons learned from both offline and online institutions. Through our focus on multiple centers of power, this work brings attention to how design can negotiate between the advantages of centralization and decentralization in order to pave the way toward more ethical, sustainable, or even empowering online platforms.
2 BACKGROUND AND RELATED WORK

2.1 Multi-level Governance in Online Social Platforms

Much research has examined the different kinds of governance enacted on online social platforms. Thus far, scholars have primarily distinguished between industrial governance, which comprises large-scale, global content moderation operations that separate policy development and enforcement teams, from community-reliant governance, which relies on subcommittees of volunteers to enforce a platform’s moderation policies and engage in local community norm-setting [21, 51, 55, 111]. The community-reliant model involves a decentralization of governance power that has been associated with a greater localized understanding of community needs, in contrast to the centralized industrial model [68, 80, 81].

Though community-reliant platforms are more decentralized, many still incorporate a top level of governance made up of platform operators, platform developers, or a global content moderation team overseeing the different communities. The addition of multiple levels into the governance process allows platforms to create a structure through which end users acting as volunteer community moderators can influence, monitor, and engage with platform owners [27, 60]. Decentralization also enables operators at the platform level to leverage local information and innovations to improve the informational efficiency of their governance processes [27, 90]. Thus, with multi-level structures, platforms are more likely to attend to the welfare of all participants.

Since the early days of the internet up until now, many digital platforms with multi-level governance structures have enjoyed widespread popularity. Some platforms have a decentralized middle level that is ingrained into the platform by design, such as Reddit or Discord, with subreddits and channels operating as middle level administrative units, respectively. However, middle levels can also be unofficial—they can be designed and implemented by users leveraging platform APIs or outside tools to support bottom-up collective governing. For instance, on Twitter, users who found themselves being harassed by the same accounts built third-party moderation tools called blocklists to let subscribers automatically block all accounts on each community-curated list of block-worthy accounts [49, 63]. Thus, these blocklists too form administrative units at the middle level, with each unit making local governance decisions for its subscribers. In addition, some platforms such as Facebook combine both unitary and multi-level governance into their platform, with the Facebook News Feed governed via a centralized, industrial model, and Facebook Groups employing more of a multi-level, community-reliant model.

While the current literature on platform governance spans multiple disciplines [51, 55, 68] and informs many of the key elements of governing online communities, the interplay between different centers of power and levels of platform governance has not yet been systematically analyzed. Instead, some papers have pointed out specific cases of what we refer to as horizontal interactions between centers within a middle level of governance. For instance, research on the work of content moderators on Reddit and Twitch has illuminated how they often govern multiple online communities, and tools and resources are shared across their different centers [61, 80, 81, 131]. Jhaver et al. show how lists of blocked accounts are sometimes shared across different instances of blocklists on Twitter [63]. Elsewhere, a study of the Stack Exchange network of question answering communities reveals consistencies in democratic elections of their moderators, suggesting learning across communities [44]. And looking at file-sharing communities, Harris described how emergent communities of software and media pirates are formed to enable different solutions to the challenge of free-riders, a challenge endemic to protocols like BitTorrent [57].

In addition, the rich world of online gaming platforms provides examples of the emergence of middle level centers that innovate to create specialized local governance. Research on emergent cultural differences between a multi-player
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game’s different physical servers—providing otherwise identical instances of the same game—offers evidence of the cultural effects, and potential value, of multi-level community architectures [24, 117]. For instance, studies of the multiplayer online role-playing game World of Warcraft (WoW) have documented how guilds provide unique roles, structure, and diversity in contributing to the game’s play and culture [120]. Frey and Sumner show how player-run Minecraft communities self-organized around an emergent volunteer ecosystem of shared governance plugins and public server lists that implemented peer-to-peer advertising [46].

To a lesser extent, research has also catalogued examples of interactions across different governance levels. For instance, some work on YouTube has examined how YouTubers, who constitute governance centers at the middle level, collectively organized to pressure the top level to change their demonetization policy [22, 119]. Similarly, work on Reddit has examined how moderators of different subreddits collectively organized to protest the actions of the top level [79]. In other work, researchers have examined how top levels of governance will regulate centers in the middle levels that they believe are governing poorly [25, 26].

Taken together, these one-off cases suggest that there is a broader pattern arising across different platforms regarding learning and specialization between middle level governance units, as well as interactions between governance levels. In this work, we provide a framework to systematically analyze these intra-level and inter-level interactions across different centers of power in a wide variety of platforms. As calls for greater decentralization in online platforms leads to more platforms with multi-level governance structures [41, 108, 135], it becomes imperative to analyze how different multi-level designs affect overall governance performance online.

2.2 Applying Theories of Offline Governance to Multi-level Platform Governance

Since the early days of the internet, scholars have looked to policy, economics, organizational psychology, and other social sciences to inform online community design and management. In their book *Building Successful Online Communities: Evidence-Based Social Design*, Kraut and Resnick surveyed the social computing literature that draws from social science theories to identify ways to encourage commitment, motivate contributions, regulate behavior, and deal with newcomers in online communities [68]. This literature argues that social science theories can help us identify the problems or challenges that will be faced by most online communities, provide solutions to those problems, and predict the likely consequences of various design and policy decisions. For example, Kiesler et al. argue for community participation in rule-making, monitoring, graduated sanctions, and conflict-resolution mechanisms by drawing design principles for self-governance of common pool resources from the discipline of natural resource management [67].

Although the concept of multi-level governance is under-theorized in online contexts, it has long attracted interest in offline governance systems, as evidenced by the multiple sub-disciplines that have emerged in the social sciences for exploring this property. Most notable are: organizational theory, with its century of interest in administrative hierarchy, governance, and management; federalism, focused on the different ways that nations divide power between a central government and local states; and polycentricity, a general theory for how systems with independent and interdependent centers of power compete and cooperate given overlapping jurisdictions.

2.2.1 Organizational Theory. Literature in economics, organizational theory, and political science has focused on the effects of multi-level architectures in formal organizations, starting with the view that hierarchically arranged organizations emerge because (1) high transaction costs can make some economic relationships inefficient via market exchange [29, 129], and (2) humans in manager roles are bounded in the number of employees they can manage directly [113, 114]. This latter idea, from Herbert Simon, has many implications for organizational structure since cognitive limits bound a manager’s
ability to receive and process information, and increase the potential for organizational hazards like opportunism and maladaptation [130]. Adding multiple levels to the administrative structure of firms improves organizational decision making by facilitating division of labor and resulting increases in task specialization [48, 65, 93].

In making the analogy between formal organizations and online platform governance, certain aspects are particularly relevant, such as the ability in both cases to cheaply exit and begin a new instance [12] or to have a governance level with no autonomy that exists solely for administrative convenience [113]. However, the analogy breaks down in other ways: unlike in online communities, members of typical offline organizations are strongly induced to align their behaviors with the goals of the organization, through salaries, stock options, the threat of job loss, and other features of the labor context.

We turn next to political science, the other primary discipline focused on multi-level governance. Unlike organizational theory, it does not assume the same alignment of interests. Instead, it permits and even encourages (properly harnessed) conflict, competition, and contestation. This aligns with recent efforts to reframe the regulatory role of platforms from market vendor to governing sovereignty [41, 71, 98, 118].

