

# S Y M P O S I U M

## AN EFFECTUAL MODEL OF COLLECTIVE ACTION FOR ADDRESSING SUSTAINABILITY CHALLENGES

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Market failure has been cited as a major cause of environmental degradation due to business activity. Yet entrepreneurs often play an active role in tackling environmental issues and developing sustainable solutions for them. Whereas a rising literature on sustainable entrepreneurship seeks to investigate how they do this, rigorous microfoundations for such investigations do not yet exist. With a view to developing such microfoundations, we reanalyzed Nobel laureate Elinor Ostrom's historical case study of governance structures for managing water basins in the Los Angeles area. Our analysis allowed us to bring together Ostrom's institutional analysis and development framework and effectuation to show how effectual entrepreneurs transform market failures into sustainable solutions by self-selecting stakeholders. The resulting integrated model of collective action serves both as a practical guide for entrepreneurs seeking to tackle sustainability issues and as a theoretical framework for researchers to develop rigorous microfoundations for future empirical work.

Market failures cause environmental problems such as global warming and climate change (Cohen & Winn, 2007; Dean & McMullen, 2007; Dorfman & Dorfman, 1993). Market failure occurs when markets fail to allocate resources efficiently due to factors such as nonexcludability of benefits of particular goods (Randall, 1993). Nonexcludable goods are goods that cannot be excluded for use based on price or other factors, and so may be overused by the few, leading to their depletion and demise—resulting in “the tragedy of the commons” (Hardin, 1968). Researchers in economics have identified collective action as a solution to these market failures (Olson, 1971, 1982; Ostrom, 1998). For example, in the field of management, strategy scholars have argued that

businesses and business strategies can foster environmental sustainability (Gladwin & Kennelly, 1995; Jermier, Forbes, Benn, & Orsato, 2006; Porter & Kramer, 2006; Porter & van der Linde, 1995; Shrivastava, 1995a, 1995b), and sustainable entrepreneurship scholars have reasoned that entrepreneurship has an important role to play in solving sustainability problems (Cohen & Winn, 2007; Dean & McMullen, 2007; York & Venkataraman, 2010). Yet none of these streams of research is able to specify how private citizens can act locally to solve sustainability problems.

Entrepreneurship is often described as essential to crafting creative and sustainable solutions for these problems (Austin, Stevenson, & Wei-Skillern, 2006; Cohen & Winn, 2007; Dean & McMullen, 2007; Markman, Russo, Lumpkin, Jennings, & Mair, 2016; York & Venkataraman, 2010), yet it is unclear how an entrepreneur can tackle problems of such magnitude. Without an understanding of how sustainable entrepreneurship unfolds, looking to entrepreneurship as a panacea to cure all societal ills is not very useful (Hall, Daneke, & Lenox, 2010). To bridge this gap, in this paper we develop an effectual model of collective action that begins with the individual

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entrepreneur, unfolds based on her actions and interactions, and eventually leads to sustainable solutions.

In doing so, we describe variables and relationships that affect sustainable entrepreneurship by combining Ostrom's institutional analysis and development (IAD) model of collective action (Ostrom, 2010, 2015) and effectuation (Sarasvathy, 2009; Sarasvathy & Dew, 2005). The strength of effectuation is that the dynamic model provides a process perspective on entrepreneurship, and the strength of IAD is that it distills all the variables that affect collective action and relationships among them. To leverage the strengths of both frameworks, we integrate them in two ways. First, we bring effectuation into the IAD model to identify variables that affect sustainable entrepreneurship. Second, we bring IAD into the dynamic effectual process model to describe how sustainable entrepreneurship unfolds.

To empirically illustrate the sustainable entrepreneurship process model developed here, we apply it to an iconic historical case study of a sustainability problem studied in depth by Nobel laureate Elinor Ostrom. In other words, we reanalyze Ostrom's historical narrative to highlight elements of entrepreneurial effectuation already embedded in it. Specifically, the dynamic effectual process model explains how entrepreneurial actors can kick-start collective-action solutions by creating selective incentives, so that only those who contribute to the solution can obtain the benefits from the solution, and/or by creating effectual opportunities so as to make the common-pool resource sustainable and productive. The integrated effectual-IAD model offers two contributions: (1) It provides a systematic framework to bring together theory, practice, and pedagogy in building environmentally and socially sustainable solutions in the face of market failures, and (2) it develops theoretically important connections between the literature stream on entrepreneurial effectuation and theories of collective action.

## LITERATURE REVIEW

### Sustainable Entrepreneurship

Sustainable entrepreneurship serves as an ideal context in which activism blends with both market and institutional logics (Mars & Lounsbury, 2009) and provides unique opportunities to create different kinds of organizations, institutions, and markets. Shepherd

and Patzelt (2011, p. 137) defined sustainable entrepreneurship as "[focusing] on the preservation of nature, life support, and community in the pursuit of perceived opportunities to bring into existence future products, processes, and services for gain, where gain is broadly construed to include economic and non-economic gains to individuals, the economy, and society." For recent reviews of the field refer to Hall et al. (2010), Lenox and York (2011), and Muñoz and Dimov (2015). Broadly, this stream of scholarship begins with the premise that entrepreneurs reframe market failures into potential entrepreneurial opportunities (Cohen & Winn, 2007; Dean & McMullen, 2007) at the nexus of the environment and the opportunity (York & Venkataraman, 2010).

At the micro level, entrepreneurs can implement markets for public goods and extract entrepreneurial rents by making them excludable through property rights or the use of technology (Cohen & Winn, 2007; Dean & McMullen, 2007). They create new sustainability-oriented business models because they are not encumbered by path dependencies and the need to integrate their strategies with existing ones (Bohnsack, Pinkse, & Kolk, 2014; Cohen & Winn, 2007). However, creating ventures that solve sustainability problems is not easy; it is difficult to motivate people to work toward preserving and replenishing the public good (Ostrom & Ostrom, 2014). It does not require different kinds of entrepreneurs (Alvarez, Young, & Woolley, 2015), but it does need an understanding of what is to be developed and what is to be sustained (Shepherd & Patzelt, 2011). It also requires an alignment of values (O'Neil & Ucbasaran, 2016) and organizational design (Parrish, 2010) with the sustainability goals of the venture.

At the macro level, institutions are important in the understanding of sustainable entrepreneurship (Bjørnskov & Foss, 2016). Typically, institutions exert enormous pressures to conform, and changes often require external shocks (Sine & David, 2003) or a favorable regulatory environment (Sine, Haveman, & Tolbert, 2005). Even in newer sectors such as solar energy (Meek, Pacheco, & York, 2010) and wind energy (Sine & Lee, 2009), institutions are pervasive and affect the rules of the game. Yet institutions both constrain and provide opportunities for change (Alvarez et al., 2015; Muñoz & Dimov, 2015). For example, both socially determined institutions and centralized government institutions drive entrepreneurship in the environmental context, as evidenced by the solar industry in the United States (Meek et al., 2010).

Further, institutions can be and are routinely changed by entrepreneurs acting to reform legislation, norms, or property rights. This in turn changes the rules of the game (Pacheco, Dean, & Payne, 2010).<sup>1</sup> In changing legislation, rules, or property rights, entrepreneurs are required to navigate often contradictory institutional logics at multiple levels to integrate sustainability into for-profit venture ideas (Hargrave & Van De Ven, 2006; Kent & Dacin, 2013). Micro activities of individuals within these institutions bridge (Tracey, Phillips, & Jarvis, 2011) and, alternately, stabilize and change (Bjerregaard & Luring, 2012) these contradictory institutional logics. Further, micro activities of individuals outside these institutions also destabilize markets and cause existing institutions to change (King & Pearce, 2010) by creating social movements (Sine & Lee, 2009).

Therefore, the role of entrepreneurs in the context of sustainable entrepreneurship is multidimensional: They have political, social, institutional, and economic roles in the process of sustainable development (Jennings, Greenwood, Lounsbury, & Suddaby, 2013; Khavul, Chavez, & Bruton, 2013), and they bridge multiple contradictory logics, change the rules of the game, and create new institutional forms and new organizations by transforming prisoner's dilemma types of tragedies into opportunities. Yet it is easy to look to the entrepreneur as a solution for all the problems in society (Hall et al., 2010), and without understanding the complexity and the interconnected nature of the problems involved and having a process model that describes how to create entrepreneurial solutions, this direction of thought is not very useful. Hall et al. (2010) further suggested that developing the links between effectuation and sustainability helps us grapple better with sustainable entrepreneurship. So far, effectuation has developed a process model for entrepreneurship in general (Dew, Read, Sarasvathy, & Wiltbank, 2011; Sarasvathy, 2009; Sarasvathy & Dew, 2005) but has not theorized specifically about sustainable entrepreneurship.

