Journal of Business and Management Studies
ISSN: 2709-0876
DOI: 10.32996/jbms
Journal Homepage: www.al-kindipublisher.com/index.php/jbms

JBMS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Bridging Theory and Practice: Applying Ostrom's Law to Real-World Resource Management

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| ABSTRACT
This article aims to address the practical application of Elinor Ostrom's contributions to resolve issues related to collective action in three key areas: (1) the establishment of institutions, (2) adherence to collective obligations, and (3) mutual monitoring. The article explores the appropriate ways to implement Ostrom's theories across different regions and communities. The discussion begins by outlining Ostrom's significant contribution to economic theory, and this contribution is often referred to as "Ostrom's Law." This principle posits that a resource arrangement that works in practice can work in theory, challenging the prevailing belief that common-pool resources are inherently mismanaged and require either centralized regulation or privatization. The article further examines the potential for developing a practical model for future collective, coordinated actions, which would incorporate both the strengths and limitations of Ostrom's economic theory. Five models for the creation of new collective agreements, as proposed in Ostrom's works are analyzed, alongside practical examples from countries such as Spain, Philippines, Nepal, and Turkey, where Ostrom's principles have been effectively applied in the management of natural resources. Ostrom's analytical methods and her conclusions regarding collective action theory hold significant value for developing practical tools for direct implementation, particularly in contexts of rapid development, such as those faced by nations, organizations, and smaller collectives. The methodology in 'Bridging Theory and Practice: Applying Ostrom's Law to Real-World Resource Management' combines qualitative case studies, comparative analysis, and theoretical modeling to explore the practical application of Elinor Ostrom's theories of collective action and management.

| KEYWORDS

Institution, governance, collective action, Ostrom's Law, the commons, Tragedy of the Commons.

| ARTICLE INFORMATION

ACCEPTED: 15 October 2024 **PUBLISHED:** 04 November 2024 **DOI:** 10.32996/jbms.2024.6.6.2