2.2.2 Federalism. Although political science's interest in the concept of governance surged in the 1990s and has grown ever since, the term is not new. Rather, it incorporates a very long history of governing, rule, authority structures, and domination [122]. There is no single, universally accepted theory of governance in political science; the field is populated with many overlapping theoretical discussions and debates [6]. Graham et al. define governance as “the interactions among structures, processes, and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say” [52]. Thus, governance through the political science lens is fundamentally about power, relationships, and accountability: it is concerned with questions like who has the influence, who makes the decisions, and how decision makers are held accountable.

One major theory from political science that is relevant to our focus is federalism. Political scientists (being, traditionally, mostly Western and American) have taken as a paradigm of multi-level governance the federated organization of the United States around many smaller governance units. Federalism is a system of governance in which a political territory is divided into semi-autonomous states that share authority with each other and a common central government [39, 103, 128]. Federations exist on a continuum, with more peripheral systems where member states are bound by loosely structured trade and defense alliances at one extreme and “administrative centralization” at the other extreme, where member states have little autonomy and behave more like the administrative units of a hierarchical organization [11, 38]. Each governing unit in this system can make laws that directly affect the citizens within its territorial purview [126].

Federal systems, in their idealized form, consist of neatly nested jurisdictions, with the top-level governance jurisdiction equal to the union of the non-overlapping jurisdictions of all lower-level systems. Within this framework, parallels to the online realm are already apparent. The jurisdiction of the Wikimedia Foundation is equal to the union of its hundreds of distinct language editions, each of which has a certain autonomy over its own functioning, constrained only loosely by encyclopedia-wide constraints. Reddit is composed of the union of its distinct subreddits and the assertion of some degree of platform-level governance over all subreddits; it simultaneously reserves for each subreddit a certain amount of freedom to implement additional governance within each middle-level unit.

Aroney [8] offers a taxonomy of federalism that is particularly well-suited to describe the complexities of multi-level platform governance. His taxonomy details features describing whether the system is a federation or confederation (i.e., whether a unit can leave unilaterally or not), whether it is formed by the aggregation of formerly independent governance units or the devolution of a formerly unitary government, whether its different levels wield redundant or complementary powers over their members, and whether its lower-level governance units are symmetrical or asymmetrical in their powers,
rights, and roles. The concepts of symmetric and asymmetric federations distinguish a body of equal states, as in the idealized United States, from a mix of states, commonwealths, districts, and territories with very different levels of autonomy and representation, as in the realized United States.

Although scholars are making steady progress toward increasingly general theories of federalism [10], the field’s narrow interest in large nations, and disregard for small communities, is closely related to an attendant problem with the Federalist literature, i.e., it is drawn from an ultimately small number of examples of federated nations (fewer than 30) that, together, sometimes fail to represent the rich space of potential multi-level governance systems.

### 2.2.3 Polycentric Governance

Fortunately, a community of political scientists expanded their scope to include smaller governance systems, producing another body of theory that accounts increasingly successfully for observed variation. This is the theory of polycentricity, which both generalizes to include the smaller-scale systems characteristic of online communities and deviates from the rigid nesting of traditional theories of federalism. Polycentricity encompasses cross-cutting linkages that make it possible to capture the complexity often observable in multi-level governance systems online.

The concept of polycentricity is pivotal to the Ostrom school of institutional economics, pioneered by the work of Vincent and Elinor Ostrom [4, 91, 95, 96]. V. Ostrom initially adopted the term ‘polycentricity’ to describe the governmental fragmentation in U.S. metropolitan areas, arguing that political units could achieve greater efficiency in the production of public goods and services if they “take each other into account in competitive relationships, enter into various contractual and cooperative undertakings or have recourse to central mechanisms to resolve conflicts” [96]. Later, E. Ostrom’s research on community-based collective management of natural resources became the best-known application of polycentricity to real-world settings. Since the Ostroms’ groundbreaking use of polycentricity to describe the management of commons [90, 92], a number of scholars have analyzed the utility of polycentric governance in sustaining natural resources [5, 15, 16, 47, 75, 76, 85, 86, 97, 105].

Federalism can be viewed as a type of polycentricity [4] since it incorporates many of the key normative elements of Ostroms’ theory, including the idea of multiple power centers and redundant jurisdictions [125]. However, while federal systems consist of neatly nested jurisdictions under a single highest center of power, polycentric systems include crosscutting ‘issue-specific’ jurisdictions and envisage an explicit role for autonomous private corporations, voluntary associations, and community-based organizations [83].

Although there is no clear consensus definition of polycentric governance, most scholars agree that a polycentric system of governance consists of: (1) multiple decision-making centers with overlapping domains of responsibility, (2) that interact through a process of mutual adjustment in complex and ever-changing ways, and (3) generate a regularized pattern of overarching social order that captures efficiencies of scale at all levels of aggregation [4, 82]. Researchers have developed many different models of polycentric governance systems in order to build greater clarity and specificity around the concept and highlight its posited advantages [4, 23, 124]. Polycentricity is, in essence, an expression of self-governance capabilities that, over time, will produce a complex system of governance institutions [125].

The literature on polycentric institutional arrangements is particularly well-suited to inform the analysis of multi-level online platforms containing “nested quasi-autonomous decision-making units operating at multiple scales.” [43] We find many analogues to polycentric systems on sites like Reddit, Twitch, and YouTube where different subreddits or channels operate independently but take account of each other through processes of cooperation, competition, conflict, and conflict resolution [94].

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Table 1. Horizontal and vertical attributes that characterize multi-level platform governance and the corresponding theories or concepts from offline governance that inform our inclusion of each attribute. Note that two attributes do not derive directly from any theories of offline governance but instead from their observed relevance in online social platforms.

| Attributes                          | Relevant Theories of Offline Governance                                      |
|-------------------------------------|------------------------------------------------------------------------------|
| **Horizontal Attributes**           |                                                                               |
| Cross-cutting membership            | Cross-cutting jurisdiction characteristic of polycentric systems [83]       |
| Canonical vs emergent               | Genesis of federalism: Aggregation and Devolution [8]                        |
| Cost of entry/exit                  | Freedom of entry and exit in polycentric systems [70]; Entrepreneurial exit in institutions [12] |
| Lateral dependence                  | Cross-scale linkages in polycentric systems [23]                            |
| Transparency of governance performance | -                                                                            |
| Symmetric vs asymmetric             | Types of federalism: Symmetrical and Asymmetrical federations [8]            |
| **Vertical Attributes**             |                                                                               |
| Degree of autonomy                  | Degree of freedom from control in polycentricity and federalism [72]; administrative decentralization in organizational theory [113] and federalism [10] |
| Degree of authority                 | Ability to exert control in federalism and polycentricity [18, 84]; closely tied to autonomy in federalism [10] |
| Support by levels above or below    | -                                                                            |
| Overlap of jurisdiction             | Highly federalized political systems [93]; a key characteristic of polycentric governance [4, 23] |

The overview of offline multi-level governance theories we present above is brief and far from exhaustive, given the vast amount of literature behind each theory. However, our summary can already reveal the richness of this literature and its utility in informing platform governance. These frameworks not only provide analytical structure for our study of multi-level governance but also a means to challenge and strengthen our imagination beyond existing online examples [4, 106].