To develop such a model, we draw on the economic literature that describes collective-action problems. Collective action (detailed by Olson,

1971, 1982) was considered impossible at the level of larger groups due to divergences between individual and collective goals, but its effect on intermediate-size groups was an open empirical question. Ostrom (2010, 2015) took up the empirical question of collective action in intermediate-size groups and, based on extensive field work around the globe, showed that individuals routinely solve collective-action problems. Her work resulted in a set of design principles that served as a basis of the IAD framework.

Effectuation and IAD complement each other. Ostrom's design principles provide the conditions for collective action to occur and explain circumstances at the local and micro levels that enable collective action. The IAD framework shows policy makers and scholars what circumstances or conditions they need to create and/or look for to enable collective action. However, IAD does not explain how individuals can create such circumstances and conditions, nor does it specify ways to act within those circumstances. Effectuation bridges this gap and provides criteria that individuals can use to guide behavior in such circumstances and provides further microfoundations for action. Additionally, effectuation can also create—or, more accurately, co-create—those circumstances even when they don't exist. Therefore, integrating the two literatures enables us to identify variables that affect sustainable entrepreneurship and describe a process model that explains how sustainable entrepreneurship unfolds. Yet these literatures have only recently begun talking to each other (York, O'Neil, & Sarasvathy, 2016), and there has been no systematic attempt to link them.

### **Market Failures and Collective Action: From Olson to Ostrom**

Markets sometimes cannot allocate resources efficiently either because certain goods and resources are not excludable or because the benefits cannot be allocated based on who invested in them (Ostrom, 2010). These are called market failures. The idea of market failure is not new: The canonical example of market failure was laid out by Hardin (1968) in the article "The Tragedy of the Commons," which has fascinated scholars in several disciplines, including economics, sociology, management, and political science. To understand the nature of market failures and how to solve them, we describe two theoretical streams that economics scholars traditionally draw from: Mancur Olson's collective action and Elinor Ostrom's IAD framework.

<sup>1</sup> From a sociological perspective, these kinds of institutional changes have been studied under the rubric of institutional entrepreneurship or social movements. For recent literature reviews, refer to Tolbert, David, and Sine (2011); King and Pearce (2010); and Battilana, Leca, and Boxenbaum (2009).

In his seminal work, *The Logic of Collective Action*, Olson (1971) proposed collective action as a solution to market failure. But he also pointed out that entrepreneurs would find it difficult to garner enough stakeholders to act collectively to create a public good, because even if people can see the benefit of coming together, they will not do so for fear of encouraging “free riders” who might exploit gains to collective action without contributing to the provision of those gains in the first place. This problem becomes bigger in larger groups (Olson, 1982), and rational individuals seeking to maximize personal welfare will not act to advance the group’s common good even when the group unanimously agrees about what the common good is and how to achieve it (Olson, 1971). Based on this result, scholars and policy makers have focused on the need for a separate incentive, distinct from the achievement of the common or group interest, to induce individuals to help bear the costs and burdens involved (Olson, 1971). This has resulted in coercion and regulation as the primary means to achieve sustainable solutions.

Yet Olson acknowledged that it is possible for entrepreneurs to solve this incentive problem by creating selective incentives (i.e., ways for group members to proportionately align benefits to costs in fostering the collective good and, within reason, keep free riders from exploiting the benefits created through the collective endeavor) (Sarasvathy, 2000). Ostrom (2000, 2015) built on this and showed that individuals routinely solve collective-action problems instead of waiting for coercive institutions and regulations. Her studies revealed that while external actors such as regulators and policy makers can only perceive the rules based on what they think the game is and impose rules based on these assumptions, actors involved in these so-called tragedies actually play the game, change the rules of the game, and create new games all the time to overcome and subvert such tragedies (Ostrom, 2015). According to Ostrom, collective actions are mechanisms that transform tragedies of the commons to opportunities by coordinating or organizing based on rules that individuals can agree on, monitor, and mutually sanction (Ostrom & Walker, 2000).

Through a variety of theoretical and empirical expositions, Ostrom sought to survey, summarize, and synthesize these solutions of collective-action problems into eight design principles. Writing within the context of a limited renewable resource (à la the original “Tragedy of the Commons”), Ostrom (2015, p. 90) concluded that when the resource has clear boundaries (design principle 1); there is congruence between

local conditions and appropriation and provision rules and benefits (design principle 2); and users are able to design and modify their own operational rules (design principle 3), are able to monitor each other (design principle 4) using nested graduated sanctions (design principle 5), have access to low-cost conflict resolution mechanisms (design principle 6), have minimum rights to organize their own institutions (design principle 7), and are able to create organizations in multiple nested layers (design principle 8), it leads to the development of long-enduring institutions that solve common-pool resource problems in a self-reinforcing manner. Based on these design principles, Ostrom further developed the IAD conceptual framework, which details the variables involved in institutional change at multiple levels (Ostrom, 2010, 2015) (see appendix for a fuller explanation of these multiple interconnected levels).

In sum, Ostrom’s theory begins with a question: How and under what conditions can individual capabilities be enhanced to overcome potential tragedies of the commons? In answering this question, Ostrom articulated her design principles by identifying regularities in enduring institutional structures that solve common-pool resource problems.

Entrepreneurship process theories such as effectuation begin with similar premises but focus on how these enduring structures get created in the first place. Effectuation research starts with this question: Are there design principles of enduring venture creation that expert entrepreneurs have learned that can be taught and studied? In answering this question, Sarasvathy (2001, 2009) studied expert entrepreneurs to extract heuristics that individuals can use to create new ventures, markets, and institutions. Both of these theories complement each other and provide answers to different aspects of the same puzzle: How do individuals come together to solve problems by transforming their extant realities, which look like irredeemable tragedies, into new possibilities (Ostrom, 2015; Sarasvathy & Dew, 2005)? While Ostrom focuses on the circumstances that enable the creation of robust institutions, effectuation details the process through which both the circumstances and the outcomes are co-created from the perspective of entrepreneurs and their stakeholders. Next, we describe the body of work that has come to be called effectuation.

## Effectuation

Effectuation was discovered through an in-depth protocol analysis study of expert entrepreneurs

(Sarasvathy, 2001, 2009). That study has since been replicated with novices and expert corporate managers (Read, Dew, Sarasvathy, Song, & Wiltbank, 2009). Using a variety of different methods, scholars have also shown how effectuation works in technology ventures in multiple countries; with R&D managers, angel investors, venture capitalists, and family and small business owners; and in international and social ventures (Brettel, Mauer, Engelen, & Küpper, 2012; Chandler, DeTienne, McKelvie, & Mumford, 2011; Fischer & Reuber, 2011; Read, Song, & Smit, 2009; Wiltbank, Read, Dew, & Sarasvathy, 2009). A recent review of the literature showed that 287 papers cited effectuation, and more than 100 studies used effectuation as central to their work (Read, Sarasvathy, Dew, & Wiltbank, 2016).<sup>2</sup>

Effectuation consists of a nonpredictive logic embodied in five decision-making heuristics or design principles that help entrepreneurs tackle Knightian uncertainty, goal ambiguity, and isotropy (Sarasvathy, 2009). Under Knightian uncertainty, the future is unknown and unknowable; goal ambiguity argues that an individual might not have given and well-ordered preferences; and isotropy refers to the problem that it is impossible to know which aspects of the environment are relevant to a particular decision and which are not. Together these characterize the effectual problem space within which individuals act.

These principles are based on the logic of non-predictive control (i.e., they show how to reduce reliance on predictive strategies when faced with uncertainty) (Sarasvathy, 2009). If we consider prediction and control as orthogonal dimensions, non-predictive control is the quadrant that emphasizes strategies low on prediction and high on control (see Sarasvathy, 2009, p. 58, for the full  $2 \times 2$  with prediction and control on the axes). In sum, an effectual logic of nonpredictive control involves working with things within one's control to co-create new possibilities with self-selected stakeholders.

Briefly, the five principles of effectuation (Sarasvathy, 2009, p. 15) are:

- (1) Bird in hand: refers to means-driven as opposed to goal-driven action and interaction.
- (2) Affordable loss: consists of figuring out and committing in advance to what one is willing to lose rather than investing based on expected returns.
- (3) Pilot in the plane: suggests that human beings can co-create and transform existing realities into new possibilities and thereby falsify predicted trend lines.
- (4) Crazy quilt: urges entrepreneurs to be open to any and all stakeholders who self-select into the venture creation process and not focus only on specific targeted ones.
- (5) Lemonade: is based on the idea that even negative contingencies can be leveraged into opportunities to be embraced rather than roadblocks to be avoided or overcome.