1. Introduction

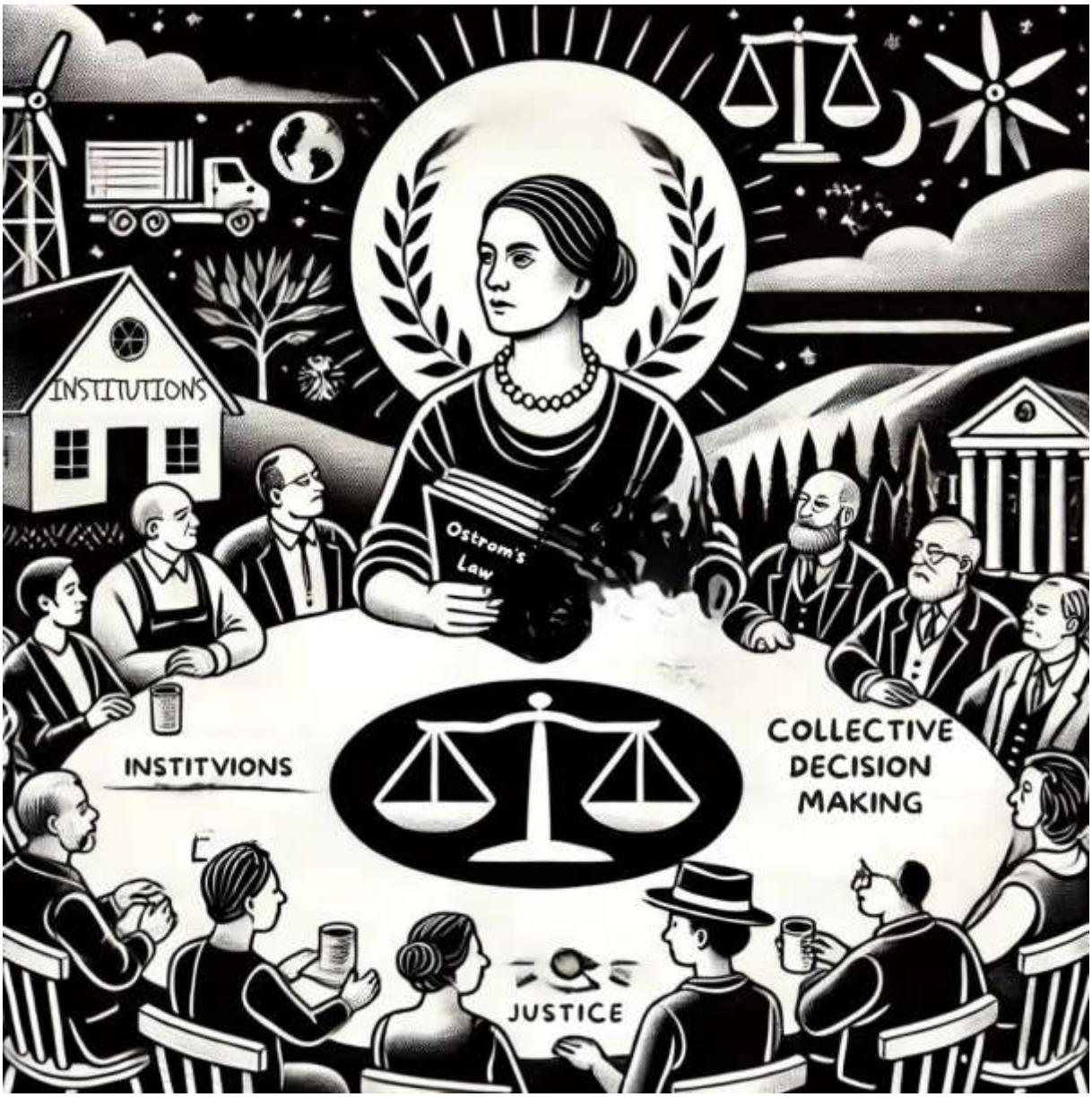
This essay offers a broad intellectual overview of the work of Elinor Ostrom on economic governance, focusing on her central theme of managing common-pool resources. In 2009, Elinor Ostrom (1933-2012) was the first woman to win the Nobel Prize in the category of Economic Sciences, and the first to win it on the basis of a body of work that spanned many years (she began her career in the 1960s, publishing extensively in both economics and political science). Ostrom's work challenged a central pillar of neoclassical economics – the 'Tragedy of the Commons'. The 'Tragedy of Commons' argued that when individuals share collective resources without external governance—whether through state regulation or privatization—it inevitably leads to overexploitation and depletion of the resource.

Ostrom, on the other hand, argued it was possible for local communities to engage in self-regulation of commonly shared resources, without having to privatize or otherwise externalize control over them. She proved this through multiple case studies, which will be referenced further in this article. From her research findings, she formulated eight theoretical principles about how a group can successfully manage common resources.

The article will discuss how Ostrom's principles can be practically implemented globally to address the challenges of collective action; specifically, it will explore how communities establish new institutions, ensure compliance with collective obligations, and foster mutual monitoring. Ostrom's Eight Principles are presented as a highly effective framework for sustainable resource management as they emphasize defined boundaries, tailored rules that fit local conditions, decision-making through group participation, and graduated sanctions.

In her book "Rules, Games, and Common-Pool Resources", Ostrom presents five models of collective bargaining models, which we will describe in this article. Four out of five models already existed before her, and these have existing scientific, theoretical and practical methods of application. These four are Contract by Mutual Consent, Private Arbitration, Drawing of Lots, and Cooperatives. The fifth model Ostrom developed herself based on her Eight Principles. We will compare the five models and examine how each can be implemented in the real world.

In conclusion, the article will discuss the global relevance of Ostrom's work, particularly in addressing complex issues such as climate change, and advocate for further research to adapt her principles to modern challenges like technological change and globalization.