### 3 Characterizing Online Multi-Level Governance

In this section, we present a series of attributes that characterize the different types of multi-level governance structures that currently exist within popular online social platforms. The focus of our analysis is on the middle levels of multi-level governance structures online, including both the interactions within and between them. Therefore, borrowing from the terminology used in the polycentricity literature [42, 110], we present **horizontal attributes** that characterize a middle level, including the unit-to-unit interaction within the level and **vertical attributes** that characterize how the middle level interacts with governance levels above and below.

Table 1 summarizes how we derive some of these attributes from theories of offline governance. Starting with frameworks of offline governance discussed in the previous section, we eliminate attributes from those frameworks that assume national-scale governance and keep attributes that are typical of smaller governance systems and lend themselves well to the online realm. Then, we combine findings from offline governance frameworks with insights gleaned from case studies of online governance to identify a select set of key attributes that capture both observable variation in online social platforms and theoretical relevance according to the literature.

#### 3.0.1 Analytic Focus on Middle Levels of Governance

In Table 2, we present examples of middle levels from online social platforms. As can be seen in the table, platforms can have multiple middle levels that are coexisting, each with their own purpose, ecosystems of centers, and distinct organizing logic. For instance, Wikipedia’s different kinds of middle
### Table 2. Examples from online social platforms of middle levels within a multi-level governance structure.

| Platform        | Middle Level | Description                                                                                                                                                                                                 |
|-----------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Facebook        | Groups       | User-created communities that are moderated and managed by a small group of volunteer members. Activity within all groups is also moderated by Facebook’s global content moderation process carrying out Facebook’s site-wide community guidelines. |
| Wikipedia       | Language edits | Each edition is distinguished by the language of the articles that it hosts and comes up with its own processes for governing article content. These editions are supported and coordinated by committees, developers, and operators within the Wikimedia Foundation. |
| Reddit          | Subreddits   | User-created and managed communities, each containing its own community guidelines and automated moderation configurations [61]. Subreddits may be banned [26] or quarantined [25] by the centralized Reddit administration. |
| Twitter         | Blocklists   | Third-party moderation tool relying on the Twitter API and expanding end user blocking functionality to create lists of block-worthy users [49, 63]. The lists enable subscribers to automatically block accounts on the list. These blocklists were either manually curated by a small staff of volunteers or automatically curated using algorithms that determined the blocking criteria. Blocklists are no longer supported on Twitter. |
| Twitch          | Channels     | Channel owners live stream their videos and make available previously streamed videos on the channel. Each channel has its own set of moderators and settings for automated moderation of comments on their videos. |
| Mastodon        | Nodes        | Each Mastodon node has server administrators who decide on what other nodes with which to federate and other aspects of governance such as moderation policies. Each user account must be a member of a specific Mastodon node. While Mastodon as an open-source project has developers, each node can decide the specific code running on its (self-hosted) server so long as the code follows the shared ActivityPub protocol for federation. |
| YouTube         | Channels     | Each video belongs to a channel, and the channel managers control the videos and comments posted on their videos. YouTube’s centralized moderation may take down any videos that violate YouTube’s community guidelines. It also has a spam filter that automatically moderates inappropriate comments across the site. |
| WhatsApp        | Groups       | Each WhatsApp group has an admin who has the power to moderate that group. WhatsApp platform operators can make platform-wide decisions, such as limits on forwarding, but are limited in their power to moderate content due to end-to-end encryption. |
| BitTorrent      | Filesharing communities | Self-hosted, emergent communities of enthusiasts of software and media piracy, usually running forum software. Communities’ requirements for membership tend to focus around management of free-riding [1]. Communities have complete independence, and users need not even use the same filesharing client, except that they all must use the BitTorrent protocol. |
| World of Warcraft | Guilds   | Guilds are created by players, and can be banned by the platform, but are left to govern their own affairs. They vary greatly in their governance, membership, goals, and membership requirements. |
| World of Warcraft | Communities | Communities are created by players, and can be banned by the platform. They replace user governance with automated mechanisms for players with no prior relationship to form pick-up groups and approximate the social connections of closer-knit guilds. Since their introduction, Communities have largely displaced Guilds as the dominant middle level of WoW. |
| Minecraft       | Servers      | Although game ownership (Microsoft) retains involvement in validation of user accounts, Minecraft worlds tend to be privately hosted. Administrators select plugins, world content, and have great control over the membership and goals of their server, though the code itself is closed source. |
levels present an example of orthogonal organizing logics. Wikipedia projects bring together contributors to work on specific topic areas or specific kinds of tasks, while Wikimedia chapters support projects in specified geographic regions. This polycentric multiplicity of coexisting middle layers is distinct from the higher-level middle layer of Wikipedia’s many language editions, with the other two existing under that level, and most active in just one of its governance centers: Wikipedia’s English edition. The idea of coexisting middle levels with varying levels of dependence is paralleled in many offline systems for analyzing multi-level governance. The trias politica division of state governments into interlinked executive, legislative, and judicial branches, each with different powers over the same constituencies, can be seen as a use of multiple interdependent middle levels in classic federalism. In the polycentricity literature, Raynard recognizes multiple parallel institutional logics as a feature of polycentric systems, in complement with alignment of institutional logics and jurisdictional overlap to identify types of institutional complexity [102].

While in most cases a platform with different types of middle layers uses them to solve different problems, it can also happen that multiple middle layers emerge to solve the same problem redundantly. World of Warcraft uses two redundant or overlapping middle levels to give users alternatives in how they come together to organize team play. One level is the traditional guild system, a lightly instrumented middle level that allows players to self-organize game guilds. Guilds are well known for giving groups of users great power and responsibility to organize their own affairs. Later, to complement guilds with a more automated, mechanism-driven organizing forum, WoW introduced communities, a middle level designed to support ad hoc teams and a ‘pick-up game’ style of game play. The two coexist, but after the introduction of WoW Communities in 2018, membership in guilds fell precipitously as players flocked to the more convenient competing system.

Due to the complexity of governance in platforms such as the ones we highlight, we focus our analysis and thus our characterization of attributes on a single middle level at a time instead of on a platform as a whole. This allows us to represent the horizontal and vertical attributes of each middle level in more detail, as attributes for different middle levels on the same platform may conflict. Nevertheless, for many platforms, characterizing just the most prominent middle level sufficiently captures the majority of multi-level governance on that platform. We note that our taxonomy of attributes is not an exhaustive account of all attributes of platform governance. Rather, it is an attempt to highlight and represent the diversity of existing approaches to online multi-level governance. Nevertheless, by highlighting dimensions of variation, we reveal unexplored regions of design space and motivate more systematic exploration.

3.1 Horizontal Governance Attributes

Our list of attributes on which middle levels in online multi-level governance systems can vary begins with attributes describing how centers within the middle level interact with one another. Table 3 characterizes a sample of online social platforms according to their horizontal attributes.