### Similarities Between Effectuation and IAD and the Assumptions of the Integrated Model

We have thus far delineated the differences between the two frameworks and have argued that they complement each other. Now we describe the commonalities between the two frameworks; these become assumptions of the integrated effectuation IAD model that we develop in the next section. These assumptions relate to the nature of the individual participating in the effectual-IAD process (he or she is complex), the process of creation (it requires interactions), the stance toward the environment (it can be transformed), and the nature of the outcomes (they can be designed and are varied).

#### Assumption 1: The Human Being Has Multiple Motivations and Is Complex

Effectuation does not require standard assumptions of homo economicus such as rationality, utility maximization, or well-ordered preferences (Thaler, 2000), nor does it require particular institutions, socioeconomic conditions, or individuals of a particular kind. Effectuation assumes variety in individual motivations and purposes and focuses instead on the process and mechanisms combined in these various elements to build enduring ventures under uncertainty; in doing so it lays out the microfoundations for building new ventures and markets. Extending this idea, Sarasvathy and Venkataraman (2011) theorized that effectual heuristics offer the beginnings of an entrepreneurial method that is broader than venture creation in that it can be used to co-create new futures. In other words, effectuation offers a set of sufficient yet unnecessary conditions for tackling Knightian uncertainty, namely a future that is not only unknown but fundamentally unknowable.

Similarly, Ostrom's work emphasizes that outside of laboratory conditions, human beings have multiple

<sup>2</sup> The web site [www.effectuation.org](http://www.effectuation.org) provides an overview of the scope and breadth of teaching, practice, and research being done in effectuation.

motivations; they are embedded in communities and act based on norms and rules that are different from the standard economic models of a selfish and opportunistic human being. Empirically, these interactions are based on conditional cooperation rather than competition and trust, and repeated interactions create and reinforce the sense of community (Ostrom, 2000).

By simply recognizing the empirical fact that human beings are varied in their motivations and not limited to self-interest and opportunism, both IAD and effectuation processes incorporate cooperative behavior. In IAD, conditional cooperators are the only ones who are willing and able to participate in solving collective-action problems that involve common-pool resources (Ostrom, 2000). Similarly, in the effectual process, only intelligently altruistic individuals who act based on the assumption that their benefit is derived from everyone else benefiting at the same time self-select into the process (Sarasvathy & Dew, 2005).

This leads to our first assumption in the integrated effectual-IAD model, which states that the human being has multiple motivations and is complex. Based on both Ostrom's work and effectuation, this in turn leads to the idea that individuals with varied motivations often find that cooperation is beneficial.

### **Assumption 2: The Process of New Market/Institution Creation Is Interactive and Intersubjective**

Effectuation is at its heart an interactive process (Sarasvathy & Dew, 2005). It requires that the decision maker be willing to work with others over time and space. Effectual interactions are also intersubjective. The notion of the intersubjective is derived from the philosophy of Davidson (2001), who argued that what we call the subjective is itself constructible through interactions with others (intersubjective interactions) and with the physical environment (objective interactions). In other words, individuals do not come to the table "fully formed." Furthermore, a large part of what makes them individuals comes from past interactions with others, either explicitly or implicitly incorporated into their tastes, preferences, values, and other subjective variables of interest. (For a fuller explanation of the intersubjective and its importance to entrepreneurship, please see Venkataraman, Sarasvathy, Dew, and Forster, 2012).

The notion of intersubjectivity highlights the fact that interactions between two individuals are not

merely combinatory but can be fundamentally transformative. In other words, what comes out of the interaction is not merely a new combination of possibilities already subjectively existing within each individual. Instead, both individuals can themselves be transformed into something new through the interaction. Hence new possibilities that did not even exist before the interaction can come to be through an intersubjective process.

Empirically, the IAD framework shows that individuals create institutions based on the recognition that they need to share resources to survive and so that the common-pool resource remains sustainable. This recognition comes because individuals communicate and understand that they share a common past and that they will share a common future, however uncertain it is. In fact, by forging shared understandings, they help manage or overcome present uncertainties to co-create a set of rules and norms for a sustainable future. As with effectuation, the IAD framework also requires that individuals be willing to engage with each other in different arenas and interact to discover information, examine and challenge assumptions, try experiments, and figure out ways to deal with conflicts and contingencies (Ostrom, 2015; Ostrom & Ostrom, 2014). In other words, the IAD framework, similar to the effectual process, is intersubjective.

This leads to our second assumption in the integrated effectual-IAD model, which states that the process of new market/institution creation is interactive and intersubjective. This in turn implies that individuals must be willing to engage with other stakeholders to forge these intersubjective understandings.

### **Assumption 3: Transformations Are at the Heart of Market/Institution Creation**

Effectuation describes the creation of new markets. Sarasvathy and Dew's (2005) process diagram laid out in detail the ways in which entrepreneurs can use effectual principles to transform existing resources into new markets. In the effectual process, only actual commitments allow each stakeholder to shape the goals of the venture. Each of these transforms an existing set of means into new possibilities. The notion of transformation here refers to the fact that what occurs in the effectual process is not merely a new combination—and yet it is almost never *de novo* creation. A transformation involves the creation of new goals, as well as ways to achieve them, in a concurrent and intertwined fashion.

In the IAD framework, the individual's actions and strategies and participation in collective and constitutional choices shape rules at each level of a nested hierarchy of situations (described in detail in the appendix). In turn, each rule or constitutional choice transforms the available alternatives for collective action (Ostrom, 2015). In other words, the new rules are neither limited to new combinations of existing rules nor are they created completely *de novo*. Instead they are transformations, just as in the effectual process. Even if new institutions that result from these transformations are not static and optimal, these transformations lead to institutions that are enduring and robust. This leads to our third assumption in the integrated effectual-IAD model: Transformations are at the heart of market/institution creation. These transformations occur as a result of intersubjective interactions (see assumption 2).

#### **Assumption 4: Markets and Institutions as Co-created Artifacts**

As explained above, the outcome of the transformational process of stakeholder self-selection in effectuation is a co-created artifact (Sarasvathy & Dew, 2005). Artifacts can include new products, new opportunities, new ventures, new markets, new institutions, and new futures. This idea of the co-created artifact within effectuation is based on Simon's (1970) exposition of the *Sciences of the Artificial*, in which he argued that natural laws constrain but do not determine our design: Humans are capable of designing their own environments, whether the environment is construed as physical, social, or any other way. Ostrom's ideas of designing enduring institutions are similar to those of effectuation and Simon's *Sciences of the Artificial*. This is illustrated in the quote "What the research on social dilemmas demonstrates is a world of possibility rather than necessity. We are neither trapped in inexorable tragedies, nor free of moral responsibility for creating and sustaining incentives that facilitate our own achievement of mutually productive outcomes" (Ostrom, 1998, p. 16).

This leads to our fourth assumption in the integrated effectual-IAD model: Markets and institutions are co-created artifacts. In other words, these institutions and markets are outcomes of human designs.

Based on these assumptions, next we take on the task of outlining an effectual model of Ostrom's IAD framework that offers microfoundations for collective action in sustainable entrepreneurship. Before

we begin, it is important to note here that Ostrom does not explicitly focus on nonpredictive control, which is at the core of all the principles of effectuation. However, her explication of the multiple uncertainties involved in common-pool resource problems are similar to the effectual problem space, and that makes it feasible to integrate her work with effectuation. It is also important to specify that we do not deny the possibility of a predictive model of collective action based on the work of Olson (1971), but we build our model on an alternate assumption that prediction is not necessary to develop a process model of collective action.