2. Ostrom's Law

Elinor Ostrom, Professor of Political Science at Indiana University and one of the world's foremost experts on economic governance, studied the interconnectedness between humans and nature her entire career. She studied the exhaustion of in-demand resources by communities, co-operatives, trusts and trade unions. Ostrom showed that the shared use of resources could be rational and sustainable and could even forestall the loss of resources without the intervention of the state or privatization.

Perhaps best-known is Ostrom's re-evaluation of Garrett Hardin's 1968 "Tragedy of the Commons," in which he argued that common-pool resources are liable to being overutilized, eventually ending up depleted unless they are properly controlled or privatized by the state. Ostrom's empirical research, by contrast, found that local, tiny groups could regulate common resources – for example, fisheries and forests – through self-governed rules developed over time. Such commons-based models could ensure long-term sustainability of the commons, so it would not be necessary to govern these resources externally or privatize them.

Ostrom's ultimate contribution to economics was captured in the now-famous law – currently dubbed Ostrom's Law – which holds: a resource structure that operates in practice can operate in theory. By this, Ostrom challenged the "Tragedy of Commons,"by Garrett Hardin, the prevailing idea that common property is mismanaged and should be either centralized or privatized. She did this by showing that in "practice" resources can be managed without government or privatization. Ostrom's work emphasizes the way in which societies can self-organize and design systems that balance extraction and recovery.

This is at the heart of Ostrom's work – how we need collective, coordinated action to meet the challenges of the modern world, from the protection of the environment to the regulation of the financial systems to the leveling of inequality. She argued that because the planet is a scarce resource, its use demands careful collective management through scientifically accurate and open-ended algorithms. Ostrom's work highlights the importance of social engagement at every level to facilitate sustainable management of collective world resources.

3. Methodology

The methodology employed in writing the article **"**Bridging Theory and Practice: Applying Ostrom's Law to Real-World Resource Management" is rooted in a multidisciplinary approach combining qualitative case study analysis, comparative research, and theoretical modeling to explore the practical application of Elinor Ostrom's theories on collective action and governance.

3.1 Literature Review:

The article began with an extensive literature review of the body of work developed by Elinor Ostrom, particularly her contributions to economic governance, common-pool resource management, and collective action. This review also included a rethinking of the Tragedy of the Commons concept and its critiques. The literature provided a theoretical framework for connecting Ostrom's principles to contemporary issues.

3.2 Case Study Analysis:

A central component of the methodology involved detailed case studies of real-world applications of Ostrom's principles in various global settings. The cases examined include collective resource management systems in Spain, the Philippines, Nepal, and Turkey. Data for these cases were gathered from published works, including Ostrom's field studies and independent research conducted by others in the academic community. Each case was evaluated based on the application of Ostrom's Eight Principles of resource management, allowing for comparative insights.

3.3 Comparative Model Evaluation:

The article employed a comparative framework to analyze five models of collective bargaining and resource management—Contract by Mutual Consent, Private Arbitration, Drawing Lots Followed by Rotation, Cooperatives, and Ostrom's own model based on her principles. Each model was systematically compared based on:

- The mechanism of delivering new regulations.
- The approach to compliance and enforcement.
- Methods of mutual monitoring among participants.

This comparative analysis allowed for an in-depth evaluation of each model's strengths and limitations, particularly in terms of practical implementation in different cultural, ecological, and governance contexts.

***3.4 Theoretical Application of Ostrom's Law**:*
The methodology also involved theoretical modeling to examine how **Ostrom's Law**—"a resource arrangement that works in practice can work in theory"—could be applied globally. This involved constructing models that could be adapted for different contexts, with an emphasis on creating scalable systems for larger global issues such as climate change. The study sought to align Ostrom's locally-based models with more complex, interdependent global commons.

***3.5 Practical Implications and Recommendations**:*
Finally, the article incorporated recommendations for practical applications of Ostrom's principles, suggesting ways that communities, policymakers, and organizations could adapt these principles to modern challenges. The focus here was on scalability, adaptation to technological advancements, and the creation of nested governance structures.