3.1.1 Cross-cutting Membership. This attribute indicates whether the membership in each middle level governance center is exclusive—that is, whether it is possible for two centers to govern the same user. For example, on Reddit, the subreddit level of governance has inclusive membership—each user can simultaneously join more than one subreddit. In contrast, guilds in World of Warcraft are a middle level with exclusive membership—characters can be part of only one guild at a time. While all multi-level governance systems have overlapping jurisdictions, i.e., the redundant jurisdiction of middle and top levels over the bottom levels, the distinct idea of cross-cutting memberships is a key factor distinguishing the neat hierarchical nesting of typical federalism from the more general and unconstrained notion of polycentricity, which permits multiple middle-level centers to assert jurisdiction over the same lower-level agent.
Table 3. Examples of middle levels of platform governance and their characterization over the horizontal attributes.

| Middle Level              | Cross-cutting Membership | Canonical vs Emergent | Cost of Entry/Exit | Lateral Dependence | Transparency Level | Symmetric vs Asymmetric |
|---------------------------|--------------------------|-----------------------|-------------------|-------------------|-------------------|------------------------|
| Facebook groups           | Cross-cutting            | Canonical             | Low               | Occasional        | Low               | Symmetric              |
| Wikipedia languages       | No                       | Canonical             | Medium            | Formalized        | High              | Informally Asymmetric  |
| Reddit subreddits         | Cross-cutting            | Canonical             | Low               | Occasional        | Medium            | Informally Asymmetric  |
| Twitter blocklists        | Cross-cutting            | Emergent              | Low               | Rare              | Medium            | Symmetric              |
| Twitch channels           | Cross-cutting            | Canonical             | Low               | Occasional        | Medium            | Asymmetric             |
| Mastodon nodes            | No                       | Canonical             | Medium            | Formalized        | Medium            | Symmetric              |
| YouTube channels          | Cross-cutting            | Canonical             | Low               | Occasional        | Low               | Asymmetric             |
| WhatsApp groups           | Cross-cutting            | Canonical             | Low               | Rare              | Low               | Symmetric              |
| BitTorrent communities    | Cross-cutting            | Emergent              | High              | Rare              | High              | Symmetric              |
| WoW Guilds                | No                       | Canonical             | High              | Rare              | Low               | Symmetric              |
| WoW Communities           | No                       | Canonical             | High              | Rare              | Low               | Symmetric              |
| Minecraft servers         | Cross-cutting            | Canonical             | Medium            | Rare              | Low               | Asymmetric             |

3.1.2 Canonical vs Emergent. Some platforms like Reddit, Twitch, and YouTube have canonical middle levels: they exist as the default moderation structures implemented by the platforms themselves. For example, subreddits exist as an essential feature of Reddit and were architected by the platform’s designers. On the other hand, some platforms have emergent middle levels. For instance, Twitter blocklists are an emergent middle level because they arose as a third-party blocking mechanism. Canonical middle levels are more likely to have community customization and rich API integration natively. In contrast, emergent levels are more likely to operate through third-party services or API hacks. Emergent levels often face a more tenuous existence: platform designers may either deprecate the features on which emergent middle levels depend (as in the API changes that broke Twitter blocklists) or add canonical levels that compete with emergent ones.

Our canonical/emergent distinction is analogous to the distinction in the federalism literature between devolution and aggregation. In this analogy, platforms with canonical middle levels resemble devolved federations in reflecting a top-down origin—in having a unitary body explicitly designed by itself to be composed of many middle-level bodies. Emergent middle levels are like aggregate federations since they both share more ‘bottom-up’ origins.

3.1.3 Cost of Entry and Cost of Exit. This attribute refers to how expensive it is to enter a new governance unit or to exit a unit that a user participates in. Costs of entry/exit are important to consider when analyzing governance procedures because we expect that they influence end-users’ compliance with social norms and community guidelines. Exit and entry costs are technically distinct, but we treat them together because they tend to correlate, and the implications of high or low costs in each are similar.

A middle level has higher entry costs when there are barriers to initial entry, and also if access to additional common privileges are earned incrementally. These costs can be either monetary or based on other criteria of value to users, such as their time investment and reputation on the platform. Some platforms require users to pay before they can access restricted spaces on the site, and many communities create membership applications and even interview processes.

A center has higher exit costs to the extent that users lose something of value on leaving, especially something concrete. Every time a user leaves such spaces, they may have to forgo their monetary or other investments made in gaining access. Platforms with low exit costs can also induce competition between centers within the middle level by facilitating
exits from a community in favor of similar ones. Both polycentricity and online community have drawn the attention of economists because of their relationships to exit; both are seen as being able to harness exit logic in processes of institutional adaptation [70, 89]. Exit can be particularly cheap online, because it is often possible not only to leave any community to find another, but to leave a community and begin another. This especially cheap form of exit, called entrepreneurial exit, broadens the space of alternative communities to include all potential alternatives that a dissatisfied user might be motivated to create [12].

An example of high entry/exit costs is massively multiplayer online games, where users invest vast amounts of time to build high-performing characters and earn digital awards that are unique to one server community. This makes users more invested in maintaining access to that unit. Another example is BitTorrent filesharing communities, where management of the free-rider problem common in peer-to-peer sharing communities [1] is controlled by setting sharing requirements to continue as a member, and exiting results in lost access to files [35]. Meanwhile, Wikipedia has medium entry costs because while it is easy to gain entry initially to edit, maintaining those edits can involve additional bureaucratic hurdles tied to a granular system of privileges [20]. Exit costs are lower because a user’s edits and access to content are not lost upon exit, but it is not as low as middle levels like Facebook Groups, as entrepreneurial exit is not possible.

3.1.4 Lateral Dependence. Middle levels can also differ in terms of the level of dependence between their many middle-level centers. At one extreme, multi-player game servers are independent in the sense that activity in one center is not influenced by activity in another, formally or informally. At the other extreme, nodes of the distributed social network Mastodon are in some sense defined by which nodes they choose to connect to and how they parameterize those connections. As another example of formalized links, every Wikipedia article in a language edition has links to the analogous article, if it exists, in every other language edition. With these lateral linkages, middle-level centers may themselves form into new higher middle levels and create emergent federations under a top level. Centers with intermediate levels of lateral dependence are those in which direct interlinkages are possible but optional. Subreddits of Reddit cannot be formally linked on the platform, but can link informally through overlapping moderators or hand-written rules that define the scope of the community in terms of other communities. Users in the “involuntary celibate” subreddit r/ForeverUnwanted may be banned if they have ever posted in r/inceltears, while the r/funny subreddit forbids meme content by suggesting that users post memes to r/memes instead. One more canonical instance of optional interlinkages is on the Slack platform. Slack Workspaces are independent by default but can be linked through shared channels.

This attribute of multi-level platforms does not come directly from the prior literature on offline multi-level systems. However, it is consistent with the consensus view of polycentricity as fostering spontaneous cooperative and competitive linkages within and between all centers [23].