### **AN INTEGRATED EFFECTUAL-IAD MODEL FOR SOLVING COLLECTIVE-ACTION PROBLEMS**

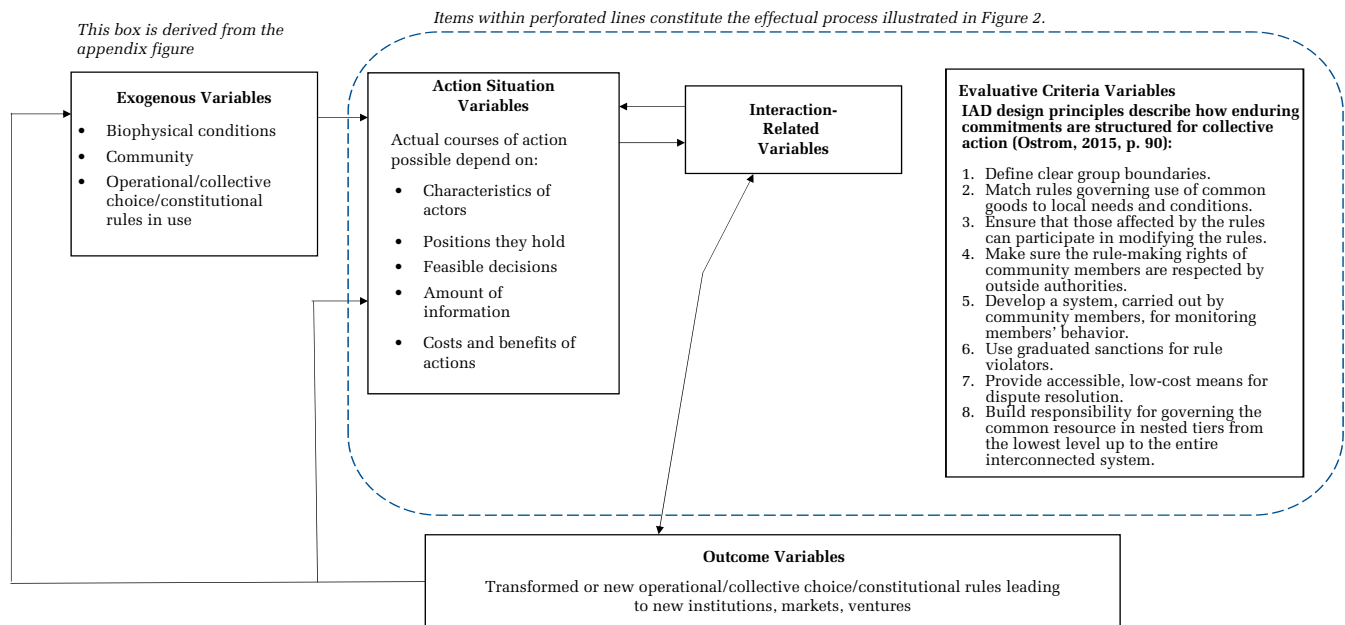
Based on the similarities between the two theories that we described in the previous section, we integrate effectuation and Ostrom's IAD in two ways: (1) We explain how and where effectuation fits into the IAD framework (see Figure 1), which allows us to describe all the variables that affect sustainable entrepreneurship, and (2) we describe how and where Ostrom's design principles derived from the IAD framework can be integrated into the effectual process (see Figure 2), which allows us to describe how the integrated effectual-IAD process unfolds and leads to sustainable solutions.

#### **Integrating Effectuation Into the IAD model**

The IAD is a conceptual framework of different variables that can affect and be affected by institutional change. Integrating effectuation into the IAD model provides us with a conceptual framework that includes all the variables that can affect sustainable entrepreneurship.

**Exogenous variables.** The IAD framework (Ostrom & Ostrom, 2014) begins by defining exogenous variables or "givens" in the form of physical and material conditions, attributes of the community, and rules in use. This is presented in Figure 1 in the *exogenous variables* box and described in greater detail in the appendix. While these variables are exogenous to begin with, the feedback from the outcomes of actions and interactions leads to changes in what the individuals take as given. This is very much in line with effectuation, where effectuators deem certain variables exogenous when they perceive them to be out of their control and others endogenous because they have control over them (Sarasvathy & Dew, 2005).

**FIGURE 1**  
**Effectuation Integrated With the IAD Framework**



**Action situation, interactions, evaluation criteria, and outcomes variables.** The next box in our integrated IAD framework is the *action situation*. The action situation is a social space where individuals interact, gather information, exchange and create goods and services, and sometimes fight. The social space includes both the situation and the participants and is a conceptual unit that can be used to analyze, predict, and explain behavior and outcomes within particular institutional arrangements. The ensuing outcomes and behavior depend on patterns of interactions among various participants (Ostrom & Ostrom, 2014) and are shown in the *interactions* box in Figure 1. The *evaluative criteria* box contains criteria for the transformation process and includes the design principles used to reach collective-action outcomes (Ostrom & Ostrom, 2014). Finally, the *outcomes* box denotes the outcomes of particular interactions within action situations given particular exogenous variables.

From an effectual perspective, the *action situation*, *interactions*, and *evaluative criteria* boxes constitute variables that affect the effectual process. The action situation is characterized by Knightian uncertainty, goal ambiguity, and isotropy (i.e., it constitutes the problem space where effectuation is most useful). However, to result in collective action, effectual interactions need to take into consideration the design principles described by the IAD framework. In other

words, when entrepreneurs do not consider the IAD design principles in their decision making, they go where the process takes them, and the outcomes may or may not end in collective action. Within the integrated-IAD model, Ostrom's design principles serve as a guide to choosing between artifacts as effectuators continue to co-create them.

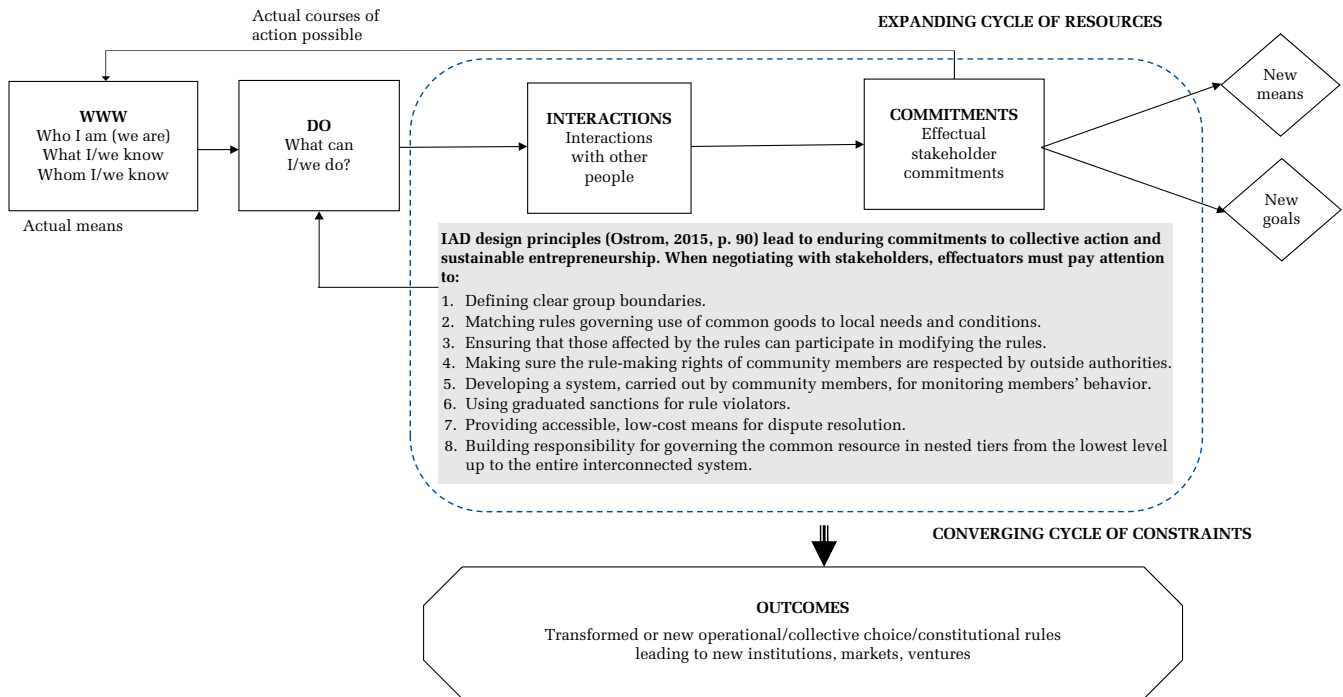
In sum, so far we have described the variables that affect sustainable entrepreneurship by integrating effectuation into the IAD model (see Figure 1). Next, we describe how the integrated effectual-IAD process model unfolds.

### Integrating IAD Into the Effectual Model

The dynamic process of effectuation is described in more detail in Sarasvathy and Dew (2005). Integrating IAD into the effectual process model allows us to develop an entrepreneurial process model for collective action. Effectuation suggests that interactions that result in actual commitments shape the artifacts that come into being. For collective action to be the artifact that comes out of the effectual process, effectuators need to heed the IAD design principles. To the extent that effectual actors in the collective-action process pay attention to these principles, they not only act *within* the rules of the game that define action situations, they also co-create new rules and institutions that transform any situation to a sustainable collective-action situation



**FIGURE 2**  
**Integrated Effectual-IAD Process Model**



in which individuals act toward group goals. Therefore, the integrated effectual-IAD model in Figure 2 provides microfoundations for the collective-action process in general.

Effectual entrepreneurs do not start with a defined problem. They begin with who they are, what they know, and who they know (*WWW* box in Figure 2). They begin the process by asking what they can do (*do* box in Figure 2), given their *WWW*. They then interact with various stakeholders and seek commitments from them to co-create opportunities (*interactions* and *commitments* boxes in Figure 2). These interactions and commitments, guided by IAD design principles, lead to collective action. Each commitment results in new means and new goals, leading to two concurrent cycles of expanding resources and converging constraints. These commitments, guided by IAD design principles, eventually coalesce into new artifacts, such as new ventures, new institutions, and new rules that are enduring and sustainable (*outcomes* box in Figures 1 and 2).