***3.6 Challenges and Future Research**:*
The methodology also involved identifying and discussing the key challenges faced when applying Ostrom's models, especially in regions with weak social capital or limited governance frameworks. Future research directions were suggested to address these gaps, particularly through the development of intellectual tools and the integration of modern technologies for better resource monitoring and management.

By combining these approaches, the article bridges the gap between theory and practice, offering a robust evaluation of how Ostrom's work can be applied to solve real-world problems related to resource management, sustainability, and collective action.

4. A Comparative Study of Collective Bargaining Models

Collective bargaining models represent frameworks that groups use to negotiate agreements, manage resources, and ensure compliance with established rules. These models are vital in various social, economic, and ecological contexts, including labor negotiations, community resource management, and cooperative enterprises. Now, we will compare five prominent models of collective bargaining that Ostrom researched, highlighting their mechanisms for establishing regulations, ensuring compliance, and monitoring adherence to agreements.

4.1 Contract by Mutual Consent

In this model, participants mutually agree on the allocation of potential returns and the costs associated with enforcing the agreement. One notable feature is that any participant can veto the agreement, making unanimous consent essential for the agreement to be implemented. Compliance is voluntary and occurs only when all parties consent. Mutual monitoring is enforced by participants themselves, ensuring accountability for breaches of the agreement.

Example: Herders Negotiating Over Pasture Use

Eleanor Osrtom considers a group of herders who need to come to an agreement before moving their animals to pasture. They meet to discuss different strategies for sharing the potential of the pasture and the costs of enforcing their agreement, such as ensuring that no one overgrazes the pasture. The contract they create is only valid if all the herders agree. If one herder believes that the distribution is unfair—say, that one herder is receiving a disproportionate share of the pasture without bearing his fair share of the costs of enforcement—he has the right to veto the agreement. The only possible deal—and the equilibrium of this negotiation—therefore is a fair distribution of both the benefits of the pasture and the costs of enforcement. This ensures that each herder benefits equally and the group can maintain sustainable use of the resource.

4.2 Private Arbitration

Private arbitration introduces external facilitators to help resolve disputes. The participants either reach an agreement independently or hire an arbitrator who assists in negotiations. The arbitrator cannot impose terms but helps enforce the agreement, ensuring that disputes are resolved within the framework of the agreed-upon rules. Mutual monitoring involves a coercive mechanism (punishment), where participants monitor each other and report violations to the arbitrator who oversees the execution of a penalty, thus maintaining compliance through self-interest.

Example: Private Arbitration in Sports Leagues

Professional sports leagues face constant temptations to break the rules. To manage disputes, they use private arbitration. In this system, the arbitrator does not impose terms, but helps teams and players resolve disputes within pre-agreed rules. Teams monitor each other for contract violations and report them, ensuring fairness. The goal is to select the arbitrator with the lowest fee, making long-term agreements possible without the need for constant oversight.

4.3 Drawing Lots Followed by Rotation

This model emphasizes fairness through rotation and random assignment of privileges or resources. Participants approve the list of lots for the draw, which is then followed by rotation to ensure that each participant has equal access to better positions over time. While violations are rare, they are easily resolved because of the model's simplicity and the inherent self-interest of each participant for fair access to each lot. Mutual monitoring is managed by the participants themselves, without the need for external enforcement.

Case Study: Lotteries and Rotations in the Alanya Coastal Fisheries

In Alanya, Turkey, the coastal fisheries faced significant problems in the early 1970s when unlimited fishing led to conflicts and rising costs. To solve this problem, local fishermen developed a system based on lotteries and rotation of fishing spots. Every September, all licensed fishermen participate in a lottery to be assigned fishing spots for the season. From September to January, fishermen rotate their fishing spots to the east every day, and then from January to May, in the opposite direction, according to the fish migration. This system ensures that every fisherman gets an equal chance at the best fishing spots and prevents conflicts over territory.