3.1.5 Transparency of Governance Performance. This attribute refers to the extent to which centers in a middle level are transparent in how they govern and how much they rely on explicit or mechanistic approaches to governance rather than moderator discretion. Reddit is overall of intermediate transparency. It has governance systems that offer high-transparency, such as written rules that are visible and accessible via API. It also has systems with low transparency, including AutoMod rules governing programmable automated moderation activities, which are private to administrators by default and thus harder to study or extract [61]. This transparency could be driven by the governance level’s accountability (see next subsection) to the levels above or below, but it could also be derived from other sources such as administrator personality or platform affordances that facilitate transparency. Regardless, we restrict our sense of transparency to governance-related activity specifically, e.g., a user’s flagging activity rather than their general posting history. Different
Table 4. Examples of middle levels of platform governance and their characterization over the vertical attributes.

| Middle Level          | Autonomy from Above | Autonomy from Below | Authority over Above | Authority over Below | Support by Above | Support by Below | Overlap of Jurisdiction |
|-----------------------|---------------------|--------------------|----------------------|----------------------|------------------|------------------|-------------------------|
| Facebook groups       | Medium              | Medium             | Low                  | High                 | Medium           | Low              | High                    |
| Wikipedia languages   | High                | Low                | Medium               | High                 | High             | High             | Low                     |
| Reddit subreddits     | Medium              | Medium             | Low                  | Low                  | Medium           | Low              | High                    |
| Twitter blocklists    | High                | High               | Low                  | Low                  | Medium           | Low              | High                    |
| Twitch channels       | Medium              | Medium             | Low                  | High                 | Medium           | Low              | High                    |
| Mastodon nodes        | High                | High               | Medium               | High                 | Low              | Medium           | Low                     |
| YouTube channels      | Medium              | Medium             | Low                  | High                 | Medium           | Low              | High                    |
| WhatsApp groups       | High                | High               | Low                  | Low                  | Medium           | Low              | Low                     |
| BitTorrent communities| High                | High               | Low                  | High                 | Low              | Medium           | Low                     |
| WoW Guilds            | Medium              | Medium             | Low                  | High                 | Medium           | Medium           | High                    |
| WoW Communities       | Medium              | Medium             | Low                  | High                 | Medium           | Low              | High                    |
| Minecraft servers     | High                | High               | Low                  | High                 | Medium           | Low              | Low                     |

Data streams in a center—including a center’s metadata, rules, content, logs, moderators IDs, moderator actions, and community membership—may vary in their transparency. Assessing the transparency level of a whole middle layer involves looking at default transparency settings, and considering separately what aspects of governance are opaque before a user becomes an official member of a center, and what remains opaque even after joining.

3.1.6 Symmetric vs Asymmetric. One relevant feature from the federalism literature asks how similar units within a middle level are to each other, in terms of their rights under the top level and powers over their lower level. The scalability of online platforms, and the level of standardization imposed by their code, seems to ensure the overall symmetry of units in a middle level. Nevertheless, there are instances of asymmetry, as in the case of platforms that provide ‘premium’ units. Minecraft Realms, for example, are professionally rather than privately hosted Minecraft servers that offer users more services, such as professional content moderation. Similarly, YouTube offers a tiered governance strategy, providing amateurs, professional amateurs, legacy media organizations, and contracted producers with different levels of procedural protection as well as different material resources and opportunities [22].

Asymmetries can also arise informally, from a platform’s norms and practices rather than its architecture. Subreddits that have been run with involvement from Reddit Inc. staff, such as r/IAmA, have preferential access to Reddit’s centralized promotional apparatus, while subreddits whose content is highly regulated—such as channels focused on self-harm, harm to others, or harm to children—receive streamlined access to professional moderation staff, at least informally. In our assessment, we regard platform-formalized asymmetries, such as those of YouTube and Minecraft, as more substantive than the informal or unofficial asymmetries evident in Reddit, even if those latter asymmetries may have a comparable impact in practice.

3.2 Vertical Governance Attributes

We next describe the vertical governance attributes in our taxonomy, where vertical attributes characterize middle levels according to their relationship to top and bottom levels. Table 4 characterizes a sample of digital platforms on their vertical attributes.

3.2.1 Degree of Autonomy from Levels Above or Below. This attribute measures the extent to which centers of power in the middle level can operate independently, or whether they have a relationship of accountability to another level that
constrains their autonomy. The attribute maps directly to a central concern of scholars of polycentricity and federalism: the degree of freedom from control by the other levels of jurisdiction with which any government executes its functions [72]. Many platforms have governance levels that possess moderately high levels of autonomy. For example, moderators of Reddit communities can independently make a vast majority of moderation decisions, like determining subject, writing rules, removing posts, and selecting leadership. Even in settings that support great autonomy, such as those like Mastodon that are organized around a standard rather than a platform, the autonomy that middle levels can gain will vary with how rich the standard is and how openly it accepts third-party input. A deeper manifestation of autonomy is in the powers top levels grant to middle-level centers and don’t exercise themselves. For example, while platforms generally reserve the exclusive right to blanket-ban users who violate their terms, they typically devolve to middle level centers the right to ban users from specific centers.

As it turns out, this reluctance by central governance to exert its powers often builds up expectations among administrators at lower levels that top-level agents will be hands off. As a result, when the top level does assert its power, as has happened on Zoom, Slack, and Reddit [112], lower-level administrators may perceive it as an overreach by top-level governance and a breach of their trust and understanding with it. In some cases, this assertion of power is restricted technically, such as in the case of WhatsApp, where end-to-end encryption limits what can be exercised from above.

Middle levels with no autonomy can exist solely for administrative convenience, which organizational theory calls administrative hierarchy [113], a concept that has also been recognized in the federalism literature as administrative decentralization [10]. Examples include Facebook’s division of users by country or language community, or World of Warcraft’s distribution of users and guilds across largely indistinguishable servers.

With greater autonomy from levels above, centers are more likely to operate without fear of being sanctioned. For example, Twitter blocklists were not very accountable to the centralized Twitter level because they were hosted on an external server and were not reviewed by the Twitter moderation team. In comparison, Facebook Groups are accountable to Facebook operators because operators can ban Groups that do not adhere to Facebook Policies. Still, even within platforms that monitor, report, and enforce explicitly forbidden actions, middle levels like Facebook Groups and Reddit subreddits retain substantial autonomy to determine their own affairs.

It is also meaningful to conceptualize the degree of autonomy of a middle level from those below it. In the “implicit feudalism” model that is inherent on many social platforms [107], a founder of a community has absolute autonomy over that community by default and is not directly responsible to users. Often, the only accountability is indirect, through the threat that users will exit for other more accountable or otherwise desirable communities [45]. The more rare and interesting case is a middle level that is formally accountable to those below it. On Wikipedia, the community has the power to withdraw an administrator’s special privileges in cases of abuse of authority, and also restrict their use of certain functions and place them on probation. Whether moderators are reportable by users, or somehow accountable to them, is a major factor in determining a center’s autonomy from below.

It is important to analyze the autonomy or independence in decision making experienced by each decision-making center. As Marshall [76] notes, de facto autonomy may matter as much as formal autonomy. While platforms may devolve certain responsibilities to decentralized moderation centers, they may employ governing-at-a-distance strategies as a way of exercising greater control over outcomes, for example, by imposing reporting and compliance requirements [23, 56, 76].

1https://www.insidehighered.com/news/2020/09/25/zoom-refuses-stream-university-event-featuring-member-terrorist-organization
2https://www.theverge.com/2018/12/20/18150129/slack-iran-deactivated-sanctions-license-cuba-crimea
3https://www.facebook.com/policies/pages_groups_events/
4https://en.wikipedia.org/wiki/Wikipedia:Administrators

Manuscript submitted to ACM
This may leave the decentralized centers with considerably diminished autonomy to modify their operations to address evolving moderation challenges.