To illustrate empirically how this process unfolds, we next apply our integrated effectual-IAD model to the original historical case study that Ostrom used in her exposition of the IAD framework.

**Application of the integrated effectual-IAD model: A canonical example.** In Chapter 4 of *Governing the Commons*, Ostrom traced the historical development of a set of institutions and governance structures to manage the groundwater basins beneath the Los Angeles metropolitan area. Based on extensive fieldwork conducted by Ostrom and Weschler and updated by Blomquist (Ostrom, 2015, p. 104), this has become a canonical example of IAD. We summarize it below<sup>3</sup> and map it out as a figure to demonstrate how it is an exemplar of the integrated effectual-IAD model we have developed here.

<sup>3</sup> We summarize this example based on Chapter 4 of Ostrom's *Governing the Commons* (Ostrom, 2015). We use this canonical example as an illustrative case to highlight the effectual nature of the IAD model, and the illustration is more powerful if we can show that effectuation is interleaved throughout in Ostrom's own description of the problem. Hence, while we describe it as much as possible in our words, the organization of the entire example and the events that occurred are based on Ostrom's (2015) description, and we provide page numbers from her work as appropriate.

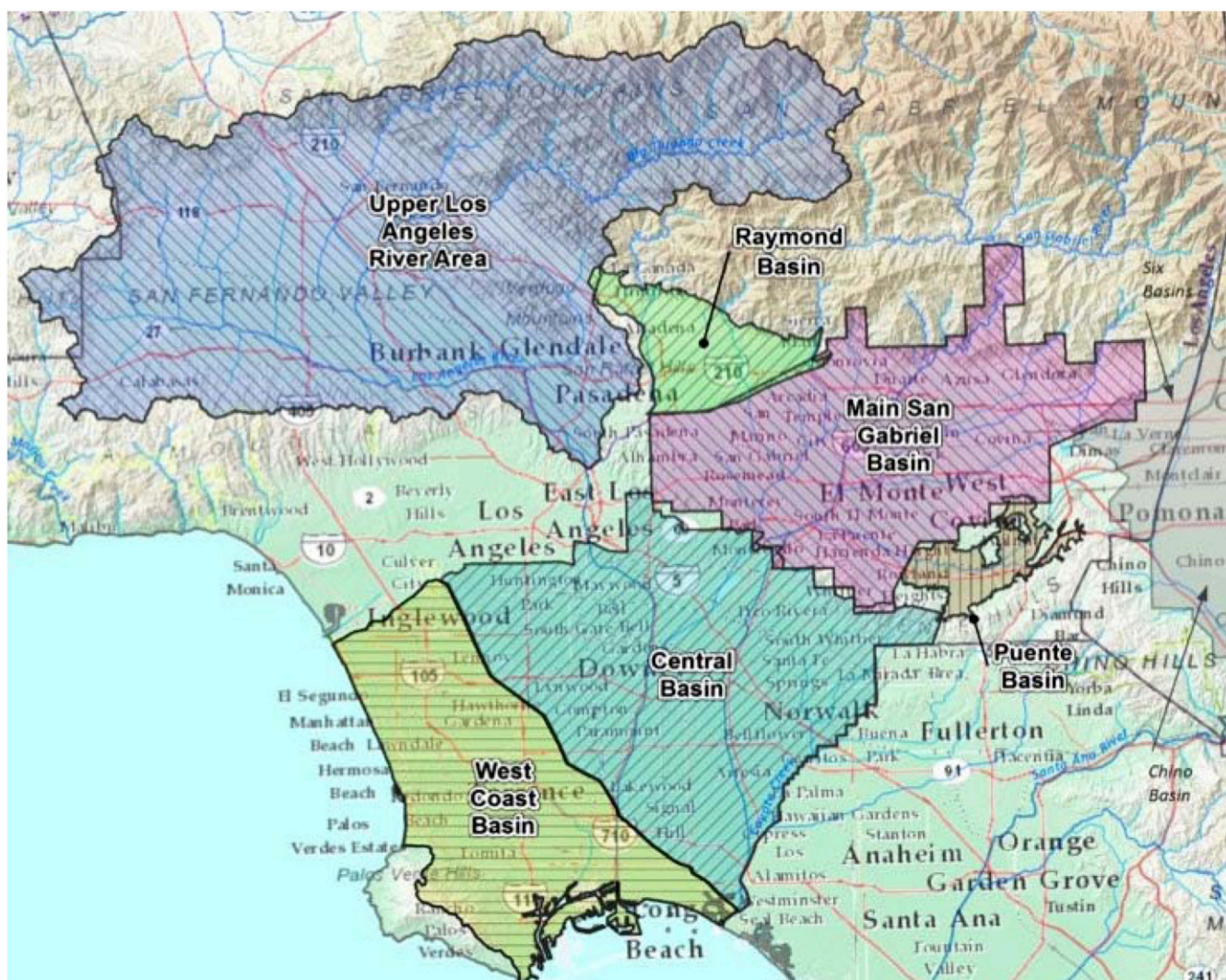
## The Problem

Because Los Angeles is semi-arid, both groundwater basins and surface water supplies are used to provide water (p. 104). A map of the different basins in the region is shown in Figure 3. Groundwater is cheaper than importing water from areas such as Colorado or Northern California. However, these groundwater basins can be destroyed by overuse, overextraction, or pollution, and the cost of even a single basin is exorbitant (p. 106). Extracting more than safe levels of groundwater causes the salt water to intrude into the groundwater basin and eventually destroys the supply of water (p. 106), but

because water is scarce, there are ever-present threats of overextraction by some users.

Two types of individuals could pump water in Los Angeles in the 1980s: (a) landowners with land overlying the groundwater whose claim to water was based on ownership of that land and (b) appropriators who did not own the land and whose claim to water was based on their history of water use under the “first in time, first in right” policy (p. 107). In addition, anyone who extracted groundwater, whom Ostrom referred to as “groundwater producers,” could gain use-based water rights through adverse use or via prescriptive rights, where appropriators gained water rights by pumping

**FIGURE 3**  
Map of the LA Groundwater Basins



nonsurplus water continuously and openly for more than five years (p. 108). The uncertainty of these multiple doctrines of water rights was compounded by the fact that no one knew at the time of extracting groundwater what the pumping rates were, the safe yields of the basin, and whether there was a surplus (p. 108). All of this led to a pumping race (i.e., overextraction of groundwater and the depletion of the resource for more than 50 years). This represents a typical common-pool resource that is nonexcludable—where use of the good by one person reduces the availability for another.

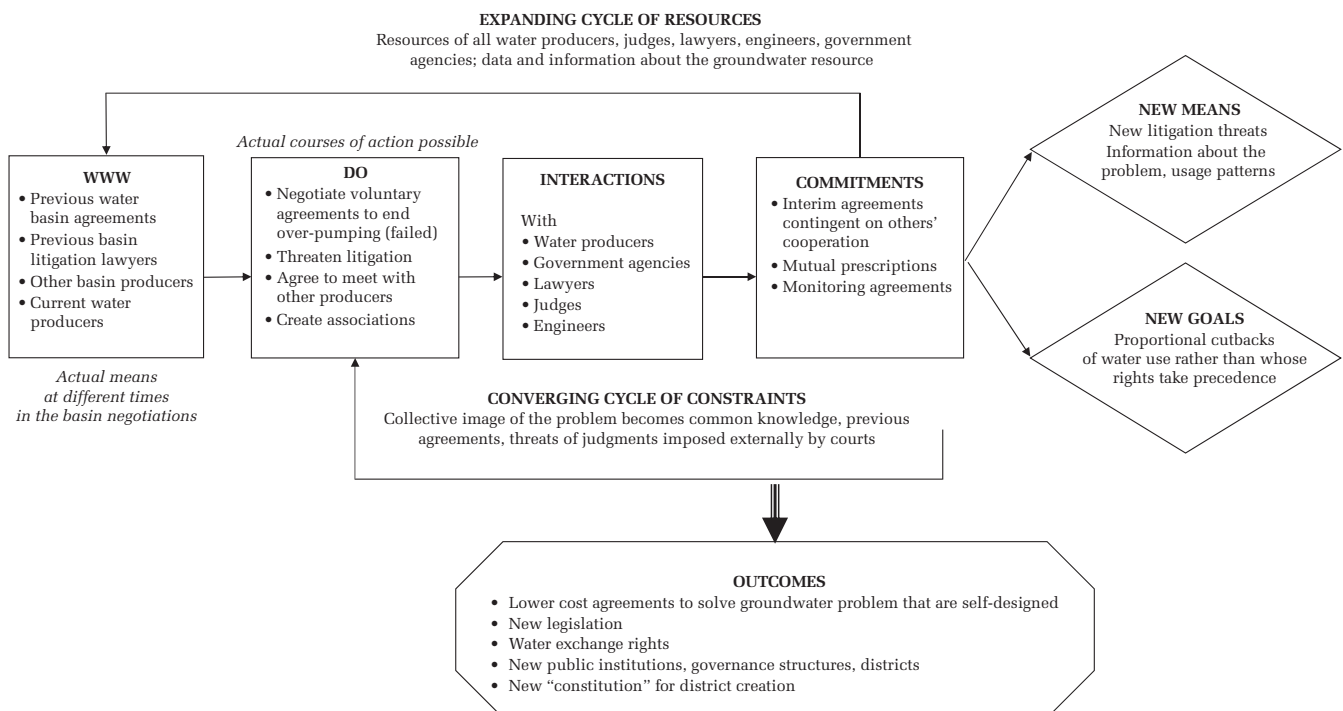
The problem is relatively complex, and it requires new legislation, markets, policies, and institutions. At first blush, it seems as though the most effective processes for finding solutions should be completely predictive because the solutions require changes in multiple interconnected institutional levels. However, the process of institutional change, as we illustrate (in text below and graphically in Figure 4) is overwhelmingly effectual.