Control and enforcement are carried out by the fishermen themselves, who have a strong incentive to comply with the rules, since they will also benefit when it is their turn to get the best spots. If someone tries to cheat by fishing in the best place on the wrong day, they are quickly caught by their colleagues, who are ready to defend their own rights. Disputes are often resolved informally in a local cafe, highlighting the self-governing and cooperative nature of the system. This unique model has proven highly effective without central regulation, with the fishermen themselves ensuring fairness and sustainability.

4.4 Cooperatives

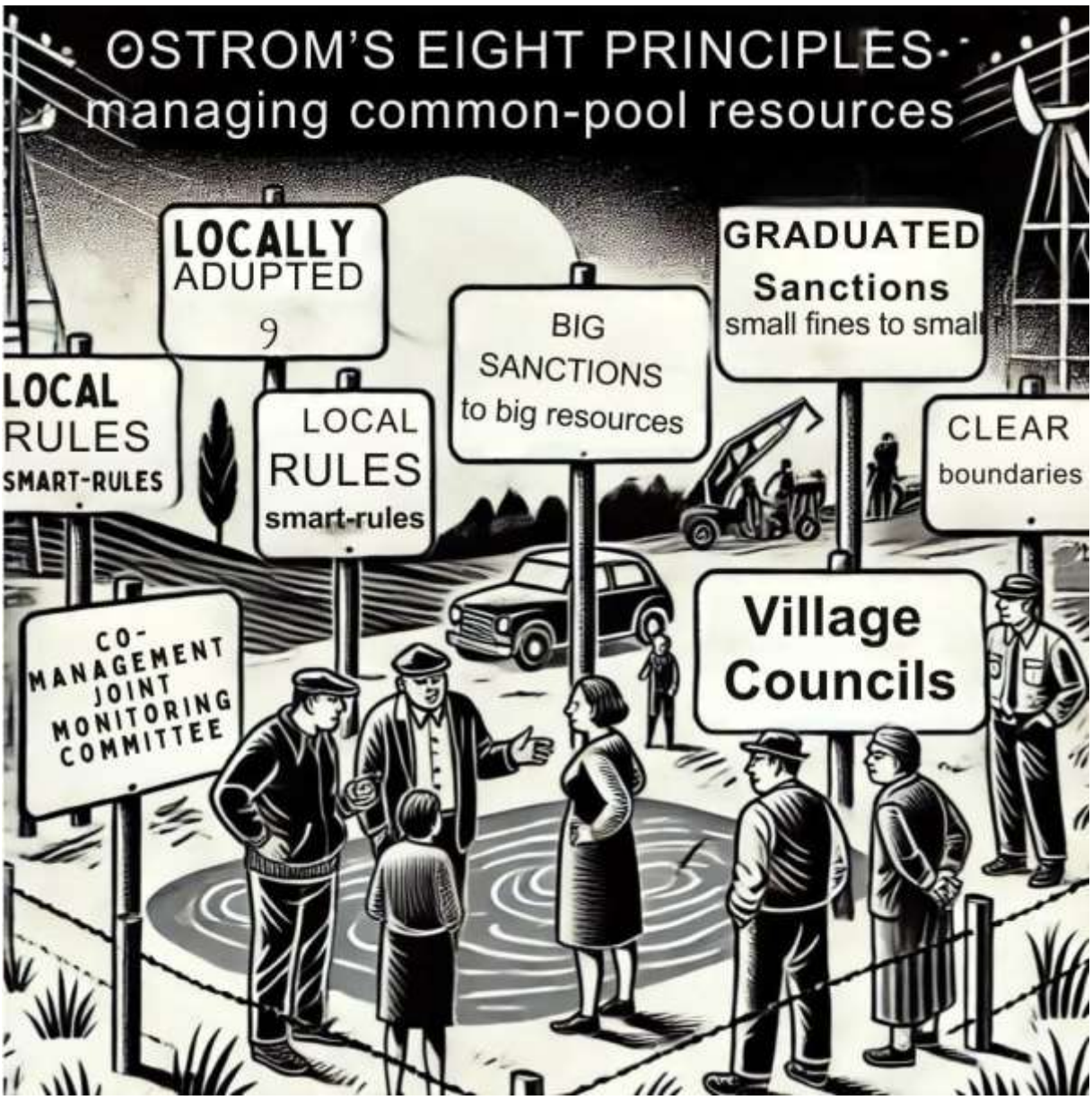
In cooperative models, internal governance is critical. Cooperatives develop their own rules and management mechanisms, determining how costs and profits are shared among partners. While there are fewer specific details on compliance mechanisms in this context, cooperatives often rely on mutual agreement and collective enforcement by their members. Monitoring is generally handled internally through self-regulation.