### 3.2.2 Degree of Authority over Levels Above or Below

A related but distinguishable attribute to autonomy is authority, which refers to the ability to regulate or sanction. The question of authority is as central to federalism and polycentricity as autonomy, defined, as they are, around systems with multiple centers of power [18, 84]. Indeed, a middle-level center having autonomy implies its having authority over something. But piecing out the direction of its authority, like the direction of its autonomy, gives insight into its structure and helps to distinguish different instances we observe of multi-level governance platforms online.

A unit can have authority over lower levels with or without autonomy from them. For example, administrators of Facebook Groups have authority over Group members because they have the power to sanction members or their posts in their Groups and governance decisions are taken autonomously as administrators are usually not elected by Group members. On the other hand, administrators of Wikipedia's specific language editions have authority over the governance of Wikipedia pages in that language but they do not operate autonomously since community members can strip away their administrator rights. Middle levels usually have high authority over low levels. One exception we have found is Twitter blocklists: as a third-party service with limited functionality, these blocklists could not strongly sanction their subscribers.

Middle levels can also have formal authority over upper levels, at least in theory, although we have not succeeded in finding any platform that formally granted collective authority to middle level centers over top-level operations. CCP Games, the developer of the massively multiplayer online game EVE Online created a player-elected Council of Interstellar Management to serve as their conduit to the game's player community, but the body is explicitly only advisory, with no formal authority to influence development. The closest example of formal bottom-up authority may be in the governance of the Wikimedia Foundation, which, likely as a result of its mission, has at least informal mechanisms for granting authority to its language editions; however, the most evident and concrete mechanism—the Foundation's partially member-elected board—encodes a more direct rather than representative democratic structure. Similarly, any member of a Mastodon node can informally influence the shared code base and standard upon which all nodes build off of and rely on by contributing to the open source project.

### 3.2.3 Support by Levels Above or Below

On some platforms, middle levels are supported by higher levels through a variety of means, such as receiving technical help or getting access to moderation resources. For example, Reddit provides to moderators on each subreddit an Automod configuration, which lets them set up moderation rules that automatically remove inappropriate content. On the other hand, Twitter did not provide any resources to assist the operation of blocklists.

On other platforms, centers in a middle level are supported by lower levels, such as private servers of Mastodon, Minecraft, or World of Warcraft, that sometimes depend on users’ financial support. This quality, which is related to authority and autonomy, is not motivated by the offline literature like they are, but stands out because of the variety of forms of support we see online. Support would seem to be tied to autonomy, with a high level of support to a middle level implying a correspondingly high level of accountability from that level. However, it is not difficult to observe decouplings. Recent attention on the inconsistent demonetization of YouTube videos highlights that YouTube does not equally support amateur creators and established media partners even though all channels are accountable to the same guidelines [22].

In general, we consider support from above to be lowest for centers on platforms with self-hosting, medium for centers hosted on a central platform, and highest in cases of centers receiving funding, human staff support, or special access to developer tools. We consider support from below to be highest among centers that are fully user-run and -funded, and
lowest on platforms with no tools or culture supporting voluntary contributions. We set support from below to be medium when there is a mix of centers that are supported by administrators and centers that are supported by end users.

3.2.4 Overlap of Jurisdiction. This attribute considers the degree of overlap between middle levels and higher levels in terms of their areas of responsibility: what are the governance actions that each level can take and how much do those overlap? Overlap of jurisdictions is a key feature of polycentric governance [4, 23]. Ostrom described governance systems with overlapping jurisdictions as “highly federalized” political systems [93]. For an example of high overlap, YouTube content creators can remove comments posted on their videos, just as YouTube platform operators can also remove comments from any video on YouTube. In both cases, the responsibilities and actions afforded to the middle level are a subset what is afforded to the top level, leading to high overlap in the style of a nested federation. In the cases of low overlap, typically, we see a ‘thinner’ top level that has access to or chooses to exert few actions in comparison to the middle level centers, and the responsibilities they oversee are not shared by the middle levels. For instance, while Mastodon node administrators are in charge of almost every aspect of governance in each node, the top level solely oversees code development. As can be seen in Table 4, this attribute has some correlation with autonomy from above. However, this is not always the case—third-party tools like Twitter blocklists have high autonomy from above but in this case, they also have high overlap, as both levels monitor accounts for poor behavior.

4 DISCUSSION

By drawing analogies between platform governance and offline multi-level systems, our work uses literature on offline institutions towards a taxonomy of multi-level governance in online social platforms. We now discuss some of the limits of those analogies before turning to propose design implications and further research drawing from our taxonomy to support platforms and communities seeking to decentralize their governance.

4.1 Differences in Online and Offline Multi-level Governance Systems

While there is much we can learn from offline institutions, governing online spaces poses some unique challenges: there are fundamental ways in which social platforms differ from offline systems. There are also crucial ways in which offline theories of governance break analogy with governance on online platforms, and insights from the former do not translate well to the latter.

4.1.1 Limitations of Offline Theories of Governance in Explaining Online Phenomena. While organizational theory provides valuable insights about the effects of organizational structure on decision making, it assumes that all agents in the hierarchy are working towards the same end [65]. This crucial assumption helps organizational researchers focus on the problems of how firms process information, but it often overlooks for the potential for conflict, which breaks analogy with most online communities. However much unity Wikipedians share around the encyclopedia’s goals, they are volunteers with individual motivations and, unlike employees in a company, are not paid to subordinate their personal goals and desires to those of any superiors. Although Wikipedia is, at some level, an organization unified around a common goal of providing “a free widely accessible encyclopedia,” it is equally valid to see it as a highly contested, strategic space, whose articles are as often the result of compromise between editors in conflict as successful collaboration [17, 134]. This limits the ability of theories of administrative hierarchy to inform multi-level governance in online communities, where the motives behind multi-level structure are less about efficiency in implementation or information processing, and more about identifying, coordinating, or asserting the autonomy of many independent agents.
Moving to the political science literature on federalism and polycentricity, we find more points of overlap. However, despite its superficial ability to capture some of the neatly nested jurisdictions observed online, the federalism literature provides a very incomplete source of properties general enough to illuminate multi-level governance online. First, its focus on nation-scale federations comes almost entirely at the expense of other scales of governance systems, like small-scale communities. This results in a narrow view of multi-level governance, evidenced by some of the criteria that political scientists have used to taxonomize federations, such as a formal distribution of legislative and executive authority, designated representation of distinct regional views, a supreme written constitution, and a system of courts [72]. These criteria are much too onerous to describe the kinds of multi-level online communities that we observe. Aroney [8] offers a taxonomy of multi-level governance systems that is slightly more general, but still nation-focused. Polycentricity offers a framework much better suited to platform governance but it assumes the presence of organizations and individuals in “critical supporting roles” [83, 96] that have no analogues in online platforms.