### Toward Solutions

**Raymond Basin.** The first coherent steps toward solving the groundwater problem occurred in the Raymond Basin. The basin had a dominant producer: the city of Pasadena. In the 1930s, Pasadena no longer

wanted to act independently to protect groundwater resources that benefited other producers that did not bear the cost. The city tried to negotiate with other producers in the area but was unsuccessful. Hence, in 1937, Pasadena began legal proceedings against the city of Alhambra and 30 other water producers (p. 111). This led to an investigation of the actual levels of groundwater, so the producers were able to see a single authoritative image of the problem they had (p. 112). With the initiation of legal proceedings, the default conditions had changed: If the producers could not find a solution to their water problem, the judges would decide what to do, but they would not be able to go back to their original pumping-race condition (p. 112). Therefore, they had to act. With the threat of litigation, all but two of the 32 parties signed an agreement to proportionately cut back their water use instead of negotiating whose rights took precedence. This concept was called mutual prescription (pp. 112–113). They created further agreements that guaranteed proportional shares of safe yield if water conditions changed in the future and made arrangements through which water rights could be traded on a yearly basis (pp. 113–114). The two producers that did not sign the agreement went to court, and the judge issued a judgment that upheld the water producers' mutual prescription agreement (p. 114).

**FIGURE 4**  
Applying the Integrated Effectual-IAD Model to the LA Groundwater Basin Example





**West Basin.** The West Basin negotiations that followed the Raymond Basin deal had one major advantage: The Raymond Basin neighbors had undertaken the cost of finding innovative solutions to their groundwater problem and had experimented with and developed a formula (mutual prescription) to negotiate water usage and rights (pp. 114–115). However, the West Basin area had no single dominant producer to initiate litigation. Therefore, in 1943, nine of the coastal municipalities met several times and agreed that they needed more information about the groundwater problem (p. 115). As a result of this agreement, they decided to initiate legal action to curtail water pumping. Kenneth Wright, the attorney for Pasadena in the Raymond Basin court proceedings who also served as the attorney for the California Water Service Company in the West Basin, explained the concept of mutual prescription to these producers (p. 116).

After that, the producers in the region formed the West Basin Water Association to gain information about groundwater levels (p. 116). The association formed a Legal Settlement Committee made up of six lawyers and five engineers. The formation of the Legal Settlement Committee within the association was significant in terms of changing the bargaining structure: The members of this committee represented not only the interests of their firms but also the committee's interests (p. 118). For instance, T. B. Cosgrove, one of the people appointed to the Legal Settlement Committee, was the attorney for the Dominguez Corporation. He had opposed the litigation before his appointment, but once he joined the committee he became a cooperator. This meant that his firm could not obtain as many water rights as it could have if he had opposed the litigation (footnote 19, Chapter 4). In terms of the people involved, it is also interesting to note that the city of Inglewood initially opposed the actions proposed by the West Basin Water Association; they were senior appropriators, and their lawyers had advised them that this status would ensure that their water rights were protected. However, once the Raymond Basin judgment came out in favor of the mutual prescription agreements, they became active participants in the effort to find solutions (p. 117 and footnote 18, Chapter 4).

Despite the support of all these stakeholders, agreement about water withdrawal was not a simple replication of the Raymond Basin strategy because there was no dominant producer. However, the producers knew they had to find a solution because the initiation of litigation procedures had ensured that they could not go back to their pumping race

(p. 117). Cosgrove and the committee drafted an interim agreement as a contingent contract that would take effect only if enough people signed, so that no one could be cheated (p. 119). Two parties refused to sign the agreement: the California Water Service Company and the city of Hawthorne. The California Water Service Company refused because it had paid a bulk of the initial litigation costs (p. 119). Eventually, it decided to voluntarily cut back production but refused to sign the contract, which would result in additional costs of monitoring and watermaster services (p. 120).<sup>4</sup> Hawthorne did not sign because it had a different view of the problem: It believed that the agreement favored industrial producers at the cost of the public. The city eventually appealed in court and lost (pp. 120–121).

**Central Basin.** The Central Basin litigation was much easier because Carl Fossette, who was the part-time executive director of the West Basin Water Association, became an important part of the new Central Basin Water Association (p. 123). He was able to help water producers change institutions in all the interlinked basins because of his overlapping positions, long tenure, tolerance for conflict, and ability to represent multiple interests (footnote 28, Chapter 4). In addition, some West Basin water producers also worked in the Central Basin, which meant they knew about the West Basin and Raymond Basin negotiations. This made the negotiations in this region much less expensive: They used the West Basin and Raymond Basin agreements and adapted them to their particular circumstances (p. 123). By negotiating their own agreements, all regions had solved their groundwater problems at a fraction of what it would have cost them if they had waited for the court to sort out whose water rights took precedence (Table 4.1, p. 134).

### After litigations

Once the litigations occurred and the producers conformed to the new water allocation patterns, the

<sup>4</sup> As part of their mutual prescription agreements, each water producer agreed to be monitored by a watermaster. The watermaster was a neutral authority who disseminated information, monitored everyone periodically, and calibrated the meters (p. 125). Because all the pumpers in question agreed to and participated in the initial allocation of rights, they thought the system was fair (p. 126). If any party believed that the watermaster was prejudiced, it could appeal to the court and secure a different watermaster (p. 126).

parties realized that there was no public agency with the authority or the capability to answer any new questions these litigations brought up, such as where to get additional water to meet demand and the jurisdiction of different public agencies (pp. 127–128). Hence, 45 agencies met in September 1954; a committee of 12 was formed to draft more effective water legislation (p. 128). The committee included such diverse individuals as engineers, attorneys, and representatives of irrigation districts, water districts, farm bureaus, cities, private utilities, and the state of California, which allowed for multiple perspectives in the decision-making process (footnote 35, Chapter 4). They drafted the Water Replenishment District Act, which authorized citizens of California to create new districts based on specified rules and regulations (p. 129) to be better organized for water allocations and disputes.

After the water cutbacks due to the mutual prescription agreements, the various basins did not have enough water to serve their districts. The West Basin water producers wanted to purchase reclaimed water from the Hyperion sewage water reclamation plant, but this was technically unfeasible (p. 130). This meant that they had to negotiate with the Metropolitan Water District (MWD) of Southern California, which was a powerful body (p. 130). Based on the Water Replenishment District Act, they decided to form a joint district with their Central Basin neighbors (p. 131) to negotiate with MWD because they reasoned that it would give them more bargaining power (p. 130). After deciding to form a joint district, they began to negotiate with all the public agencies that would eventually be responsible for these basins (p. 132). The proposal they drafted was “a constitution for a multiple agency management system to operate a coordinated program” (p. 132). This resulted in the creation of a series of structures that jointly managed the districts and their water allocation (i.e., a polycentric governance system).

These institutions remain robust and effective in managing groundwater allocation, as does the mutual prescription formula these producers agreed upon. Further, the process of mutual prescriptive solutions led to the creation of new markets for water trading. Finally, the interactions among stakeholders led to the creation of new legislation, new water districts, and new organizational forms.