Example: Cooperatives in Law Firms

Forming a co-op, as many law firms do, allows a group of lawyers to pool their resources for mutual benefit. All the partners contribute their assets to a common fund, which might be used to purchase shared resources (such as a legal library) and to pay

for collective services (such as research and secretarial support). They also develop their own internal management systems, which work out formulas to share expenses and income equitably among themselves.

For instance, partners might decide to share costs according to the number of clients or cases each lawyer brings in, while sharing profits according to seniority or contribution. Each of these decisions is made collectively, with compliance maintained through mutual agreement because each partner is invested in the firm's success. The firm runs smoothly because the lawyers themselves, who have a stake in a shared resource (the firm), monitor it and manage it.



4.5 Ostrom's Eight Principles

Elinor Ostrom's principles provide a robust framework for managing common-pool resources. These principles advocate for clear boundaries, rules that fit local conditions, and group-based decision-making. Monitoring is an essential element, conducted by resource users themselves, while sanctions for violations are graduated to reflect the severity of infractions. Ostrom's framework also emphasizes the importance of conflict resolution being accessible and informal, ensuring that local governance is recognized by higher authorities.

Table: Comparative Analysis of Collective Bargaining Models

Model	Delivery of New Regulations	Compliance	Mutual Monitoring
Contract by Mutual Consent	Participants mutually determine the allocation of potential returns and the costs of enforcing the agreement. The agreement is subject to veto by any participant, thus requiring consensus for implementation.	The agreement is only enacted and observed with the mutual consent of all involved parties.	Participants negotiate penalties for violations and ensure mutual control. The monitoring is collectively enforced, relying on participant accountability.
Private Arbitration	The parties involved either self-negotiate or engage an arbitrator to facilitate the creation of new agreements. The primary objective is to select an arbitrator offering the lowest cost for service provision.	A private agent is employed to enforce the agreement. The arbitrator's role is limited to assisting with dispute resolution, ensuring the terms agreed upon by the parties are upheld. The arbitrator is not allowed to impose terms.	Private monitoring is employed to ensure compliance, with coercion used as a mechanism for rule enforcement. Contracting parties are responsible for monitoring each other and reporting breaches to the arbitrator in alignment with their personal interests.
Drawing Lots Followed by Rotation	Participants approve the list of lots for the draw, after which random assignment of privileges or resources takes place. This is then followed by rotation to ensure that each participant has equal access to better positions over time.	Compliance is maintained through peer enforcement, with minor infractions resolved easily by participants. The collective adherence to the rules is motivated by the desire to protect individual rights when it is each participant's turn for rotation.	Mutual monitoring is managed by the participants themselves. The central government is not involved in direct enforcement, with control remaining in the hands of the community members.