4.1.2 Stakes Involved in Online Governance are Qualitatively Different.
While online governance focuses on activities revolving around information sharing and building social capital, offline governance is concerned with a much wider set of issues, including protecting from external physical threats and ensuring the health and overall welfare of citizens. Further, individuals have higher mobility on online platforms than in offline settings, and the constraints for entry/exit are much lower. This shapes the perspectives and practices of stakeholders on digital platforms. We note that some important exceptions exist: for instance, users who rely on online support groups for mental health help, LGBT issues, etc., may have a higher dependence on the social capital offered by online communities into which they have invested their time and effort. Still, democratic participation in online governance is much harder than in offline governance. The private ownership of most online platforms also means that the financial benefits of good governance are not necessarily reinvested in improving community outcomes but may instead go into private pockets. This further discourages public participation in governance processes online.

4.1.3 Compensation of Labor.
While offline administrators in governance units at different levels are supported through tax dollars, online administrators in middle-level units are typically volunteer contributors with low support from top and bottom levels, as shown in the examples from our taxonomy. Researchers have highlighted the significant physical and emotional labor that goes into enacting content moderation [53, 61, 104, 131]. These discrepancies raise the question of whether local content moderators should receive financial compensation for the responsibilities they shoulder. Few platforms have explored alternative business models for compensating local administrators, which could involve anything from the sharing of ad revenue with lower-level administrators, to subscription-based models that support local and global governance, to even multi-stakeholder ownership of platforms [109]. Some scholars have proposed a marketplace of governance services that are separate from platforms, analogous to emergent middle levels in our taxonomy [40, 78, 108, 132], though it remains an open question how third-party services themselves will have viable business models [74].

4.1.4 Decisions about Technical Architecture Shape Middle Levels.
Unlike offline institutions and governments, each platform makes a whole host of technical decisions about its architecture that affects whether middle levels emerge as well as how they behave. One key infrastructural decision that affects the emergence of middle levels is whether or not a platform provides external access to their data through an API. When a platform provides sufficient access, it opens up the possibility for the emergence of third-party middle levels like in the case of Twitter blocklists. However, such emergent middle levels have a precarious existence and can be deliberately shut down or inadvertently broken by changes in the API.
Similarly, if a community platform chooses to abide by an interoperability standard, then middle levels of governance are bound to exist. For instance, Mastodon nodes offer a particularly interesting case of how architecture shapes middle levels: these nodes are self-hosted, and indeed, there is simply a thin top level consisting of a common technical standard. While these nodes are somewhat constrained by the mechanics of code written by Mastodon developers implementing the standard, the nodes can also fork and change this code and govern themselves in different ways.

A different example of how technical decisions can constrain or empower different levels of governance is of WhatsApp enforcing end-to-end encryption for its chats. This precludes the top governance levels from directly taking any governance actions on end users or from overseeing middle levels. It also empowers WhatsApp Group admins, who form the middle level of WhatsApp governance, to have greater autonomy. However, while technical constraints can powerfully influence governance, scholars have repeatedly demonstrated how an over-reliance on technical decentralization can merely exchange the formal endowment of central powers with an emergent rise of central powers [34, 101].

4.2 Design Implications

As can be seen from our characterization of the existing landscape, multi-level governance can exist in many different ways. For centralized platforms seeking to achieve greater decentralization or disparate communities seeking to federate under a common governing body, how to best do while sustainably addressing community needs is a daunting question. Despite the potential for decentralized governance to create local centers that are more attuned to community needs, more centers of power also means more potential points of failure and the possibility of greater overhead and inefficiency [10].

We draw on the gaps we identify in current implementations using our taxonomy as well as guidelines raised primarily by scholars of polycentricity [23] to point to a non-exhaustive set of design implications for platforms and communities.

4.2.1 Vertical Designs to Enable Innovation and Adaptation. One major benefit of decentralized governance is the ability for individual centers to innovate, as emphasized in the phrase “laboratories of democracy” used by U.S. Supreme Court Justice Louis Brandeis to describe state governments. As online communities evolve, their survival partly depends on their willingness to also evolve their governance procedures in response to events. For instance, the early, well-known case of textually enacted rape in LambdaMOO was resolved via new governance structures involving elected officials, petitions, and ballots [37]. The literature on polycentricity similarly emphasizes continual adaptation in the face of changing environments [23, 56, 58, 91], and points out that adaptive capacity depends on the ability of governance centers to have the freedom to continually experiment with a variety of rules [23, 91]. Thus, to enable innovation and adaptation, online social platforms should be designed to allow local administrators to experiment with governance, including community guidelines, sanctioning criteria, and software tooling to support governance workflow automation or auto-moderation [61]. Vertical attributes include providing greater autonomy from above so that middle-level centers can independently develop tools and establish rules. Another attribute is providing support by above in the form of platform tools that provide greater flexibility or help with experimentation. For platforms with thin top levels, support could instead come from below in the form of funding or volunteer development of tools.

4.2.2 Facilitating Social Learning. The benefits of experimentation grow when governance knowledge and tools developed in one middle-level center can spread to others via social learning. In their analysis of 5,673 Wikia communities, Zhu et al. found that when users participate in multiple online communities, their membership helps the survival of each of those communities due to the transfer of best practices [136]. Many governance scholars identify social learning and building social capital as important conditions for increasing resilience and sustainability [13, 43, 50], without which each center must arrive at an optimum arrangement through its own trial and error [91]. However, many platforms with
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multi-level governance do not offer formal forums for administrators at different middle-level centers to communicate with one another, leading to inefficiencies such as the building of redundant tools [61].

Certain multi-level designs could support greater learning between different centers of power. Allowing for cross-cutting membership permits members to be in multiple communities, as in the Wikia case mentioned above. Allowing for greater lateral dependence across centers could help reduce unnecessary inefficiencies. On Wikipedia, new language editions commonly bootstrap from more established language editions by translating their policies and articles. Middle-level centers could also band together to form units in another middle level via a nested hierarchy to formally or informally share governance responsibilities, resources, or knowledge. Separately, learning could be facilitated by the top level. Given some overlap in jurisdiction, the top level could itself incorporate popular novel solutions developed by middle level centers. The top level could also promote certain middle level solutions to other middle level centers. For example, after Reddit Automod was voluntarily used as a bot by many Reddit communities, Reddit realized its potential and incorporated it as a default mechanism on all subreddits [61].

4.2.3 Fostering Healthy Competition. Competition for users is another outgrowth of increased decentralized governance that can lead to better conditions for users. On Reddit, new communities often form when a faction of an existing community is dissatisfied with how it is moderated [80, 81]. According to polycentricity and federalism scholars, competition between different units of government induces self-regulating tendencies as different centers are compelled to demonstrate their value to members [64, 66, 83, 96, 121].

From our taxonomy, certain horizontal attributes directly relate to enabling greater competition across middle-level centers. One of these is low costs for entry and exit, which both lowers the switching costs of moving centers as well as the cost of starting a new center [32, 45]. Another relevant attribute is higher transparency of governance performance. V. Ostrom et al. argue that conditions that make competition beneficial emerge when information about the performance of centers is publicly available [96]. Publicizing information such as number of members, level of activity, or active involvement of local governance operators in a center invites comparison and induces pressures on each center to match the performance of more successful centers. Finally, the possibility for asymmetry within middle-level centers through the elevation of centers that meet certain criteria may induce competition.