**Mapping the canonical example onto the integrated effectual-IAD process model.** In Figure 4, we map out the process through which the groundwater problem was solved in Los Angeles. In her in-depth narrative of the history, Ostrom described the

institutional change process as being incremental, sequential, and self-transforming (Ostrom, 2015, p. 137). This is very much in line with the integrated effectual-IAD framework in Figure 2. Furthermore, as depicted in Figure 4, the narrative clearly highlights the integration of every step of the effectual process with the IAD design principles laid out in the effectual-IAD model in Figure 2. In other words, Figure 4 reproduces Figure 2 with the narratives from the Los Angeles water basin case study incorporated into each box.

**WWW box.** Based on their current situation, affected stakeholders collectively decided that a particular common-pool resource problem needed to be solved, and their solution was based on who they were, what they knew about the problem, and whom they knew. These were the means they began the process with. In the case of the groundwater problem, water producers began with the understanding that current usage patterns of water were unsustainable. At different points in time, the set of means that water producers could use changed; it included past judgments and lawyers and individuals from previous negotiations once the process unfolded.

**Do box.** Ostrom (2015) herself has argued that based on available means, while first-order solutions to a problem might be infeasible, certain individuals might voluntarily decide that it is easier to solve a small part of a second- or third-order problem (i.e., the payoffs to solving a higher-order problem are sufficiently high and can be distributed among many people; p. 141). This allows the users to self-select in solving pieces of a problem at the institutional or constitutional level first rather than at the operational level. The process is sequential and incremental, and early successes and failures are evaluated before anyone needs to invest larger amounts (p. 137) (i.e., actions can be taken based on affordable loss without having to calculate all the upside and its beneficiaries in advance). In the groundwater problem (Figure 4, *do* box), possible actions based on affordable loss included threats of litigation, attempts to initiate voluntary agreements, meeting with other producers, and creating associations.

**Interactions and commitments boxes.** The individuals involved met and interacted with each other and, in the process, gained information about the basin as well as the likelihood of the other person investing in and sticking to commitments (Ostrom, 2015, p. 138, and Figure 4, *interactions* box). These discussions led to the initiation of litigation, which enabled the participants to reach enforceable

agreements in terms of mutual prescriptions and monitoring agreements to limit their water withdrawals (Ostrom, 2015, p. 138, and Figure 4, *commitments* box).

**Concurrent expanding cycle of resources and converging cycle of constraints.** Each interaction transformed the structure of alternatives within which new strategic choices could be made (p. 137). In the groundwater problem, this led to new means (*new means* box) such as (a) more information and (b) using litigation as a tool to enact behavioral change. It also led to new goals (*new goals* box) when the producers decided to focus on proportional cutbacks rather than arguing about rights. This resulted in two concurrent cycles of expanding resources in terms of other stakeholders and information, and converging constraints in the form of a common image of the problem and the threats of externally imposed judgments.

This integrated effectual-IAD process eventually coalesced into a variety of new artifacts, including institutions and rules that took the form of new markets for water exchange rights, new polycentric institutions for governance, new legislation, new constitutions for district creation, and new districts. These are depicted in the *outcomes* box in Figure 4. All of these resulted in a sustainable solution to the Los Angeles groundwater basins' common-pool resource problem.

So far, we have described the overwhelmingly effectual nature of the process of finding solutions to the Los Angeles groundwater basins' problem. Ostrom (2015) further provided multiple examples of collective action for various problems involving the commons, such as overfishing in fisheries, developing irrigation projects, balancing farming and forestry, and preserving groundwater. All of these situations involve multiple stakeholders and are characterized by Knightian uncertainty, goal ambiguity, and isotropy. The effectual-IAD model developed here provides guides to action under these conditions. Therefore, we could have used any of these examples to make the same argument that tragedies of the commons can be solved and are usually solved based on effectual interactions that are guided by IAD principles as described in our model.

## DISCUSSION

Our framework provides a guide for action when individuals interact in uncertain environments with a view to creating sustainable solutions to the tragedy of the commons. Sustainability problems are complex, and human beings who grapple with them have multiple motivations. Yet such problems are

routinely solved in practice, as illustrated in the water basin example. This paradox is clearly articulated in Ostrom's work on collective action and was the starting point for the development of our integrated model. We began by assuming that theories that explain how human beings solve difficult problems cannot ascribe particular near-universal motivations to individuals or prespecify outcomes with any degree of precision. Instead, we sought to specify the dynamics of co-creation and collective action where both antecedents and outcomes may be in flux, even if the various actors agree on some high conceptual level on the shape of the problem to be solved.

To develop a model that embodied these complexities of sustainability problems, we combined the IAD framework with the dynamics of effectuation. We developed this model in two parts: First, we described all the variables that affect sustainable entrepreneurship, and second, we provided a process model that explains how the process of sustainable entrepreneurship unfolds. The two theories are similar in their assumptions, which made it easy to integrate them. Integrating these theories enriches effectuation by introducing collective-action design principles into the entrepreneurial process and enhances IAD by providing an entrepreneurial process perspective that describes how human action and interaction can systematically lead to collective-action outcomes. We describe these contributions in more detail in Table 1.

Typically, in building theories that deal with complexity of any kind, it is customary to specify necessary conditions either about the nature of the individual or about the environment, or both. Necessary conditions related to individuals may include assumptions such as that entrepreneurship requires risk takers, or that collective action requires individuals who will go beyond self-interest. Necessary conditions about the environment specify enabling conditions, or principles that allow for collective action to happen. The framework we build here integrating effectuation and IAD does not have any of these conditions. Instead, it serves as a guide for action for all kinds of individuals working on all sorts of complex sustainability issues that involve Knightian uncertainty, goal ambiguity, and isotropy.

In our framework, an optimistic individual can act optimistically and a pessimistic one can act pessimistically. Moreover, when these two kinds of individuals interact, they can each make commitments to specific courses of action they agree on, even if their agreement is based on different motivations and personalities. In the case of climate change, for example, the optimist might believe that solar panels

**TABLE 1**  
**Similarities Between IAD and Effectuation and How Integrating Them Enriches Both Perspectives**

Common assumptions between IAD and effectuation		
Assumption 1	Human beings are complex and have multiple motivations.	
Assumption 2	The process of new market/institution creation is interactive and intersubjective.	
Assumption 3	The environment is transformed by intersubjective interactions and leads to the creation of new markets and institutions.	
Assumption 4	Markets and institutions are co-created and are outcomes of human design.	
Why integrate IAD and effectuation?		
Contributions	IAD enriches effectuation by	What it contributes to effectuation
Contribution 1	Providing design principles that guide collective action and lead to sustainable entrepreneurship	Without the guiding design principles of IAD, effectuators go where the effectual process takes them. This may or may not result in collective action. IAD design principles help channel effectual strategies to enable and foster collective action.
Contribution 2	Providing a list of exogenous and endogenous variables that affect and are affected by action and interaction in collective-action situations	IAD allows entrepreneurship and effectuation scholars to study, measure, and quantify complex collective-action processes.
Contribution 3	Explicitly delineating nested and interconnected action situations into four categories: operational, collective action, constitutional, and meta-constitutional	IAD enables entrepreneurship scholars to collect data and study the nested nature of collective action and develop multilevel models that can tackle the complexities of sustainable entrepreneurship.
Contributions	Effectuation enriches IAD by	What it contributes to IAD
Contribution 4	Offering a micro-level process perspective that provides actionable tactics for an entrepreneur seeking to tackle big, hairy collective-action problems	Effectuation provides microfoundations for collective-action theories such as IAD. It allows IAD scholars to map individual human action to polycentric governance outcomes within a dynamic process model.
Contribution 5	Describing how individuals can transform existing common-pool resource situations by co-creating new rules and institutions that enable polycentric governance of those resources	Effectuation enables IAD scholars to descriptively integrate individual human action with IAD principles while at the same time developing normative guidelines on how people can kickstart collective action.
Contribution 6	Describing how to stitch together stakeholder commitments by working with other individuals using effectual principles without having to rely on prediction	Effectuation highlights variables at the intersubjective level of analysis relevant to the implementation of IAD (e.g., commitment, negotiation, self-selection, etc.).

have a high market potential in terms of return on investment (ROI), while the pessimist might believe that without solar power climate change will kill us all, and so one ought to invest in it even if the ROI may be slim to none. Yet if the two are able to interact based on the guides to action described in our framework, collective-action solutions to sustainable entrepreneurship will occur. This model has implications both for theory and practice, and we describe these next.

### Theoretical Implications

**Multilevel models.** Scholars have argued that multilevel models are necessary for the next level of

theorization in entrepreneurship (Davidsson & Wiklund, 2001; Zahra & Wright, 2011). However, multilevel modeling is rare because it is difficult to completely specify a multilevel model (Klein & Kozlowski, 2000). Yet the IAD and collective-action literatures in economics have shown both theoretically and empirically how data can be collected at multiple levels in settings of complex collective action to solve problems of sustainability. Future research on sustainable entrepreneurship could emulate the methods employed in these literatures and use real-time historical case study methods combined with game theoretic experiments in the lab and field to take a more textured look into entrepreneurs' actions, reactions, and interactions. The

integrated effectual-IAD process model for sustainable entrepreneurship that we develop here provides a way to systematically collect data and analyze it at the individual, collective choice, and constitutional levels.