Cooperatives	Cooperatives develop their own internal governance structures, establishing formulas for the equitable distribution of both expenses and revenues among the participating members.	While compliance specifics are not detailed, cooperatives typically rely on mutual agreement and self-enforcement among their members.	Internal mechanisms for monitoring and enforcement are presumed to exist, though not explicitly stated. Again, cooperatives often rely on collective enforcement by their members.
Ostrom's Eight Principles	Ostrom's principles advocate for the establishment of clearly defined boundaries, tailored rules that fit local conditions, and decision-making through group participation. Smaller systems may be integrated into larger networks.	Rules governing common resources are enforced through mutual consent and continuous adaptation to the group's needs. Sanctions for violators are graduated and reflect the severity of the infraction.	Monitoring is carried out by users of the common resource, ensuring mutual compliance. Conflicts are resolved via a pre established guideline, making the process relatively straightforward as well as informal. Guidelines may adapt according to the needs of the community. Higher-level authorities should recognize the decisions of local authorities as a form of self-governance and local mediation.

Collective bargaining models provide diverse mechanisms for organizing group decision-making, compliance, and monitoring. While each model offers unique benefits, their effectiveness depends on the specific context in which they are applied. Models such as **Ostrom's Eight Principles** are highly effective in managing common resources, while **Private Arbitration** provides external assistance in resolving disputes. **Contract by Mutual Consent** emphasizes internal consensus, and **Drawing Lots Followed by Rotation** ensures fairness through rotation, particularly in small communities. Finally, **Cooperatives** encourage self-governance and shared responsibility, but may face challenges in large or complex systems.

5. The Practical Application of Elinor Ostrom's Work

The practical application of Elinor Ostrom's work – especially her eight principles for managing common pool resources – provides a solid foundation for dealing with complex problems of collective action in places and among people everywhere. Her research provides insight into how communities around the world have been able to overcome the challenges of collective action to govern commons assets – whether natural resources such as forests or fisheries, or social 'commons' such as public goods.

Key Principles and Their Practical Application:

5.1 Define Boundaries:

Ostrom demonstrates the power of defining the boundaries of who could access the common resource. This reduces conflict and allows for better management. In practice, this principle has been applied to local commons issues including the management of Swiss alpine pastures as well as the use of irrigation systems for canals in Spain and the Philippines. Clear boundaries can mean more equitable access and use.

5.2 Tailored to Local Needs:

Ostrom's research shows that local communities are best positioned to create rules that make sense for their local conditions: the rules must be designed to accommodate the locally observed social, ecological and economic conditions. In practice, this might

mean that localized rules in a fishing village in Japan, for instance, could help manage fisheries in a way that avoids the need for centralized authority and enables sustainability over long periods of time.

5.3 Participatory Decision-Making:

Widely shared participation in decision-making builds the culture of 'Ownership' of the rules and higher 'commitment' to their enforcement. Ostrom's research also showed that local users of resources were also more likely to follow rules they had participated in making. This has been effective in situations in which common properties have been managed by local cooperating farmers and also in forests shared by communities. These models suggest that more policies should be bottom-up, rather than foisted from above.

5.4 Monitoring and Accountability:

Monitoring use is essential to enforce the rules once they are agreed upon. The local users of resources are often the most effective monitors of use because they have the most to lose when their resource is mismanaged. Ostrom gave examples where resource users developed their own rules for monitoring use and reporting violations to others, as in the case of the fishermen in fishing communities in Turkey who rotated their fishing spots so that monitoring was by all of them.

5.5 Graduated Sanctions:

Sanctioning shouldn't be arbitrary and capricious, but should escalate in severity as a violation escalates in severity. This principle allows for flexibility and fairness in enforcing rules – for example, in many self-organized communities the first step might be a warning, followed by a fine, before something like community banishment becomes necessary.

5.6 Conflict Resolution:

Ostrom advocated simple, low-cost access to the people who need them most. When conflicts can be quickly resolved by a neighbor, friend or village leader, problems don't escalate into costly feuds. Many of the most successful community-managed systems include this – village councils, for instance, or a local cooperative board that can mediate disputes.