Care must be taken to safeguard against excessive competition that may undermine cooperation and reduce overall effectiveness [31, 99]. While attention is a finite resource that middle levels such as YouTube channels are bound to compete over, excess competition may be reduced through the enabling of cross-cutting memberships. This way, joining one center does not imply exiting another, allowing the possibility for centers to be complementary despite the appearance of competitive overlap.

4.2.4 Establishing Accountability. Holding decision makers accountable for failing to meet the expectations of citizens is crucial for the proper functioning of governance systems [23]. Agrawal and Ribot describe mechanisms for holding offline governance actors accountable, including legal recourse through courts, third party monitoring, auditing and evaluation, public reporting requirements, education, embedding leaders in their community, performance awards, and oversight of local government by the central state [2]. Many of these mechanisms have analogous applications in the online setting. For instance, researchers already engage in external monitoring and auditing of content moderation practices on platforms. Our design attribute of transparency of governance performance is a direct facilitator of these accountability practices. We note that transparency online differs fundamentally from offline institutions due to technical architecture. For example, Wikipedia automatically maintains a record of all actions by all participants for all time, permitting a degree...
and availability of forensics and accountability unheard of offline. Communities on platforms like Minecraft\textsuperscript{5} and Reddit have also explored logging of moderation actions via third-party tools.

Accountability is also fundamentally tied up with autonomy. For middle levels that have lower autonomy from above, accountability could be provided by the top level. Surprisingly, we find little evidence of top levels that actively evaluate the moderation practices of local governance centers, except in egregious cases where centers are in violation of platform guidelines. One recent example is Twitch’s proposed “Brand Safety Score”\textsuperscript{6} that attempts to score streamers based on aspects including how they govern their stream, though it seems primarily for the benefit of advertisers and not accountability to members. However, a pitfall that platforms should avoid is punishing middle-level centers for the actions of their members while not providing adequate support for governance. For instance, many YouTube content creators spoke out when YouTube demonetized channels due to inappropriate comments posted on those channels.\textsuperscript{7} This could have the effect of further hurting marginalized communities that sustain targeted harassment and lack resources to handle it \cite{73}.

Finally, accountability can also come from below. Most of our examples have high authority over below, suggesting there should be a commensurate degree of “accountability to” and “support from” below. That this is rare is indicative of the room for improvement in online multi-level systems. Lower autonomy from below could be enabled through processes for users to report, elect, or otherwise exert pressure on local administrators. Although formal accountability to end users remains rare outside of reporting tools, tools are increasingly available for supporting the democratic election of community leaders \cite{135}.

4.2.5 Providing Mechanisms for Conflict Resolution. Conflicts between different centers of power are not uncommon on online social platforms. Online communities often break apart because of internal squabbles. On polarizing topics, communities holding opposing views may attack one another on the same platform \cite{33, 69}. Conflicts also exist between governance centers at different levels \cite{79}. Offline policy scholars stress the importance of both formal and informal mechanisms of conflict resolution \cite{3, 23, 96}. Carlisle \textit{et al.} propose designing forums for conflict resolution that offer a variety of mechanisms (e.g., conciliation, mediation, and arbitration) so that disputants can select the approach that is best suited to the nature of their dispute \cite{23}. Agrawal and Gibson also point out that local communities that do not possess political or material clout may need the involvement of judicial or higher-level government bodies \cite{3}. This suggests that online platforms could benefit from formal avenues for local centers to report or resolve disputes with each other, particularly when a large community attacks a smaller one. However, we are not aware of formal avenues specifically for conflict resolution between different communities; instead, most exist for reporting conflicts between individuals.

When conflict resolution does happen, it happens informally and behind the scenes, such as in our example of lateral dependence on Reddit, where subreddits can choose to blanket ban posters from other subreddits to prevent brigading. At the same time, there is value in maintaining informal mechanisms for conflict resolution because it avoids centralizing decision making and control \cite{96}. Low-cost, informal mechanisms for conflict resolution are particularly important when the formal mechanisms are expensive or protracted.

5 LIMITATIONS AND FUTURE WORK

Given the vast literature on multi-layer governance systems, we were limited in our ability to engage with promising theories and may have overlooked some relevant lines of research. While we draw from this literature to inform our

\textsuperscript{5}https://www.curseforge.com/minecraft/mc-mods/block-history
\textsuperscript{6}https://www.digitalinformationworld.com/2021/03/twitch-scores-users-through-brand.html
\textsuperscript{7}https://www.thewrap.com/youtube-inappropriate-comments-demonetization/
analyses, we do not argue that these are the only models that can lead to successful platform governance. It is possible that what works offline may fail in online settings, and vice-versa, due to differences such as the ones we discussed in Section 4.1. We also note that operationalizing these theoretical constructs may not fully explain the success (or lack thereof) of online governance systems because that depends on a range of factors, including the robustness of each governance center. More systematic, empirical research on online governance is needed to better inform how different governance arrangements are likely to perform under different settings.

To that point, our characterization of different social platforms in Tables 3 and 4 are based on our observations as scholars of online platform and community governance. While all the coauthors of this paper reached agreement through deliberation, other observers may reach different conclusions. We call for further systematic and empirical research to accurately and precisely characterize these attributes. Comparative analyses of a larger set of multi-level platforms along these attributes may also generate additional transferable governance insights.

Finally, it may be challenging for non-experts and engineers to translate high-dimensional theoretical insights into practical solutions. Thus, more work is needed to detail how our design implications can apply more specifically to different platforms. Following that, deployments of new designs on platforms can help to empirically validate hypotheses arising from our work. Taking as an example the attribute of transparency of governance performance, a platform could introduce features to publicize local governance performance and measure whether local centers improve as a result of increased competition and accountability. An important component of this future work is to more explicitly define for each case what is successful governance and how to measure it.

6 CONCLUSION

Hierarchy and interdependence are fundamental properties of complex social systems and fundamental design principles of engineering [115]. This basic importance, combined with its surprising complexity, makes multi-level design a daunting subject, one that has been reinvented in virtually every discipline in hard-to-reconcile ways, each with subtle distinctions and a confusing mix of general and domain-specific characteristics. The importance of multi-level platform design is evident in its ubiquity on large-scale social platforms, as observed in both canonical and emergent examples of middle levels. From a theoretical perspective, close consideration of multi-level systems encourages careful and non-ideological approaches to otherwise ideology-laden subjects like authority, power, responsibility, and autonomy: middle levels often exist to help users, and platforms benefit from the best of both centralization and decentralization by distributing powers to all levels of a system. In this work, we wrangle the many manifestations of multi-level organization into the beginnings of a general taxonomy, toward a systematic understanding of how multi-level architectures emerge and how we can best harness them for more empowering and accountable design.

This research draws upon various theories of multi-level governance systems to propose design and policy solutions for improving online governance. As opposed to offline institutions, online platforms can iterate quickly, base decisions on mass data, and compare communities directly. This makes them an ideal laboratory for exploring the design space of potential multi-level governance architectures. We note that the attributes we relate in this paper are not meant to be measurable indicators of functional systems but qualitative descriptions sufficiently general enough to be contextualized to each platform. These are far from the only insights that the scholarship on offline multi-level governance systems can offer to the realm of online platforms. We aim to start a conversation that more closely links political science and public administration scholars to the platform governance community.
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