**Intersubjective level of analysis.** Solving collective-action problems not only requires multiple methods and multilevel analyses as in IAD, it also requires special attention to the intersubjective. For example, Venkataraman et al. (2012) argued that individuals begin with a shared understanding of language and rules and interact with one another to stitch the opportunity together piece by piece. In the case of sustainable development, where institutions and markets perhaps do not exist, this suggests interesting research ideas at the intersubjective level, such as how entrepreneurs could help develop and foster a sense of community (Jennings et al., 2013; Marti, Courpasson, & Dubard Barbosa, 2013) and how they learn and put to use the notion that futures are co-created (Sarasvathy, 2009). Each interaction with a self-selected stakeholder coalesces into a commitment or a deal that structures the relationship between the entrepreneur and the stakeholder as described in the integrated IAD effectual process model. Therefore, these deals and commitments are artifacts of our model and are a useful way to study intersubjective interactions in sustainable entrepreneurship.

**Behavioral change as a proximal dependent variable.** Extant literature has argued that outcomes for sustainable entrepreneurship are difficult to measure (Parrish, 2010). Other scholars have argued for the need for action-based proximal outcomes in entrepreneurship in general (Shepherd, 2015). Both the literature on IAD and the one on effectuation offer glimpses that not only outcomes but goals, motivations, and other individual behavioral variables may change through the entrepreneurial process. Yet research on behavioral change as a dependent variable is practically nonexistent in entrepreneurship. Simple anecdotal evidence and almost all normative work in sustainable entrepreneurship argue for behavioral change in individuals. For example, how do we get people to recycle? How do we get corporations to pay more attention to their environmental footprint? In creating solutions to such sustainability issues, the solution is sustainable only if agent (customer, user, or other stakeholder) behavior changes. In the case of the LA basin example described in this paper, if the mutual prescription-based monitoring schemes had not led to a difference in water usage patterns, the solutions would not have led to a conservation of the resource.

There is a rising stream of work in psychology and behavioral economics that focuses on behavioral change as a dependent variable (Cialdini, 1993; Datta & Mullainathan, 2014; Miller & Prentice, 2016), and

using this literature to study sustainable entrepreneurship would be useful. If we consider behavioral change as the dependent variable, institutions, social movements, collective action, interactions, and behavioral research serve as tools and information to institute behavioral change in the process of creating sustainable solutions. In constructing research of this kind, scholars would consider institutional transformations, creation of new firms, and changes in policy as independent variables that affect the dependent variable: behavioral change.

## Practical Implications

**Learnable and teachable.** The effectual-IAD process model provides a guide to collective action that can be learned and taught to entrepreneurs seeking to solve complex sustainability problems. This model describes collective action from the perspective of individual actors seeking to solve sustainability problems and provides them with a tool kit for action and interaction. Because the model makes no assumptions about kinds of individuals, their motivations, or their values, it is teachable to almost anyone who wishes to engage in collective action to solve sustainability problems. And an important part of the lesson here consists of criteria and techniques to bring even those who may not be motivated by sustainability problems on board into the collective-action process.

**Structuring stakeholder commitments.** The IAD design principles provide guidelines for stakeholder commitments. Evaluating each commitment based on these principles provides a way to judge whether the outcome will externalize collective-action issues to the government or society or solve them. Freeman, Harrison, Wicks, Parmar, and De Colle (2010) suggested that any trade-offs that result in externalities are simply failures of imagination. The IAD principles give individuals a set of guidelines that help them evaluate their solutions and identify whether their commitments will result in enduring sustainable collective-action solutions. Therefore, these principles can be used as tools that guide sustainable decision making in both entrepreneurial ventures and corporations at large.

## CONCLUSION

Sustainability issues are becoming more pressing by the day; debates in scholarship and popular media cover who should solve the problem, who is responsible for the environmental degradation, what the role of organizations is, and what our legacy for future generations is. In this paper, we take a different approach: We provide a guide to action for any and all individuals seeking



to solve complex sustainability problems based on their current situation. This approach argues for a central role for entrepreneurship in the process of creating solutions to sustainability problems but does not ascribe particular characteristics or motivations to the entrepreneur. Instead, it recognizes sustainable entrepreneurship as a process that involves any and all stakeholders who are willing to self-select into the process.

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## APPENDIX

### INTERCONNECTED AND NESTED ACTION SITUATIONS

#### Appendix notes:

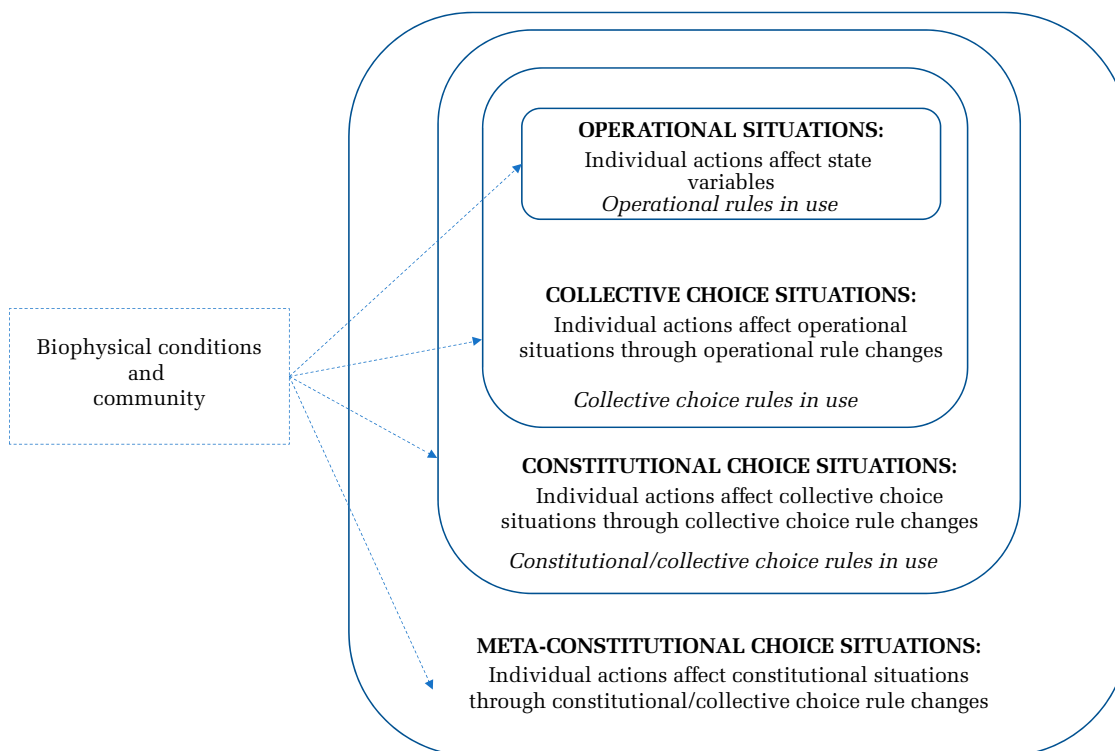
Institutional design based on real people solving complex problems involves three worlds or situations within which individuals act (Kiser & Ostrom, 2000): the operational, the collective choice, and the constitutional (refer to appendix figure). These three situations are nested within each other and interact in complex ways. Adapted from Figure 3.2 in Ostrom and Ostrom (2014).

- (1) In an operational situation, given a particular situation, individuals act and devise strategies for future action contingent on the rules of the game. In free markets, for example, this level gives the individual a variety of choices and strategies to trade and create organizations.
- (2) In a collective-choice situation, the scope of action depends on the rules of the game or institutional arrangements. The rules of the game are determined,

changed, or enforced in the collective-choice world of action. Nonconformity to rules is punished and objections and changes to rules are voiced using symbolic actions such as voting or civil disobedience.

- (3) The third world/situation of action occurs at the constitutional level; these are rules about rules—in other words, decisions about who gets to make the rules, how the rules can be changed, and so on. These constitutional rules constrain the sets of collective-action strategies available, which in turn affects the decisions and actions individuals can take.

These three worlds or situations are interconnected and can be transformed based on actions and interactions. Further, each of these situations has rules that determine which actions are possible and which ones are not. These rules of action determine the nature of the situation and are embodied in institutions. Ostrom's design principles determine rules in each situation that enable collective action. Enduring institutions that affect all three situations have distributed structures in which decision making is not centralized—that is, these institutional structures are polycentric (Ostrom, Tiebout, & Warren, 1961).



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