5.7 Minimal State:

Inter findings are that the commons continue to be effectively managed in the absence of state intervention, nor of privatization. Communities devise systems of governance that are not part of the state, but are acknowledged by higher levels of authority (co-management). This was the case, for example, in the co-management of forests in Nepal, where local user groups manage resources without interference from the state.

5.8 Nested Enterprises:

Systems that are smaller and nested within larger networks, so that local governance systems can coordinate with other local governance systems – either from the bottom up or the top down – when a resource spans multiple communities (eg, a river system or a fishery). This principle is used in complex irrigation systems in Spain, in which local groups manage segments of the system but coordinate with larger networks to distribute water.

6. Challenges and Opportunities for Practical Models

While Ostrom's principles have been successfully applied in many cases, several challenges remain in creating a **universal model** for collective resource management:

6.1 Local vs. Global Scale:

Ostrom's models are typically based on small-scale, localized communities. The challenge lies in **scaling these principles to address global commons** such as climate change, where resource users are far more diverse and spread across the globe. A potential solution could involve creating nested governance structures, where local institutions are linked into larger networks that manage global resources.

6.2 Cultural and Institutional Differences:

Not all communities have the same cultural or institutional foundations to enable self-organization. Applying Ostrom's principles in regions with weak social capital or governance systems may require external facilitation to build the necessary **trust and coordination mechanisms**.

6.3 Need for Better Intellectual Tools:

As Ostrom herself noted, the intellectual tools necessary to understand **why some institutions succeed while others fail** remain underdeveloped. More research is needed to understand the nuances of resource management in different contexts, particularly with respect to modern challenges such as technological change, population growth, and economic globalization.

6.4 The Role of Technology:

Modern technological advances in **monitoring and information-sharing** offer new tools for applying Ostrom's principles on a broader scale. For example, **community accessible drone monitoring and live webcam monitoring** could enable real-time monitoring of resource uses or misuses, making mutual monitoring easier even in large or dispersed communities.

7. Conclusion

Elinor Ostrom's contributions on collective action and resource management have provided a rich and flexible theory of what it takes to manage common-pool resources sustainably. Her research has provided a meaningful and localized set of principles for bottom-up, self-organized resource management. Her work offers lessons for communities everywhere to govern their commons independently of government action or market privatization. The challenge of applying her models at scale, however, still exists, and further research and innovation is required to develop more effective ways of applying her principles to the demands of modern complexity. As we grapple with global, interdependent commons such as the environment, Ostrom's research will likely become ever more central to the development of future models of governance for sustainable resource stewardship.

7.1 Concepts

An institution is a humanly devised structure of rules and norms that shape and constrain social behavior. [1]

Governance is the overall complex system or framework of processes, functions, structures, rules, laws and norms born out of the relationships, interactions, power dynamics and communication within an organized group of individuals which not only sets the boundaries of acceptable conduct and practices of different actors of the group and controls their decision-making processes through the creation and enforcement of rules and guidelines, but also manages, allocates and mobilizes relevant resources and capacities of different members and sets the overall direction of the group in order to effectively address its specific collective needs, problems and challenges.[2]

Collective action is action taken jointly by a group of people whose purpose is to improve their condition and achieve a common goal.[3]

The commons refers to shared resources that are collectively owned by all members of a society, neither under private ownership nor directly managed by governmental authorities. [4]

The concept of The Tragedy of the Commons was first introduced by Garrett Hardin in his seminal essay. In this work, Hardin argued that when individuals share collective resources, the absence of external governance—whether through state regulation or privatization—would inevitably lead to overexploitation and depletion of the resource. [5]

Footnotes:

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2. Bevir, Mark (2012). *Governance: A very short introduction*. Oxford, UK: Oxford University Press. ISBN 9780191646294. Governance refers, therefore, to all processes of governing, whether undertaken by a government, market, or network, whether over a family, tribe, formal or informal organization, or territory, and whether through laws, norms, power or language. Governance differs from government in that it focuses less on the state and its institutions and more on social practices and activities.
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